Mergers and Competition in the Dutch Healthcare Sector

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About the Author

Anne-Fleur Roos (1985) completed a BSc. in Health Sciences in 2008 and an MSc. in Health Economics, Policy and Law in 2009, both with distinction. She then became a PhD student at Erasmus School of Health Policy and Management, Erasmus University Rotterdam.

At Erasmus School of Health Policy and Management, Anne-Fleur studies and teaches in the field of healthcare financing and organisation. This thesis is a result of her research on mergers and competition in the Dutch healthcare sector, and it was funded by an iBMG grant for innovative PhD research. While working on her dissertation, Anne-Fleur also worked as an external collaborator in several projects at the Dutch Healthcare authority. Her work has been published in international peer-reviewed as well as professional journals and she has been granted several awards, scholarships and fellowships. She has presented her work to a wide range of audiences, including peers, policymakers, the general public and students.

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Fusies en concurrentie in de Nederlandse gezondheidzorg

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PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus

Prof. dr. H.A.P. Pols

en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op
donderdag 14 juni 2018 om 13:30 uur.

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CHAPTER 1

Introduction

1.1 Introduction

In the Netherlands, questions regarding the appropriate way to organize the delivery of hospital care long predate the introduction of competition in the 1990s and 2000s. In 1978, a symposium on 'inter-institutional co-operation and mergers' was organized by the Dutch National Hospital institute (NZi). The questions discussed during this symposium included: "why do hospitals merge?" And, because the Dutch government was at that time closely involved in the planning of hospital services: "which distribution of hospital services across the country leads to the highest efficiency, accessibility and quality of care?" Almost forty years later, the same questions continue to dominate the debate on the structure of the healthcare market in the Netherlands, although because of changes to the Dutch healthcare system, additional questions have emerged. The large number of mergers between hospitals is a point of concern in terms of the consequences of further consolidation in the hospital market, especially now that a larger role for competition is envisioned in the sector than forty years ago. However, the gradual introduction of competition into the Dutch healthcare system also led people to ask how far competition in healthcare should be taken, what the impact of mergers on competition is, and what the effects of competition are. These questions were seldom asked in relation to the heavily regulated healthcare market of 1978.

In this thesis, we will seek to contribute to a better understanding of the effects of competition and mergers in the Dutch healthcare sector. The findings of this thesis may help the government, its regulatory agencies and other countries to improve the functioning of markets in healthcare. Although some form of competition has now been introduced into most of the markets for healthcare in the Netherlands, this thesis will focus on the hospital sector. Hospital care accounts for the majority of overall healthcare spending (OECD, 2015). More importantly, however, the hospital sector was among the first healthcare sectors in the Netherlands in which competition was introduced, following a long period of strict regulation, and it simultaneously experienced increasing levels of consolidation. The combination of these factors creates an excellent opportunity to study the effect of market structures in the healthcare sector.

In the remainder of this chapter, we present a brief overview of existing research concerning the effect of competition and mergers in healthcare. First, we will explain why health economists do not simply open an economics textbook, read what the sections on oligopolies or bilateral bargaining have to say about the rationales and effects of mergers and competition and leave it at that (section 1.2). In section 1.3, we will provide a brief overview of the empirical research done so far. Finally, we will outline the research topics that will be addressed in this thesis (section 1.4).

1.2 Why study mergers and competition in healthcare?

In the Netherlands, as in many other countries, the scope for competition between healthcare providers and healthcare payers has increased substantially in recent decades. Although competition in healthcare was long restricted almost exclusively to the United States, over the last twenty years European countries have also been seeking to increase competition between healthcare providers, healthcare payers or both (Propper, 2012). Propper and Leckie (2011: 671) explain why competition in healthcare holds such promise for policy makers:

> *"Competitive pressure helps make private firms more efficient. They cut costs and improve their goods and services in order to attract consumers, and this continual drive for improvement is good for the economy. Firms that are unable or unwilling to become more efficient will be priced out of the market while new, more efficient, firms will enter the market. (…) Giving purchasers or service users the ability to choose applies competitive pressure to healthcare providers and, analogously with private markets, they will raise their game to attract business."*

However, healthcare markets differ from textbook competitive markets (Gaynor et al., 2015; Propper & Leckie, 2011). In 1963, Arrow explained that the prevalence of uncertainty regarding the timing, nature, extent and impact of illness and healthcare causes unregulated competition in healthcare markets to be suboptimal. Dranove and Satterthwaite (2000: 1096) conclude that "the model of perfect competition can […] serve as the benchmark of optimal performance, but generally it can not be used to illuminate the health care market's specific functioning". Because healthcare markets are imperfectly competitive, non-market institutions have arisen in addition to

market institutions. Hence, although many countries have introduced competitive forces into their healthcare systems, in practice these markets remain heavily regulated (Helderman et al., 2012)[1].

Where does this leave us? Are there any theoretical models that "take into account [healthcare market's] deviations from the competitive market's prerequisites" (Dranove & Satterthwaite, 2000:1096) and which we can draw on in order to evaluate market performance in healthcare? Fortunately, research concerning the industrial organization of healthcare markets has led to significant progress in understanding how non-market institutions in healthcare are able to overcome the issues of the unregulated market (Dranove, 2012). Although most early theoretical work relied heavily on simple models of oligopolistic markets, recent studies have incorporated game theoretical concepts in order to model the peculiarities of healthcare markets more convincingly and thereby increase our understanding of the functioning of healthcare markets. Hence, from a theoretical perspective, health economists are acquiring a better understanding of the functioning of healthcare markets that depend on both regulation and competition. This conceptual understanding has also been supported by empirical findings, which are discussed in the next section.

1 It should be noted, that in practice, there are almost no perfectly competitive markets and that in every market there is always some form of governmental intervention (Tirole, 1988). However, after studying the specifics of healthcare markets, Dranove & Satthertwaite (2000) conclude that no other market of substantial importance violates the requirements of perfect competition to the same extent as the market in healthcare.

1.3 Empirical research on the impact of hospital mergers and competition

Empirical research on the industrial organization of private healthcare markets (i.e., markets with competing health insurers and providers) is based on five stages (Gaynor et al., 2015). In the first stage, healthcare providers determine the level of quality that they provide. In the second stage, providers negotiate with insurers to determine the insurers' provider networks and the prices paid to providers. In the third stage, insurers choose their premiums. In the fourth stage, consumers choose their insurers and in the last stage, some consumers utilize healthcare. While currently each of the individual stages that Gaynor et al. (2015) identifies has been analyzed at least to some extent, very few papers have addressed more than one or two of these stages at once because of modelling issues (Gaynor et al., 2015). Furthermore, early studies were hampered by a lack of data. However, since much more data is now available and we have more advanced econometric techniques at our disposal, health economists are able to tackle many more questions empirically.

One important finding from the empirical literature is that the effect of competition depends heavily on the institutional features of a healthcare market (Propper & Leckie, 2011). That is, competition-inducing reforms take place in the context of different institutions and policy programs, which determine the responsiveness of market players to changes. Each country therefore displays its own combination of competition and regulation in healthcare markets. In their report on provider competition in healthcare, the European Commission's Expert Panel on Effective Ways of Investing in Health (EXPH) acknowledged the potential value of competition in European healthcare systems. However, the Panel also stressed that minor differences in market characteristics can lead to very different outcomes and that it is therefore important for policy evaluation studies to take account of the specifics of the market in question (Barros et al., 2016). The same is likely to be true for studies into the effect of healthcare mergers. This does not mean that it is impossible to learn from other countries' experiences, but international differences do mean that policies – and the results of empirical research – need to be translated rather than directly transferred (Dixon & Poteliakhoff, 2012). By gathering knowledge on the effect of competition and mergers within diverse institutional contexts, researchers and policy makers are able to learn whether competition is effective, which policies work and which policies need to be improved.

In the subsequent sections, we will first discuss the empirical research into the impact of healthcare mergers and competition on prices (section 1.3.1). Then, in section 1.3.2, we will focus on the impact of mergers and competition in healthcare markets on quality of care.

1.3.1 Empirical research on the impact of healthcare mergers and competition on prices

Studies that estimate the impact of concentration differ widely in terms of the methodology used and measurement assumptions made (Gaynor & Town, 2012). Most of the early studies in this field relied on the structure-conduct-performance (SCP) approach. In practice, the SCP approach boils down to regressing price on some measure of market concentration, usually the Herfindahl-Hirschman Index (HHI), while controlling for observable confounding variables. Although relatively easy to understand, these studies suffer from several shortcomings. For example, studies adopting this approach often neither account for the fact

that the measure of competition may be affected by the outcomes that were being studied, nor do they define the healthcare markets in question concisely enough (Propper & Leckie, 2011). It is well-documented that for this reason, SCP studies underestimate the impact of concentration on prices (e.g., Gaynor & Town, 2012).

Recent empirical research has focused more on these methodological issues and its results are therefore generally considered more reliable. These studies usually look at consummated mergers or policy changes by employing a difference-in-differences approach. A difference-in-differences approach involves comparing the price changes at the organizations that are subject to a reform or a merger with price changes among a group of comparison organizations which are unaffected by the reform or the merger. Although many of the problems that beset the traditional SCP approach are eliminated when newer approaches are adopted, these newer approaches are associated with difficulties of their own. For example, defining which organizations are unaffected by the event that is being studied, and may therefore be included in the control group, can be a daunting task under the difference-in-differences approach. Another concern is that the merger or the reform may be endogenous (Gaynor & Town, 2012). Propper (2012) also points out that difference-in-differences designs are essentially black box analyses that do not shed light on how exactly changes in incentives are translated. Hence, our understanding of these mechanisms often remains limited.

The latter issue is partly solved by newer research that uses structural and semi-structural techniques that stem directly from economic theory. These approaches also have their challenges, which lie mainly in the translation of economic models to actual data as well as the determination of a sensible counterfactual, but because of recent progress, these techniques are nonetheless considered promising avenues for further research in the industrial organization of healthcare markets (Gaynor & Town, 2012).

Although the empirical literature on the impact of healthcare mergers and competition differs widely in the methods used, the results that follow from the studies are remarkably similar: most studies found that increased competition leads to lower prices and lower costs (Gaynor & Town, 2012). Hospital mergers, which generally lead to less competition, are mainly found to lead to large price increases (Gaynor & Town, 2012). However, the effect

of mergers varies between different market settings, hospitals and insurers, and the mechanisms by which these heterogeneities occur are not always well understood (Gaynor & Town, 2012; Propper, 2012). This heterogeneity in the effects of mergers also means that it is unclear how the findings – which emanate mainly from the United States – translate into settings involving newly emerging competitive healthcare markets. Moreover, there is limited evidence on whether and how this evidence can be used to predict the price effects of future mergers and reforms. In this thesis, we will discuss a number of these issues (see the outline in section 1.4).

1.3.2 Empirical research on the impact of healthcare mergers and competition on quality

Like the literature on the price effects of competition and mergers, the empirical literature on the impact on quality is growing, albeit at a much slower rate. Only a few studies have investigated the effect of mergers on quality and these studies do not agree on whether there is an effect and if so, whether it is positive or negative (see Gaynor & Town, 2012 for an overview). The literature on the impact of competition on quality, however, is more extensive and its findings are more consistent.

Generally, there are two market configurations in which quality competition is observed: quality competition in systems with regulated prices, and quality competition in systems with freely negotiable prices. Most research on the competition-quality relationship under regulated prices has found that competition has a positive impact on quality, which is in line with the predictions of economic theory in relation to markets with regulated prices (Gaynor & Town, 2012). Economic theory predicts that the impact of competition on quality in markets where prices are freely negotiable is much more variable, and this is also confirmed by empirical studies (Gaynor & Town, 2012).

However, earlier studies leave plenty of scope for further research on the competition-quality relationship. For example, currently a very limited set of quality indicators is used to establish the relationship between competition and quality. Our knowledge would be greatly enhanced by broadening the scope of quality that is measured. Furthermore, research in this field has been limited to the United States and England and it would be interesting to find out how these findings translate to other settings. We will explore these and other issues in this thesis (see section 1.4 for an outline).

1.4 This thesis

This thesis contains six research chapters and one concluding chapter. This final chapter reflects on the main findings of this thesis and provides policy recommendations as well as directions for further research. All chapters can be read independently, which inevitably implies there is some overlap in their descriptive sections.

1.4.1 How do institutional changes relate to hospital mergers?

Chapter two sets the stage for the remainder of the thesis by outlining the history of hospital mergers in the Netherlands. In this chapter, we will summarize which policy changes have occurred over the past forty years and relate these to changes in the hospital market structure. We will show that the Dutch hospital market has experienced several waves of mergers and that these waves are the main reason for the existing high level of concentration in the Dutch hospital sector. The introduction of competition into the sector implied that market concentration has become a source of concern. After all, competition can only lead to increased efficiency, quality and accessibility when a sufficient number of alternatives are available to consumers and/or insurers. This precondition may not be fulfilled in a market that becomes excessively concentrated, particularly because there is no reason to believe that the ongoing consolidation of the hospital sector will stop in the near future. Neither is it likely that new (international) hospital organizations will enter the market in the foreseeable future. In the remainder of this thesis, we will discuss our research into the effects of these changes.

1.4.2 What is the effect of hospital competition on quality of care?

In chapter three, we will present our study into the effect of hospital competition on quality of care. This study looks at the effect of the introduction of price competition into the Dutch hospital market and examines whether its impact on the quality of hip replacements differs between highly concentrated hospital markets and less concentrated hospital markets. Hitherto, the small number of studies on the impact of the introduction of price competition in the Netherlands have produced mixed results and none of them has been able to establish a causal relationship between competition and the quality of care provided.

The most important finding of our study is that, despite the lack of information on quality when free price negotiations were introduced, competitive pressure does not appear to have deteriorated quality.

1.4.3 What are the price effects of a hospital merger?

In chapter four, we turn our attention to price effects. In this chapter, we introduce a case study involving a hospital merger in the Netherlands. We used this case study to research the effect of market concentration on prices. In most studies into the effects of hospital mergers, the unit of observation is the merged hospital, while the observed price is the weighted average across hospital products and across payers. Little is known, however, about whether price effects vary between different hospital locations, different products and different payers. In chapter four, existing bargaining models are expanded to allow for the potentially heterogeneous price effects of mergers. Furthermore, a difference-in-differences model is estimated in which price changes at the merging hospitals are compared to price changes at comparison hospitals. The most important findings are that (i) where this merger affected prices, this effect was positive and (ii) price effects may differ across locations, products and payers.

1.4.4 What is the predictive power of an *ex ante* merger simulation model?

Chapter five addresses the question of whether we are able to predict merger price effects prospectively. In this chapter, we will investigate the same merger case as in chapter four, but we take the analyses one step further and compare the predicted results of a merger simulation model to the actual changes that were reported in chapter four to evaluate whether the current models perform sufficiently well to be used in antitrust cases. We conclude that the merger simulation model that we used could be a useful and powerful addition to the toolkit of antitrust agencies, but further refinements are needed in order to better reflect the peculiarities of the Dutch healthcare market. We also make suggestions with regard to the latter.

1.4.5 Why do healthcare providers merge?

In chapter six we study merger motivations of healthcare providers. Although mergers occur frequently in the Dutch healthcare sector, empirical insight into why healthcare providers opt to merge is lacking. Neither do we know enough about the influence of national

healthcare policies on mergers. The introduction of competition has led many to assert that healthcare mergers may be at least partially motivated by a desire to anticipate an increasingly competitive environment by improving their bargaining position vis-à-vis third-party payers, but empirical evidence to support this hypothesis is lacking. To identify the reasons for mergers and their relation to (changes in) healthcare policies, we conducted a survey on the motivation for mergers that was sent to the majority of Dutch healthcare executives. The study indicates that healthcare providers opt to merge predominantly in order to improve the provision of healthcare services and to strengthen their market position. We find that motives for merging are related to changes in health policies, in particular to increasing pressure from competitors, insurers and municipalities.

1.4.6 Why are healthcare mergers abandoned?

In chapter seven, we turn to the question of why healthcare mergers are abandoned. So far, we have focused on why healthcare organizations merge and the effect of concentration on quality and prices. However, it is also interesting to consider those merger plans that are less successful, because research in other sectors has shown that the effects of abandoning merger plans can be substantial. Chapter seven aims to improve our understanding of the reasons why healthcare mergers may be abandoned, based on the same survey that was used in chapter six. We show that merger plans are frequently abandoned in the healthcare sector: thirty-eight percent of the mergers that our respondents were involved in, ended prematurely. The most frequently mentioned causes of merger abandonment are (i) changing insights regarding desirability and feasibility during the merger processes, (ii) incompatibilities between executives, and (iii) insufficient support for the merger among internal stakeholders.

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CHAPTER 2

A Brief History of Dutch Hospital Mergers and Competition

Abstract

The Dutch hospital market has become increasingly concentrated over the past 40 years. This was caused by a high number of mergers, some closures and very few new entrants to the market. Particularly since the introduction of competition into the hospital sector, market concentration has become a source of concern. The few studies that have investigated the effects of concentration suggest that high market concentration may not be beneficial for society or the organizations involved. In the discussion on how to best organize and finance healthcare, the underlying and structural changes that have led to the high levels of concentration in today's hospital market have largely been neglected.

2.1 Introduction

Because ongoing hospital consolidation is at odds with the objectives of introducing more competition into the Dutch hospital market, merger activity over the past decade has fueled a debate regarding the consequences of mergers and the desirability of further concentration. However, consolidation in the Dutch hospital sector long predates the introduction of competition. This paper describes developments in the Dutch hospital market structure over the past 40 years and discusses the implications of those developments for current healthcare policy. The paper shows that although the organization and financing of the Dutch hospital market has changed tremendously over the past 40 years, market concentration has increased consistently and continuously over that same period, notwithstanding the wider policy context. If anything, the introduction of more competitive pressure seems to have accelerated consolidation, but it has done so in an already highly concentrated market. The difficulty is that, although it is possible to modify the organization and financing of healthcare, changing the market structure turns out to be less feasible. Because mergers leave remaining hospitals with greater market power and few new competitors enter the market, the effect of consolidation on market structure is (semi-)permanent. We argue that the Dutch health policy debate about the merits of introducing more competition into the hospital sector, has paid too little attention to the underlying structural changes in this market, which have greatly enhanced hospitals' market power.

In the next section, we will provide a chronological overview of the policy changes that have occurred over recent decades and relate these to changes in the structure of the hospital market. We will explain how the policies of successive Dutch governments have influenced hospital mergers and closures. After a brief discussion of the first three decades of the postwar period, the overview will start around 1978 – the year in which mergers between hospitals were subject to public criticism for the first time – and will cover the following almost 40 years (until 2017). In section 2.3, we will discuss the implications of these developments.

2.2 Health policies and their impact on hospital mergers

2.2.1 Before 1978: the welfare state, post-war reconstruction and government attempts to influence the structure of the hospital market

Until the 1970s, the primary focus of the Dutch government's healthcare policy was to promote public health, guarantee minimum levels of quality and ensure universal access to basic healthcare services through access to health insurance (Schut & Van de Ven, 2005). At the same time, there was also some focus on the supply-side of the market. In the first half of the 20th century, specialist physician practices developed into small-scale, private, non-profit hospitals that were scattered across the country. Dutch governments of the interbellum questioned the fragmented nature of the hospital market and considered a policy of centralized hospital planning (Können, 1984). However, World War II (WWII) meant that these plans never came to fruition (Können, 1984).
In the aftermath of WWII, the government's first priority was societal reconstruction. The government introduced Reconstruction Laws that required licenses for construction projects, including the (re)building of hospitals. The focus was on rebuilding the country's industries and housing, however, and licenses to build new hospitals were not granted unless absolutely necessary (Juffermans, 1982). In addition to limiting the number of new hospitals, hospital costs were contained by price controls and the regulation of physician remuneration (Juffermans, 1982).

These restrictive policies were proving increasingly problematic by the 1960s. With new technologies entering the market rapidly and demand for healthcare increasing, the outdated Dutch hospital infrastructure was causing increasing problems. Therefore, in the early 1960s, stimulated by growth in the overall economy and the welfare state, the Minister of Housing and Reconstruction began to issue licenses to build hospitals more liberally. When, in 1965, the Reconstruction Laws were also abandoned for most areas of the country, the number of new hospitals being built took off, particularly because many municipalities wished to have a hospital within their municipal boundaries (Juffermans, 1982).

Due to the lack of constraints on demand or supply, healthcare expenditure grew rapidly over this period. In 1953, the Netherlands spent 3.2 of its GDP on healthcare but by 1970 this had grown to 5.6 percent (Können, 1984). Because of the growth in healthcare

spending, the focus of government policy in the 1970s (and beyond) shifted to introducing and strengthening supply-side constraints[2]: i.e., reforming the hospital financing system and reducing excess hospital capacity (Casparie & Hoogendoorn, 1991; Maarse et al., 1992; Van der Lugt & Huijsman, 1999). Excess capacity was being caused by a steady decrease in the average length of hospital stays, resulting in a drop in the occupancy rate of general hospitals from 93 to 85 percent between 1969 and 1978 (Lorsheijd, 1981). Smaller hospitals (e.g., hospitals with less than 150 beds) were of particular concern to the government because studies had shown that quality of care was related to hospital size (Können, 1984) and that if there were any economies of scale to be achieved, these were to be achieved by the smallest hospitals (Van Aert, 1977; Van Montfort, 1980).

In 1971, the government first attempted to structurally reduce excess capacity. That year, the government introduced the Hospital Facilities Act (WZV), which subjected the construction of new hospitals and all other major hospital investments to governmental approval. Because of the hurdle that the government imposed on investment and construction through the introduction of this legislation, the WZV led to hospital closures, mergers and partnerships, especially among smaller hospitals (Können, 1984). Before the introduction of the WZV, mergers between hospitals in the Netherlands were rare (Können, 1984). Until the late 1960s, closures and the construction of larger hospitals were the main reason for increased concentration in the Dutch hospital market. Only 5 hospital mergers took place in the 1960s (Können, 1984). By contrast, since 1970, mergers have become the primary cause of increased concentration in the hospital market. Between 1970 and 1978, 24 mergers took place (Können, 1984). The majority of these were caused by the WZV and as a result the number of hospitals with less than 200 beds fell substantially (Können, 1984). Another result of the mergers during this period was that the few public hospitals that existed in the Netherlands were mainly converted into private companies. By the end of the 1970s, most Dutch hospitals were therefore under private ownership (Jeurissen, 2010). The nonprofit status of hospitals had by that time been formalized by article 10 of the WZV, which stated that only public or private nonprofit providers would be granted licenses to build hospitals (Jeurissen, 2010), so that by the end of the 1970s, most Dutch hospitals had been transformed into private nonprofit foundations.

2 Successive Dutch governments also tried to limit demand by introducing various cost-sharing arrangements or reducing social health insurance coverage, but strong societal resistance meant that the extent of cost sharing remained very modest and demand constraints played only a marginal role in containing costs compared to supply-side constraints (Schut & Van de Ven, 2005).

The incentives to merge that emanated from the WZV were only reinforced by the 'Memorandum on the Structure of Health Care' that had been issued by the Ministry of Health in 1974 (MinVM, 1974), which implied comprehensive health planning. According to the Memorandum, the allocation of healthcare services was to be improved by regional planning and organizational clustering (Schut, 1995). The Memorandum proposed new legislation on healthcare facilities to regulate volume and capacity, legislation on healthcare prices to regulate prices and legislation on national health insurance to introduce a uniform insurance system (Schut, 1995). Although none of these proposals became law before new elections took place in 1977 and, after the elections, were either abandoned (national health insurance) or substantially amended (health planning and price regulation), the Memorandum of 1974 is said to have encouraged the propensity of hospitals' decisions to merge and form partnerships (NZi, 1978).

2.2.2 1978: first concerns over mergers

In 1978, the Dutch National Hospital institute (NZi) first issued a warning regarding the large number of mergers that were taking place (Können, 1978). Until that point, due to quality and efficiency considerations, the government had been primarily concerned with the minimum size of hospitals (Können, 1984). The focus of governmental policy had therefore been on incentivizing smaller hospitals to merge, form partnerships or close. Because hospitals were privately owned, the government could not compel them to close or merge, but the incentives that resulted from policies like the WZV proved successful: many small hospitals did indeed decide to merge. In 1978, the NZi studied ten hospital mergers and found that the hospitals involved experienced many unforeseen and underestimated organizational difficulties (Können, 1978). The study also concluded that hospitals often opted to merge without having considered less radical alternatives such as strategic partnerships (Können, 1978). It should be noted that the doubts raised over hospital mergers at this stage stemmed primarily from concern over the organizations involved, rather than concerns about market power. A symposium organized in 1978 on 'inter-institutional co-operations and mergers', which brought together representatives of the government, health insurers and hospitals to discuss the distribution of hospital services over the country, reflected this sentiment. During their discussion of hospital mergers, the focus of those attending was on the difficulties of mergers for the organizations involved: e.g., the problems experienced by hospital

employees working in larger-scale organizations, or the difficulties experienced by hospital managers in harmonizing procedures and culture in the hospitals involved (NZi, 1978).

The government did not seem to share these concerns over mergers and showed no interest in putting a brake on consolidation in healthcare. In the meantime, the economy experienced the most severe downturn since the 1930s while healthcare spending continued to rise at an alarming rate. By 1978, healthcare expenditure had increased to 7.9 percent of GDP (Können, 1984), an increase of over two percentage points in just 8 years. The government's primary focus was therefore on cost containment, which was to be achieved by health planning and the more effective allocation of healthcare resources (Schut et al. 1991).

2.2.3 1978-1982: further regulation

Although the policies of the 1970s substantially reduced the number of smaller hospitals, they did not achieve a structural reduction of the growth in overall healthcare expenditure. By 1981, healthcare expenditure had increased to 8.5 percent of GDP (Können, 1984) and the government therefore enacted the Health Care Prices Act (WTG), which regulated hospital rates (Schut, 1995). In addition, in 1982, the Minister of Health introduced a plan to substantially reduce the total number of beds in general hospitals in order to increase efficiency (MinVM, 1982; Van der Lugt & Huijsman, 1999; Van der Lee, 2000). The plan identified 25 facilities that were to close and 75 hospitals that were to divest a specified number of beds. In total, 8,000 beds were to be divested (NZi, 1982). The plan was highly controversial, not least because of the privately owned status of the facilities identified, which precluded direct government intervention in these organizations. Although the plan was therefore never put into effect, some of these hospitals seem to have responded to these proposals and merged in order to safeguard their future survival (Können, 1984; Van der Lugt & Huijsman, 1999). By 1983, a further 13 hospital mergers had taken place (see table 2.1 appendix 2.1).

2.2.4 1983-1985: prospective budgeting

The WTG and WZV had failed to permanently reduce the volume of care being provided (Schut & Van de Ven, 2005; Maarse et al., 1993; Maarse, 1989). In a further attempt to curb healthcare spending, in 1983, a regime of prospective global budgeting replaced the open-ended reimbursement system. Initially,

budgets were simply set at the level of the expenditure of each hospital in the preceding year, but this resulted in inflexible and inefficient budget allocation (Maarse et al., 1993). Therefore, in 1985, a distinction between fixed and variable hospital costs was introduced. Hospitals and regional representatives of health insurers were to negotiate about the variable component of the budget, while the fixed component was defined by two input parameters. This system included higher payments for larger hospitals to compensate for higher costs associated with the provision of more sophisticated hospital services and differences in case-mix (Varkevisser, 2010). The global budgeting system therefore provided smaller hospitals with a financial incentive to consolidate in order to scale up. Hence, this policy is often referred to as the merger bonus (Varkevisser, 2010; MinWVC, 1992; MinWVC, 1993).

The push for larger organizations that resulted from the financing system was reinforced by the Operating Costs Reducing Investments (EVI) directive that was also introduced in 1985. The EVI directive was introduced for the next 5 years and subjected the construction of new hospitals and major hospital investment to governmental approval. Only those investment plans that would lead to a substantial reduction in the total number of beds or hospital functions, and therefore reduced operating costs, were approved. In order to fulfill these requirements, hospitals often had to cooperate or merge. Although the EVI directive was not designed to encourage mergers, the directive may have led to a strategic response that involved mergers by hospitals. This directive may therefore have increased hospitals' propensity to merge, especially among hospitals with substantial excess capacity (MinWVC, 1992; Van der Lugt & Huijsman, 1999). Between 1983 and 1986, 11 more hospitals mergers took place (see table 2.1 appendix 2.1).

2.2.5 1986-1991: Dekker Committee and functional budgeting

Over time, the lack of incentives for efficiency and innovation within the system of healthcare finance and delivery became the subject of increasing criticism (Schut, 1995). In 1986, the government appointed the independent Dekker Committee to design a blueprint of an efficient and equitable healthcare system. The Dekker Committee outlined a market-oriented healthcare system. The mandatory national health insurance scheme proposed by the Dekker Committee would guarantee universal access to basic healthcare services, and regulated competition would create

incentives for both insurers and providers to improve the efficiency of healthcare delivery (Schut & Van de Ven, 2005). The implementation of the Dekker plan proved highly problematic, however (Schut, 1995; Schut, 1996), and if the Dekker plan was to work, a number of requirements would first have to be met in order to create the appropriate incentives for consumers, providers and health insurers (Schut & Van de Ven, 2005). Since none of these requirements had been met when the Dekker plan was published, such radical reform was not feasible. The market-oriented program also quickly ran out of steam because it could not provide short-term solutions to the urgent need to contain costs that still existed (Helderman et al., 2005).

Instead, an attempt was made to improve the budgeting system: 'functional budgeting' replaced the prospective budgeting model in 1988. Functional budgeting was a normative allocation model based on parameters that related to three budget components: availability, capacity and production (COTG, 1987). Under this system, hospitals had to negotiate prospectively with the regional representatives of health insurers over the parameters. The availability component comprised approximately 25 percent of the budget and was chiefly a measure of the hospital's catchment area. The capacity component was approximately 35 percent of the budget and included variables such as the number of beds, the number of physicians, the availability of special services and so on. The production component made up the remaining 40 per cent of the budget and reflected a cluster of parameters relating to the number of discharges, admissions, outpatient treatments and so on (Post, 1988; COTG, 1987). Yet again, the new system provided hospitals with an incentive to merge (Den Hartog & Janssen, 1993). By enlarging their geographical area or market share by merging, smaller hospitals were able to increase their budget claims in the availability component, as well as their claims for other parameters (e.g., the permitted number of beds and/or specialists which were included in the capacity parameter) (Post, 1988; COTG, 1987). Between 1986 and 1992 alone, 30 further hospital mergers took place (see table table 2.1 appendix 2.1).

Since the objective of government policy was to incentivize smaller hospitals to merge, the policies could be considered successful. Of the hospitals that exited the market, either through mergers or closures, between 1979 and 1991, 86% had less than 150 beds (Den Hartog & Janssen, 1993). However, the policies were

less successful in meeting the government's real priority: the elimination of excess capacity. Although hospital capacity (in number of beds) was reduced by 14% between 1979 and 1990 (Den Hartog & Janssen, 1993), this was much less than the government had anticipated or hoped for (Maarse et al., 1992; Maarse et al., 1997). Moreover, the occupancy rate of general hospitals was still decreasing – from 85 percent in 1978 (Lorsheijd, 1981) to 70.9 percent in 1992 (Bartels, 1993) – and due to the many mergers that had occurred, the hospital sector had become much more concentrated than many other sectors (Schut et al. 1991).

2.2.6 1992-2000: moving towards competition

Even though the Dekker plan had not been implemented in 1986 and successive governments continued to focus on strengthening supply and price controls, the period subsequent to 1986 was also characterized by government attempts to fulfill the requirements for a system of regulated competition to be put in place. The budgeting system was successful in containing cost increases (Groenewegen, 1994; Maarse et al., 1993), but the lack of incentives for efficiency and innovation continued to plague the healthcare system and waiting lists were increasing (Schut & Varkevisser, 2013). As time passed and it became clearer that the future healthcare system would be based more on competitive forces, further consolidation in the Dutch hospital market came to seem more and more problematic (Schut, 1989; Schut et al. 1991; Schut, 1992). In 1992, the Minister of Health first expressed an awareness of this inconsistency, stating that mergers in healthcare should no longer be encouraged by the government (MinWVC, 1992b). Although from that point onwards the government did indeed cease to explicitly encourage healthcare mergers, mergers nevertheless remained quite common. Between 1991 and 2001, 20 further mergers took place (see table 2.1 appendix 2.1). This was partly because the government lacked the instruments necessary to actively block mergers. In 1992, the government tried to address the incentive to merge that resulted from the 'merger bonus' by refining the hospital budgeting system (MinWVC, 1993). However, since hospitals that had similar functions but were dissimilar in scale were exposed to budget differences, some financial incentives to consolidate remained. Only in 2003, the 'merger bonus' was officially removed from the hospital financing system (TK, 2003).

The legal framework also prevented the government from intervening in the hospital market. Prior to 1998, the Economic

Competition Act (1956) did not even provide for preventive merger controls. In 1998, the Competition Act replaced the Economic Competition Act. The Competition Act not only established the Dutch Competition Authority (now known as the Authority for Consumers and Markets) but also included a prohibition on cartels, a prohibition on the abuse of a dominant market position and a preventive merger control regime. However, because competition in healthcare had yet to be officially introduced, the Competition Authority did not exercise anticompetitive control over the hospital sector. As such, the government had no legal instruments with which to block hospital mergers.

In fact, during this period, although mergers were no longer directly being encouraged by the government, the incentives that were implemented in this period and were designed to result in increased competition may actually have led to collusion or consolidation. This was particularly true of the healthcare sector, which was dominated by cartels that facilitated anticompetitive conduct and that were often instituted or backed by the government (Schut et al. 1991; Schut, 1992). Many scholars have therefore argued that hospital mergers during and after the 1990s were at least partially motivated by hospitals' desire to anticipate the changing institutional environment and to improve their bargaining position vis-à-vis third-party payers (Den Hartog et al., 2013; Den Hartog & Janssen, 2014; Varkevisser, 2010; Van der Lee, 2000; Schut, 1996; Van der Lugt & Huijsman, 1999; Groenewegen, 1994; Schut et al. 1991). It should furthermore be noted that it was not only national government that had encouraged hospital mergers, but provincial and local government too. Provincial governments, which were responsible for the implementation of the hospital planning guidelines, were sometimes even more inclined to encourage hospital concentration than national government. Even though central government appeared to take the view, from 1992 onwards, that mergers were not consistent with the goals of future healthcare policy, local or provincial governments often had their own reasons to encourage merger activity.

2.2.7 2001-beyond: competition and prospective merger control

By the end of the 1990s, the combination of a booming economy, lengthening waiting lists, calls for more autonomy by individual providers and insurers and a widely perceived lack of responsiveness in the healthcare system was leading to great pressure on

the government to abandon its rationing policies (Schut & Van de Ven, 2005; Helderman et al., 2005). In 2001, the government decided to suspend the hospital budgeting system to allow sickness funds, private insurers and consumers to reimburse hospitals and medical specialists for all the services provided. With hospital care accounting for the majority of healthcare spending (Maarse et al., 2002), open-ended reimbursement in the hospital sector resulted in a sharp increase in healthcare expenditure (Schut & Varkevisser, 2013). The government considered the reinstatement of the open-ended reimbursement system as a temporary solution to the issue of waiting lists. The limited incentives for efficiency and the lack of countervailing power on the part of the health insurers within the context of rapidly increasing healthcare expenditure and a by then stagnating economy, however, increased the urgency of comprehensive healthcare reform (Schut & Van de Ven, 2005).

For this reason, a new healthcare reform plan was launched in the *Vraag aan bod* report that was sent to parliament in 2001. The plan was strikingly similar to the Dekker plan of 15 years earlier (MinVWS, 2001), but by now these ideas had become much more practical to implement. Although progress in the areas of quality and outcome measurement had been limited, major progress had been made in developing an adequate system of risk adjustment and better product classifications. Also, the government had revised the governance structure by reinforcing the independent role of supervisory bodies in health insurance, price setting and the provision of care (Schut & Van de Ven, 2005).

With incentives for greater competition taking shape and no signs of any reduction in the number of mergers taking place, in 2001 and 2002, successive Ministers of Health again attempted to reduce the pace of consolidation, this time by proposing a moratorium on hospital mergers (MinVWS, 2002). Dutch hospitals (represented by the Dutch Hospital Association) temporarily agreed to this voluntary halt, but decided to abandon the agreement (NVZ/IPO, 2003) as soon as the Netherlands Board for Health Facilities concluded that hospital merger activity did not threaten access to hospital care (CBZ, 2002).

In 2004, the government decided that it was feasible to implement some of the key reforms outlined in the *Vraag aan bod* report. Of particular importance to hospitals were the proposals to introduce a new Health Insurance Act (Zvw) and to gradually introduce

hospital-insurer bargaining over prices. In the same year, the Dutch Competition Authority concluded that competition was now effectively taking place in the Dutch hospital sector and it began to prospectively scrutinize hospital mergers. Before that point, six more mergers had taken place with no antitrust oversight (see table 2.1 appendix 2.1).

As of 2004, mergers exceeding certain thresholds in terms of revenue had to be reported to the Dutch Competition Authority for a general review. In practice, all hospital mergers exceed the threshold and therefore have to be reported and reviewed. Based on the review, the Competition Authority decides whether a license for the merger is required. If there is reason to assume that "a dominant position that appreciably restricts competition on the Dutch market or a part thereof could arise or be strengthened as a result of the said concentration", a license is required (section 41.2 of the Competition Act). If the merging parties submit an application for a license, the competition authority performs another analysis and decides whether the merger is allowed, prohibited or only allowed subject to remedies.

Although the Dutch Competition Authority began exercising controls over hospital mergers in 2004, it has to date blocked only one merger (in 2015). Some Dutch hospital mergers that were evaluated by the Competition Authority, were permitted subject to certain conditions, such as temporary price caps and commitments to quality improvement, but most mergers were given the go-ahead without any such remedies. The Competition Authority concluded that these mergers would not appreciably impede effective competition on the market or a part thereof and should therefore be permitted to proceed. It has also argued that, in relation to the (future) development of competitive forces in the healthcare system, any potentially negative effects of concentration would quickly become negligible. This policy has provoked considerable criticism because the Authority has been seen as too lenient (Varkevisser & Schut, 2017; Schmid & Varkevisser, 2016; Loozen, 2015; 2015b; Varkevisser, 2015; Loozen et al., 2014; 2014b; Schut et al., 2014; Varkevisser & Schut, 2012; 2011; 2010; 2008; 2008b Loozen, 2011; Varkevisser et al., 2012; 2012b). Since 2004 and until September 2017, 28 hospital mergers have taken place (see table 2.1 appendix 2.1).

In the meantime, the high number of mergers between hospitals had also begun to cause political unease (e.g., RVZ, 2008). In 2014,

the Minister therefore introduced a healthcare-specific merger assessment. The healthcare-specific merger assessment entails an administrative assessment performed by the Dutch Healthcare Authority of (i) all stakeholders involved in the merger process and (ii) the provision of "crucial care" (i.e., ambulance care, emergency care, acute obstetrics and acute mental care) as a result of the merger. So far, no mergers have been blocked on the basis of this assessment and the assessment itself has been criticized because it is considered unnecessary. Loozen (2015), for example, argues that standard and strict competition enforcement is perfectly consistent with the institutional design of healthcare systems based on competition and that competitive healthcare sectors therefore need not involve additional rules, but stricter enforcement of the existing competition rules. Following ongoing criticisms, in 2016 the Minister of Health proposed retaining the healthcare-specific merger assessment, but only for mergers between healthcare organizations of a certain (yet to be determined) size. Furthermore, she proposed a reorganization of the controls on healthcare mergers by accommodating all concentration assessments within the Authority for Consumers and Markets. With financial support from the government, the Authority for Consumers and Markets has, in turn, created its own 'Health Care Taskforce' which specializes in healthcare competition policy, including merger control. To date (September 2017), however, the Minister's proposals have yet to be decided on by Dutch Parliament.

2.3 Effects of mergers on market structure, quality and efficiency

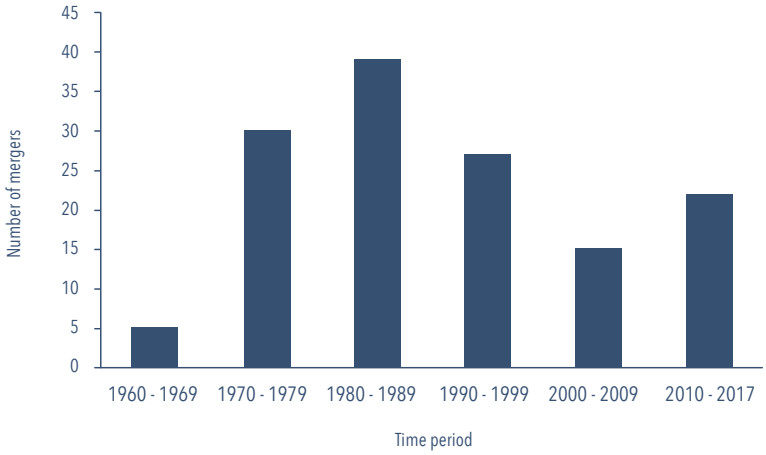
2.3.1 Descriptive statistics on Dutch hospital mergers

Between 1978 and August 2017 (i.e., the most recent date on which table 2.1 appendix 2.1 was updated), 109 hospital consolidations took place in the Netherlands (an average of 2.8 mergers per year). In addition, 30 hospitals exited the market in the same period (Den Hartog et al. 2013). These were primarily smaller (<150 beds) or highly specialized hospitals (Den Hartog & Janssen, 1993; Den Hartog & Janssen, 2000). Market entrance on the other hand was very limited. During the study period, only one general hospital entered the market in the 1990s (Den Hartog & Janssen, 2000). A handful of specialized Independent Treatment Centers (ITCs) have been allowed to enter the market since 1998, but their participation was only fully legalized in 2006. Since 2006, the number of ITCs

that entered the market has grown rapidly, but their overall national market share has remained limited to about 2.5% (NZa, 2012). In recent years, however, the number of ITCs has somewhat decreased (from 260 in 2014 to 229 in 2016; NZa, 2016), so their current market share is likely to be even lower than in 2012. Hospital mergers and, to a lower extent, closures have therefore caused the largest changes in the Dutch hospital market structure.

FIGURE 2.1 – Number of hospital mergers per decade (1960– August 2017)

Source: number of mergers from 1960-1978: Können (1984); remaining numbers: table 2.1 (appendix 2.1)

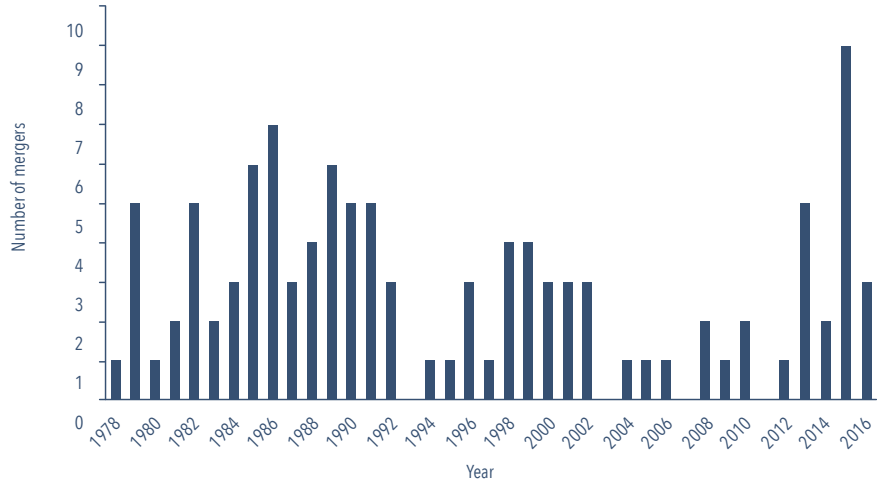


In absolute terms, the largest wave of mergers occurred in the 1980s, with 39 mergers in one decade (figure 2.1). Rather than any deceleration, the 2010s seem to have ushered in a new wave of mergers, with the annual numbers of mergers reaching (or surpassing) comparable levels to those seen in the 1980s (figure 2.2). In fact, because previous mergers have reduced the overall number of hospitals in the market, the relative number of mergers has been increasing in recent years. Since 1978, there have been only five years in which no hospital mergers took place (figure 2.2).

Not much is known about the specifics of Dutch hospital mergers. Table 2.1 (appendix 2.1) provides some information on the hospital consolidations that took place between 1978 and August 2017. Depending on which definition of a hospital is used (i.e., the locations or concerns/specialized hospitals taken into account or not), estimates of the number of hospitals in 1978 range from 233 (Stolwijk, 1981) to 240 (NZi, 1978) to 243 (Den Hartog, 2004). Of all the hospitals that existed in 1978, 174 were involved in one or more merger transactions

between 1978 and August 2017. In total, 233 hospital entities (i.e., which existed in 1978 or hospitals that resulted from mergers after 1978) were involved in a merger transaction over these years. Once the 30 hospitals that exited the market in the same period are taken into account, this means that only a handful of hospitals have not been involved in a merger or closure during this period.

FIGURE 2.2 – Number of hospital mergers per year (1978 – August 2017)
Source: table 2.1 (appendix 2.1)



The majority of merged hospitals only merged once during the study period. Some hospitals were involved in mergers more than once; that is, 28 merged hospitals resulted from one or more consolidations in one of the previous years. Two hospitals merged more than four times during the study period before they took their current form (figure 2.3).

Most hospital mergers have occurred between two hospitals (figure 2.4). Only 12 hospital consolidations have involved three hospitals, and only one consolidation has involved more than three hospital partners.

Table 2.1 (appendix 2.1) also demonstrates that a merger between hospitals does not necessarily or immediately result in a single hospital location. In fact, so far, the majority of hospital mergers have not resulted in a single hospital location. Figure 2.5 shows the time until the creation of a new hospital, the conversion to an outpatient facility or closure without replacement (in box plots).

FIGURE 2.3 – Number of mergers per hospital (1978 – August 2017)
Source: table 2.1 (appendix 2.1)

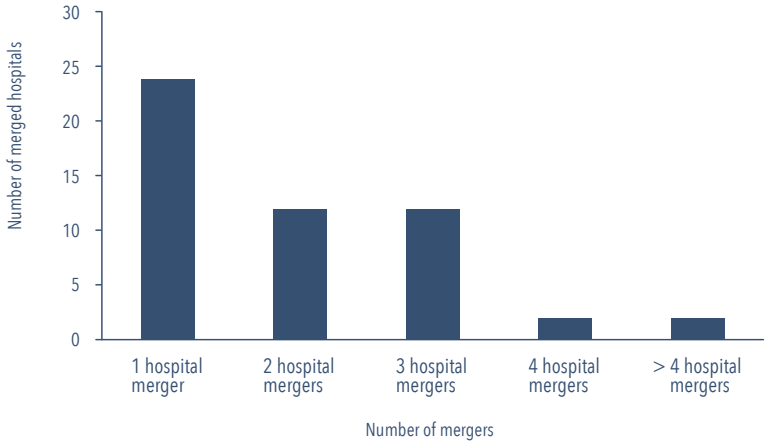


FIGURE 2.4 – Number of hospital partners per merger (1978 – August 2017)
Source: table 2.1 (appendix 2.1)

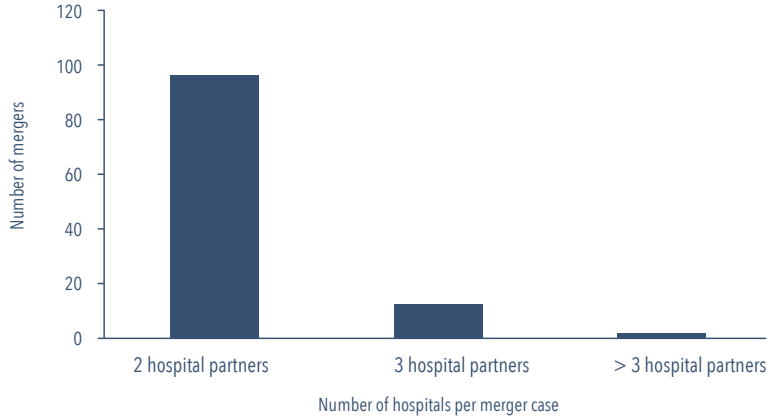
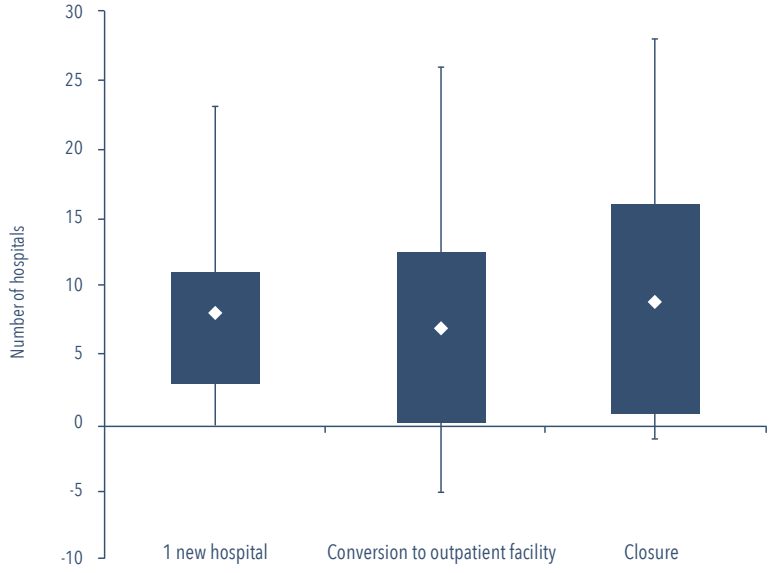


Table 2.1 (appendix 2.1) shows that 45 hospital locations were closed because a new hospital had been built, but only in 2 cases was the new hospital built within one year of the merger. On average, it took merging hospitals 8 years to physically merge. One hospital was built 23 years after the merger took place (figure 5.2).

Over time, 29 hospital locations were converted into outpatient facilities after the merger. It was sometimes difficult to determine the year of the conversion, but for the locations for which the conversion date could be found, we found that this happened on average 7 years

after the merger. Some hospitals had already been converted to outpatient facilities in anticipation of the merger, hence the negative values.

FIGURE 2.5 – Time to new hospital/conversion/closure after merger (1978 – August 2017)
Source: table 2.1 (appendix 2.1)



Between 1978 and August 2017, 36 hospital locations closed due to mergers. These were not replaced by new hospitals or converted into outpatient facilities. Of these, only 6 hospital locations closed in the same year as the merger took place. On average, these hospital locations closed 9 years after the merger (min. -1 years; max. 28 years).

2.3.2 Effects of mergers on market structure

Because of the high number of mergers, most hospital markets in the Netherlands have become fairly concentrated (Den Hartog et al., 1998). In the 1980s alone, the number of hospitals with less than 300 beds had already halved, while the number of hospitals with more than 600 beds had almost doubled (MinWVC, 1992).

Because patients in the Netherlands are on average willing to travel for 20 minutes to reach the hospital of their choice (Beukers et al. 2014; Varkevisser et al. 2012; Varkevisser et al. 2010), hospital markets are usually considered regional. Most studies that focus on the Dutch hospital market structure use administrative hospital regions that were developed for planning purposes to delineate the geographic markets of hospitals. These are reasonable proxies for the relevant hospital markets. In total, there were 27 (later 25) administrative regional markets.

In 1978, there were only three regional markets in which the largest hospital had a market share (calculated in terms of number of beds) of 50 percent or higher, but even at that time, in 23 regional markets, the four largest hospitals had a joint market share of 60 percent or more. Den Hartog & Janssen (1993) therefore conclude that even in 1978, most Dutch hospital markets could be considered as tightly oligopolistic. By 1984, in 19 of 25 regional markets the two largest hospitals had a joint market share of 40 percent or higher. On average, the market share of the two largest hospitals in all regional markets was 53.1 percent (Schut, 1989). Four years later, in 1988, this had increased by more than 10 percent to about 60 percent (Schut et al. 1991). Because Dutch merger control was lacking in that period, meaning that reasonable standards to interpret these findings were also lacking, Schut (1989) applies the thresholds that were formulated by the then prevailing US FTC Merger Guidelines to the Dutch hospital context. According to the 1982 FTC merger guidelines, markets with a Herfindahl-Hirschman Index (HHI) of over 1800 were 'highly concentrated' and markets in which the HHI was between 1000 and 1800 were considered 'moderately concentrated'. In 1984, the average HHI of all Dutch hospital markets was well above 2000 and in 16 of 25 regional markets, the HHI was above 1800 (Schut, 1989). In only one market the HHI was below 1000. The HHI of all other markets was between 1000 and 1800 (Schut, 1989). By 1988, the HHI of all markets was above 1000 and in 18 markets, the HHI was above 1800. The average HHI of all markets had, by that time, increased to 2500[3].

In 1990, the four largest hospitals in each hospital region had a joint market share of 50 percent or higher, and almost all Dutch regional hospital markets could be described as highly oligopolistic (Den Hartog & Janssen, 1993). In 1999, in 5 regional hospitals markets the HHI exceeded 5000. In 19 hospital markets, the HHI was between 1800 and 5000. The average HHI had increased by

3 In the 2010 merger guidelines, the FTC applies different thresholds. By then, markets with an HHI of between 1500 and 2500 were considered moderately concentrated. Markets with an HHI above 2500 were considered highly concentrated. Even then we find that, on average, Dutch hospital markets can be considered moderately concentrated in 1984, and highly concentrated by 1988. In 1984, the HHI of 7 regional markets exceeded the 2500 threshold. Another 11 regional hospital markets could be considered moderately concentrated. In 1988, the HHI exceeds 2500 in 10 regional hospital markets, and 8 markets could be considered moderately concentrated.

58 percent between 1979 and 1999 (Den Hartog & Janssen, 2000). By 2001, the average HHI had increased to about 3700 (Den Hartog, 2004) and in 2012 the number was 4200 (Den Hartog & Janssen, 2014). In 2012, the average weighted market share of general Dutch hospitals was 50.3 percent (NZa, 2014), which increased to 58.5 percent by 2014 (NZa, 2016).

More recent data is, unfortunately, not available, but the picture is clear: Dutch hospital market concentration has increased tremendously over the past 40 years. This was caused by a high number of mergers, some closures and very few new entrants to the market. And, as we learned in section 2.2, not much seems to have been done to prevent this from happening.

2.3.3 Effects of mergers on efficiency and quality

The question is, of course, whether (the push for) concentration has achieved the desired effects. For many years, the government explicitly encouraged hospitals to merge on the basis of quality or efficiency considerations. Whether this policy was effective is a question that has been given very limited attention. Previously, we saw that the financing system was effective in terms of cost containment and that several policies also resulted in considerable reductions in hospital capacity. However, this decrease in capacity was much less than the government had anticipated, and the lack of incentives in the payment system also resulted in long waiting lists. What about efficiency and quality?

Before the start of the wave of mergers in the 1980s, at least two studies (Van Aert, 1977; Van Montfort, 1980) indicated that the potential for scale efficiencies in the Dutch hospital market was present but very limited. In later years, with the number of hospital mergers increasing, other studies indicated that Dutch hospitals were, on average, moving beyond the optimal scale (e.g., Blank et al., 1998; 2002; RVZ, 2003; Blank et al. 2008; 2011; Blank & Eggink, 2011; Blank, 2015; Van Hulst, 2016). It is also questionable whether potential scale efficiencies can be achieved if merging hospitals do not physically merge. Dranove and Lindrooth (2003), for example, found that US consolidations involving the actual consolidation of facilities seem to lower hospital costs, while mergers that do not involve the combination of facilities produce no effects. Given that it takes Dutch hospitals on average 8 years to physically merge (see section 2.3.1), if indeed they do so at all, the potential benefits of merging in terms of cost efficiencies, may be low, at least in the short run.

Bukkems et al. (1999) performed a financial analyses of 30 Dutch hospital mergers and conclude that mergers reduce overcapacity, but have no effect on financial performance. Können (1984) undertook a qualitative study of ten hospital mergers and concluded that in the majority of cases, mergers did not have a positive effect on the hospitals' financial situation. Haring (1993 in Van der Lee, 2000) finds that mergers increased patients' travel time but did not affect the average length of stay or the number of patients' discharged from a hospital. Van der Lee (2000) undertook a qualitative study of three hospital mergers and concluded that all three mergers eventually (i.e., after 5 years) resulted in lower management costs.

More recently, the Dutch Health Care Authority has used merger simulation models to predict the price effect of mergers and found that 8 of the 13 hospital mergers that were assessed by the Authority of Consumers and Markets between 2011 and April 2015 may have resulted in price increases of more than 5 percent (NZa, 2015). Kemp et al. (2012) retrospectively analyzed the price effects of six mergers and found that in the majority of cases studied, prices significantly increased after the merger. ACM (2017) studied twelve hospital mergers and found indications of post-merger price increases, while finding limited evidence of reductions in volume. A positive correlation between hospitals' HHI and price was also found. These findings are consistent with the conclusions of Halbersma et al. (2010). Halbersma et al. (2010) found that, in the Dutch hospital sector, the market share of hospitals (insurers) has a significantly positive (negative) impact on the hospital price-cost margin. Significant (2016 in Broers and Kemp, 2017) studied three merger cases qualitatively and performed difference-in-differences estimations on 14 healthcare mergers in order to study the effect of mergers on the quality of care. According to the interviewees in the case studies, mergers affect organizational processes and structural characteristics that are relevant to the quality of care provided by the hospitals (Significant, 2016 in Broers & Kemp, 2017). Barely any significant effect of the mergers on quality was found in the quantitative analyses, however (Significant, 2016 in Broers & Kemp, 2017). Based on the results of this study, the Dutch Authority for Consumers and Markets has stated that in future merger cases, (i) it will critically assess the hospitals' assertion that the proposed merger will lead to better quality of care; and (ii) it will actively support the development of more insightful quality indicators. In addition, ACM stated that hospitals should consider other forms of cooperation than merging, in order to achieve quality improvements (ACM, 2016). Based on the findings of the price effect study mentioned above, ACM also concluded that future hospital mergers should be assessed more critically (ACM, 2017).

In conclusion, the limited evidence that is available does not particularly favor consolidations. Most studies performed in relation to Dutch hospital mergers have found no effect or negative effects as a result of mergers. Although much is still unknown, this conclusion does generally correspond to findings from the US and the UK (see Gaynor et al., 2015; Gaynor & Town, 2012; Propper & Leckie, 2011; Gaynor, 2006 for reviews of the literature). International studies have generally found that markets with lower concentration levels have lower prices and lower costs (Gaynor & Town, 2012). Hospital mergers have mainly been found to lead to (large) price increases. The results of the few studies that have looked at the effect of mergers on quality are mixed. The literature on the effect of competition generally shows that increased competition impacts positively on quality (Gaynor & Town, 2012).

2.4 Conclusion

Although the Dutch hospital market has become increasingly concentrated over the past 40 years, few studies have investigated the effects of this trend. The little that we know, however, suggests that the effects of concentration may not have been beneficial for society or the organizations involved. In recent decades, government policy has focused on regulating the hospital market, while at the same time introducing incentives for competition between providers. The introduction of competition into the sector has meant that market concentration is a concern. This is because competition can only be an effective way of increasing efficiency, quality and accessibility if sufficient alternatives are available to consumers and/or insurers. This precondition risks not being met in a highly concentrated market, which is the case for most hospital markets in the Netherlands. Furthermore, markets may even become more concentrated, since there is no reason to believe that in the near future hospital merger activity will stop. Neither is it likely that new hospital organizations will enter the market in the foreseeable future. In the discussion on how to best organize and finance healthcare, the underlying and structural changes that have led to the levels of concentration in today's hospital market have largely been neglected. In the remainder of this thesis, we will discuss our research into the effects of these changes.

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#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
1	St. Canisius Ziekenhuis Wilhelmina Ziekenhuis	Nijmegen Nijmegen	Canisius-Wilhelmina Ziekenhuis	01-01-1978[4]		Closed; 1 new hospital (1992[5])
2	Koningin Juliana Ziekenhuis Gerardus Majella Ziekenhuis	Hengelo Hengelo	Streekziekenhuis Midden Twente	01-01-1979		Open Closed (1990[6])
3	Pius Ziekenhuis Boerhaave Ziekenhuis Ziekenhuis Salem[9]	Harderwijk Harderwijk Ermelo	Christelijk Algemeen Ziekenhuis Noord-West Veluwe	01-01-1979[7]		Closed; 1 new hospital (1988[8])
4	Het Ziekenhuis Parkzicht Het Luduïna ziekenhuis[11]	Den Helder Den Helder	Gemini Ziekenhuis	01-01-1979[10]		Open Closed (1982[12])
5	Centraal Israëlitische Ziekenverpleging Nicolaas Tulp Ziekenhuis	Amsterdam Amstelveen	Ziekenhuis Amstelland	01-01-1979[13]		Closed (1979[14]) Open
6	Ziekenhuis van de ver. Chr. Ziekenverpleging Bethesda Stichting St. Andreas Ziekenhuis	Tiel Tiel	Ziekenhuis St. Andreas Bethesda	01-01-1979		Open Closed (1983[15])
7	St. Josef Ziekenhuis Wilhelmina Ziekenhuis	Doetinchem Doetinchem	Slingeland Ziekenhuis	01-01-1980[16]		Closed (1991[17])[18] Open
8	Algemeen Ziekenhuis Algemeen Ziekenhuis St. Elisabeth	Winterswijk Winterswijk	Stichting Ziekenhuisvoorzieningen Oost-Achterhoek (or: Streekziekenhuis Koningin Beatrix)	01-01-1981		Closed; 1 new hospital
9	Wilhelmina Gasthuis Binnengasthuis	Amsterdam Amsterdam	Academisch Ziekenhuis bij de Universiteit van Amsterdam	12-06-1981[19]		Closed (1983[20]) Open
10	Prinses Irene Ziekenhuis St. Elisabeth Ziekenhuis	Almelo Almelo	Twenteborg Ziekenhuis	01-01-1982[21]		Closed; 1 new hospital (1985[22])
11	Van Dam Ziekenhuis Bethesda Ziekenhuis	Rotterdam Rotterdam	Van Dam Bethesda Ziekenhuis	01-01-1982[23]		Closed; 1 new hospital (1990[24]) Closed (1982[25])
12	Het Noletziekenhuis Gemeente Ziekenhuis	Schiedam Schiedam	Schieland ziekenhuis	01-01-1982[26]		Closed (1994[27]) Closed (2008[28])

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
13	Ziekenhuis St. Andreas Bethesda	Tiel	Ziekenhuis Rivierenland	28-04-1982[29]	#6 Ziekenhuis St. Andreas Bethesda	Open
	St. Barbara Ziekenhuis	Culemborg				Outpatient facility only (1982)[30]
14	St. Hyppolytus Ziekenhuis	Delft	Het Reinier de Graaf Gasthuis	06-05-1982		Open
	Bethel Ziekenhuis	Delft				Open
	Oude en Nieuwe Gasthuis	Delft				Closed (1982)[31]
15	St. Elisabeth ziekenhuis	Oudenbosch	St. Franciscus Ziekenhuis	01-01-1983		Outpatient facility only (1983)[32]
	R.K. Ziekenhuis St. Franciscus	Roosendaal				Open
16	St. Willibrord Ziekenhuis	Tegelen	St. Maartensgasthuis	01-12-1983[33]		Closed; 1 new hospital (1984)[34]
	St. Joseph Ziekenhuis	Venlo				
17	Algemeen Ziekenhuis Zonnestraal	Hilversum	Streekziekenhuis Hilversum	01-01-1984[35]		Closed (1991)[36]
	Stichting R.K. Ziekenverpleging	Hilversum				Closed (1991)[37]
	Diakonessenhuis	Hilversum				Open
18	St. Bonifatius Ziekenhuis	Lichtenvoorde	Streekziekenhuis Koningin Beatrix	01-03-1984		Outpatient facility only[38]
	St. Vincentius Ziekenhuis	Groenlo				Closed (1984[39]); Outpatient facility only[40]
	Stichting Oost Achterhoek	Winterswijk			#8 Stichting Oost Achterhoek	Open
19	St. Luduïna Ziekenhuis	Purmerend	Streekziekenhuis Waterland	01-06-1984		Closed; 1 new hospital (1988)[41]
	Stadsziekenhuis	Purmerend				
20	Aleida Kramer Stichting	Coevorden	Streekziekenhuis Coevorden-Hardenberg	01-01-1985[42]		Closed; outpatient facility only (1980)[43]
	Röpcke Zweers Ziekenhuis	Hardenberg				Closed; 1 new hospital[44]
21	St. Geertruiden Gast- of Ziekenhuis	Deventer	Stichting Deventer Ziekenhuizen	01-01-1985		Closed; 1 new hospital (in 2008)[45]
	St. Jozef Ziekenhuis	Deventer				

APPENDIX 2.1 Table 2.1 – Overview Dutch hospital mergers 1978 to August 2017

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
22	St. Jans Gasthuis	Hoorn	West Fries Gasthuis	01-01-1985[46]		Closed; 1 new hospital (2016)[47]
	Algemeen Streekziekenhuis West Friesland	Hoorn				Closed (2004)[48]
23	Bethesda-St. Joseph Ziekenhuis	Vlissingen	Streekziekenhuis Walcheren	01-01-1985[49]		Open
	Het Gasthuis	Middelburg				Closed; outpatient facility only
24	St. Elisabeth Ziekenhuis	Sluiskil	Stichting Ziekenhuisgroep Zeeuws Vlaanderen	01-01-1985[50]		Closed; 1 new hospital (1988)[51]
	Juliana Ziekenhuis	Terneuzen				
25	Bergzicht	Goes	Stichting Oosterschelde Ziekenhuis	01-01-1985[52]		Closed; 1 new hospital (1987)[53]
	St. Johanna	Goes				Outpatient facility only (2001)[54]
	Zweedse Rode Kruis Ziekenhuis	Zierikzee				
26	Diakonessenhuis	Leeuwarden	Medisch Centrum Leeuwarden	01-01-1986[55]		Closed (1987)[56]
	Het Bonifatius Hospitaal	Leeuwarden				Closed (2004)[57]
	Triotel Ziekenhuis	Leeuwarden				Closed; 1 new hospital (1987)[58]
27	Gemeenteziekenhuis	Arnhem	Ziekenhuis de Malberg	01-01-1986		Closed; 1 new hospital (1995)[59]
	St. Elisabeth Gasthuis	Arnhem				Closed (1995)[60]
28	Gemeente-Ziekenhuis	Dordrecht	Het Merwede Ziekenhuis	01-01-1986		Closed; 1 new hospital (1990)[61]
	Gemeente-Ziekenhuis	Sliedrecht				Outpatient facility only (1997)[62]
29	Linge Ziekenhuis	Leerdam	Beatrix Ziekenhuis	01-01-1986		Outpatient facility only
	Streekziekenhuis Gorinchem	Gorinchem				Open
30	St. Lambertus Ziekenhuis	Helmond	Streekziekenhuis Helmond-Deurne[63]	01-01-1986		Open
	St. Willibrordus Ziekenhuis	Deurne				Outpatient facility only

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
31	R.K. Ziekenhuis De Goddelijke Voorzienigheid	Sittard	Maaslandziekenhuis[64]	01-01-1986[65]		Closed; 1 new hospital (2009)[66]
	St. Barbara Ziekenhuis	Geleen				Closed (1999)[67]
32	Juliana Ziekenhuis	Apeldoorn	Ziekenhuiscentrum Apeldoorn	17-01-1986		Closed (2009)[68]
	Het Lukas Ziekenhuis	Apeldoorn				Open
33	Stichting Ziekenhuisgroep Zeeuws Vlaanderen	Terneuzen/Sluiskil	Stichting Ziekenhuisgroep Zeeuwsch- Vlaanderen[69]	01-01-1987[70]	#24 Stichting Zieken-huisgroep Zeeuws Vlaanderen	Closed; 1 new hospital (1988)[71]
	St. Luduina Ziekenhuis	Hulst				Outpatient facility only
	St. Antonius Ziekenhuis	Oostburg				Open
34	St. Laurensziekenhuis	Breda	Interconfessioneel Ziekenhuis De Baronie	01-01-1987[72]		Closed (1993) [73]
	Diakonessenhuis	Breda				Open
35	Luthers Diakonessen Ziekenhuis	Amsterdam	BovenIJ ziekenhuis	24-06-1987[74]		Closed; 1 new hospital (1987)[75]
	Ziekenhuis Amsterdam-Noord	Amsterdam				Closed (1986)[76]
	Juliana Ziekenhuis	Amsterdam				
36	De Stadsmaten	Enschede	Medisch Spectrum Twente	01-01-1988[77]		Closed (2016)[78]
	Ziekenhuis Ziekenzorg	Enschede				Open
	Streekziekenhuis Noord-Oost Twente	Oldenzaal				Outpatient facility only (2014)[79]
	St. Bernardusziekenhuis	Losser				Outpatient facility only (1990)[80]
	Sint-Antoniusziekenhuis	Haaksbergen				Outpatient facility only (1990)[81]
37	Academisch Ziekenhuis bij de Universiteit van Amsterdam (UvA)	Amsterdam	Academisch Ziekenhuis bij de Universiteit van Amsterdam (UvA)	15-12-1988	#9 Academisch Ziekenhuis bij de Universiteit van Amsterdam (UvA)	Open
	Emmakinderziekenhuis	Amsterdam				Closed (1988)[82]
38	Hervormd Diaconessenziekenhuis	Arnhem	Rijnstate	10-06-1988[83]		Closed (1995)[84]
	Ziekenhuis de Malberg	Arnhem			#27 Ziekenhuis de Malberg	Closed; 1 new hospital (1995)[85]

APPENDIX 2.1 Table 2.1– Overview Dutch hospital mergers 1978 to August 2017

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
39	Mariastichting Diaconessenhuis	Haarlem Heemstede	Het Spaarneziekenhuis	31-12-1988[86]		Closed; 1 new hospital (2004)[87] Outpatient facility only (2004)[88]
40	Prot. Chr. Streekziekenhuis Juliana Ziekenhuis Pieter Pauw Ziekenhuis	Bennekom Ede Wageningen	Ziekenhuis de Gelderse Vallei	01-01-1989[89]		Closed; 1 new hospital (2000) [90,91]
41	Ziekenhuis Zonnegloren Algemeen Ziekenhuis Maarschalksbosch	Soest Baarn	Medisch Centrum Molendael	01-01-1989[92]		Closed (1996)[93] Outpatient facility only[94]
42	Rode Kruis Ziekenhuis St. Jozef Ziekenhuis	Beverwijk Heemskerk	Het Rode Kruis Ziekenhuis	01-01-1989[95]		Open Outpatient facility only (1993)[96]
43	Academisch Ziekenhuis Dijkzigt Sophia Kinderziekenhuis	Rotterdam Rotterdam	Academisch Ziekenhuis Dijkzigt/Sophia Kinderziekenhuis	01-01-1989[97]		Open Closed (1993)[98]
44	St. Carolus Ziekenhuis St. Luduïna Ziekenhuis	's-Hertogenbosch Boxtel	Het Carolus-Luduïna Ziekenhuis	01-01-1989[99]		Closed (2011); 1 new hospital[100] Outpatient facility only (1987)[101]
45	St. Elisabeth Ziekenhuis St. Maartensgasthuis	Venray Venlo	Stg. Ziekenhuizen Noord Limburg	01-10-1989[102]	 #16 St. Maartens-gasthuis	Open Open
46	Dr. H.J. Jansen Ziekenhuis Het Zuiderzee Ziekenhuis	Emmeloord Lelystad	IJsselmeerziekenhuizen (MC Groep)	01-01-1990		Open Open
47	St. Elisabeth Ziekenhuis Ziekenhuis Rijnoord	Leiderdorp Alphen aan de Rijn	Stichting Rijnland Ziekenhuis	01-01-1990		Open Outpatient facility only[103]

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
48	Eudokia Ziekenhuis Bergweg Ziekenhuis	Rotterdam Rotterdam	IJsselland (Capelle aan de IJssel)	01-01-1990[104]		Closed (1991); 1 new hospital[105]
49	St. Joseph Ziekenhuis Streekziekenhuis Dongemond St. Theresia	Oosterhout Raamsdonkveer	Pasteur Ziekenhuis	01-01-1990		Open Closed (1991)[106]
50	Groot Ziekengasthuis Willem Alexander Ziekenhuis	's-Hertogenbosch 's-Hertogenbosch	Bosch Medicentrum	01-01-1990[107]		Closed (2011); 1 new hospital[108]
51	O.L.V. Behoudenis der Kranken R.K. ziekenhuis Diakonessenhuis	Groningen Groningen	Het Martini Ziekenhuis	01-01-1991		Closed (2007)[109] Open
52	Prot. Chr. Ziekenhuis De Lichtenberg St. Elisabeth Ziekenhuis	Amersfoort Amersfoort	Ziekenhuis Eemland	01-01-1991		Closed; 1 new hospital (2013)[110]
53	Ziekenhuis Refaja (diaconessenhuis) St. Jacobsstichting R.K. Ziekenhuis	Dordrecht Zwijndrecht	Het Drechtsteden Ziekenhuis	01-01-1991		Closed (2016)[111] Open
54	St. Elisabeth's of Groote Gasthuis St. Johannes de Deo Zeeweg Ziekenhuis	Haarlem Haarlem IJmuiden	Het Kennemer Gasthuis	01-07-1991		Open Closed; 1 new hospital (2006)[112, 113] & Outpatient facility only[114]
55	Ziekenhuis de Gelderse Vallei Julianaziekenhuis Veenendaal	Ede/Bennekom/ Wageningen Rheden	Ziekenhuis de Gelderse Vallei	10-1991[115]	#40 Ziekenhuis de Gelderse Vallei	Closed; 1 new hospital (2000)[116]
56	Rode Kruis Ziekenhuis Juliana Kinderziekenhuis	's-Gravenhage 's-Gravenhage	Rode Kruis Ziekenhuis/Juliana Kinderziekenhuis	01-01-1992[117]		Open Closed (1999); 1 new hospital[118]
57	Bleuland Ziekenhuis St. Jozef Ziekenhuis	Gouda Gouda	Groene Hart Ziekenhuis	01-01-1992		Open Closed (2014)[119]
58	De Wever Ziekenhuis St. Gregorius Ziekenhuis	Heerlen Brunssum	Gezondheidszorg Oostelijk Zuid Limburg	01-01-1992		Open Outpatient facility only (2016)[120]

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
59	Onze Lieve Vrouwe Gasthuis	Amsterdam	Onze Lieve Vrouwe Gasthuis (OLVG)	31-03-1994		Closed; 1 new hospital (2003)[121]
	Vereeniging voor Ziekenverpleging (Prinsengrachtziekenhuis)	Amsterdam				Outpatient facility only (1996)[122] & Closed (2014)[123]
60	St. Lucas Ziekenhuis	Amsterdam	Lucas-Andreas Ziekenhuis	31-12-1995		Open
	Andreas Ziekenhuis	Amsterdam				Closed (2005)[124]
61	Streekziekenhuis Oranjeoord	Harlingen	Zorggroep Noorderbreedte	01-01-1996	#26 Medisch Centrum Leeuwarden	Outpatient facility only (2007)[125,126]
	Medisch Centrum Leeuwarden	Leeuwarden				Open
62	Gezondheidszorg Oostelijk Zuid Limburg	Heerlen	Atrium Medisch Centrum	01-01-1996	#58 Gezondheidszorg Oostelijk Zuid Limburg	Open
	St. Jozef Ziekenhuis	Kerkrade				Closed (2016)[127]
63	Reinier de Graaf Gasthuis	Delft	Reinier de Graaf Groep	10-06-1996	#14 Reinier de Graaf Gasthuis	Open
	Diaconessenhuis	Voorburg				Outpatient facility only[128]
64	Het Maria Ziekenhuis	Tilburg	Tweesteden Ziekenhuis	01-01-1997		Open
	St. Nicolaas Ziekenhuis	Waalwijk				Open
65	Westeinde Ziekenhuis	's-Gravenhage	Medisch Centrum Haaglanden	01-01-1998		Open
	St. Antoniushove	Leidschendam				Open
66	Academisch Ziekenhuis Dijkzigt	Rotterdam	Academisch Ziekenhuis Dijkzigt	01-01-1998[129]	#43 Academisch Ziekenhuis Dijkzigt/ Sophia Kinderziekenhuis	Open
	Daniel den Hoed Kliniek	Rotterdam				Open
67	Ziekenhuis Overvecht	Utrecht	Mesos Medisch Centrum	01-07-1998		Closed: 1 new hospital (2013)[130]
	Ziekenhuis Oudenrijn	Utrecht				
68	Sophia Ziekenhuis	Zwolle	Isala Klinieken	01-09-1998		Open
	Ziekenhuis de Weezenlanden	Zwolle				Closed (2014)[131]

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
69	Academisch Ziekenhuis Utrecht (AZU) Wilhelmina Kinderziekenhuis	Utrecht Utrecht	Universitair Medisch Centrum Utrecht (UMCU)	01-01-1999		Open Closed; 1 new hospital (1999)[132]
70	Schieland Ziekenhuis Holy Ziekenhuis	Schiedam Vlaardingen	Vlietland Ziekenhuis (St. Samenwerkende Schiedamse en Vlaardingse Ziekenhuizen)	01-07-1999	#12 Schieland Ziekenhuis	Closed; 1 new hospital (2008)[133, 134]
71	Het Drechtsteden Ziekenhuis Het Merwede Ziekenhuis	Dordrecht Dordrecht	Albert Schweitzer ziekenhuis	01-01-1999	#53 Het Drechtsteden Ziekenhuis #28 Het Merwede Ziekenhuis	Outpatient facility only (2000)[135, 136]; Closed (2016)[137] Open
72	Streekziekenhuis Het Spittaal Ziekenhuiscentrum Apeldoorn	Zutphen Apeldoorn	Gelre Ziekenhuizen	01-10-1999	 #32 Ziekenhuiscentrum Apeldoorn	Open Open
73	St. Clara Ziekenhuis Zuiderziekenhuis	Rotterdam Rotterdam	Medisch Centrum Rijnmond Zuid / Maasstadziekenhuis (since 2008)[138]	01-01-2000		Closed; 1 new hospital (2011)[139]
74	Twenteborg Ziekenhuis Streekziekenhuis Midden Twente	Almelo Hengelo	Ziekenhuisgroep Twente	01-01-2000[140]	#10 Twenteborg Ziekenhuis #2 Streekziekenhuis Midden Twente	Open Open
75	St. Joseph Ziekenhuis St. Anna Ziekenhuis	Veghel Oss	Ziekenhuis Bernhoven	01-01-2000		Closed; 1 new hospital (2013)[141] Outpatient facility only (2013)[142]
76	Ziekenhuis De Baronie St. Ignatius Ziekenhuis Pasteur Ziekenhuis	Breda Breda Oosterhout	Amphia Ziekenhuis	01-01-2001[143]	#34 Ziekenhuis De Baronie #49 Pasteur Ziekenhuis	Open Open Open
77	Lorentz Ziekenhuis Stichting Diaconessenhuis	Zeist Utrecht	Stichting Diaconessenhuis	01-04-2001		Open Open

APPENDIX 2.1 Table 2.1– Overview Dutch hospital mergers 1978 to August 2017

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
78	Ziekenhuis Rijnstate Ziekenhuis Velp De Katholieke Ziekeninrichtingen voor de Liemers (Ziekenhuis Zevenaar)	Arnhem Velp Zevenaar	Alysis Zorggroep / Rijnstate (since 2011)[144]	2001[145]	#38 Rijnstate	Open Outpatient facility only (2000)[146, 147] Open
79	Het Carolus-Luduïna Ziekenhuis Bosch Medicentrum	's-Hertogenbosch 's-Hertogenbosch	Jeroen Bosch Ziekenhuis	01-01-2002	#44 Het Carolus-Luduïna Ziekenhuis #50 Bosch Medicentrum	Closed; 1 new hospital (2011)[148]
80	St. Joseph Ziekenhuis Diaconessenhuis	Veldhoven Eindhoven	Maxima Medisch Centrum	01-01-2002		Open Outpatient facility only (2008)[149]
81	Ziekenhuis Eemland Medisch Centrum Molendael	Amersfoort Baarn	Meander Medisch Centrum	30-04-2002	#52 Ziekenhuis Eemland #41 Medisch Centrum Molendael	Open Outpatient facility only[150]
82	Rode Kruis Ziekenhuis/ Juliana Kinderziekenhuis Ziekenhuis Leyenburg	's-Gravenhage 's-Gravenhage	HagaZiekenhuis	01-07-2004[151]	#56 Rode Kruis Ziekenhuis/Juliana Kinderziekenhuis	Open Open
83	Erasmus Medisch Centrum Rotterdam Havenziekenhuis en Instituut voor Tropische Ziekten	Rotterdam Rotterdam	Erasmus Medisch Centrum	31-08-2005[152]	#43 & #66 Academisch Ziekenhuis Dijkzigt(/ Sophia Kinderziekenhuis)	Open Open
84	Ziekenhuis Hilversum Ziekenhuis Gooi-Noord	Hilversum Blaricum	Tergooiziekenhuizen	01-01-2006[153]	#17 Streekziekenhuis Hilversum	Open Open
85	Gemini Ziekenhuis Medisch Centrum Alkmaar	Den Helder Alkmaar	MCA Gemini	01-05-2008[154]	#4 Gemini Ziekenhuis	Open Open
86	Algemeen Ziekenhuis Delfzicht St. Lucas	Delfzijl Winschoten	Ommelander Ziekenhuisgroep	09-2008[155]		Open Open

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
87	St. Antonius Ziekenhuis Mesos Medisch Centrum	Nieuwegein Utrecht	St. Antonius Ziekenhuis	31-03-2009[156]	 #67 Mesos Medisch Centrum	Open Closed (2013): 1 new hospital[157]
88	Bethesda Ziekenhuis (Zorggroep Middenveld Drenthe) Scheper Ziekenhuis (Zorggroep Leveste)	Hoogeveen Emmen	Zorggroep Leveste Middenveld	01-01-2010[158]		Open Open
89	Ziekenhuis Walcheren Oosterscheldeziekenhuizen	Vlissingen Goes	Admiraal de Ruijter Ziekenhuis	01-2010[159]	#23 Streekziekenhuis Walcheren #25 Stichting Oosterschelde Ziekenhuis	Open Open
90	Medisch Centrum Leeuwarden (Zorggroep Noorderbreedte) Ziekenhuis De Tjongerschans	Leeuwarden Heerenveen	Zorgpartners Friesland	01-01-2012[160]	#61 Zorggroep Noorderbreedte	Open Open
91	Ziekenhuis Nij Smellinghe De Sionsberg (Zorggroep Pasana)	Drachten Dokkum	Ziekenhuis Nij Smellinghe/Zorggroep Pasana	01-01-2013[161]		Open Closed (2014)[162]
92	Sint Lucas-Andreas Ziekenhuis Onze Lieve Vrouwe Gasthuis	Amsterdam Amsterdam	Sint Lucas-Andreas Ziekenhuis - OLVG	01-03-2013[163]	#60 Lucas-Andreas Ziekenhuis #59 Onze Lieve Vrouwe Gasthuis (OLVG)	Open Open
93	HagaZiekenhuis Reinier de Graaf Groep	's-Gravenhage Delft	Reinier de Graaf – Haga groep	12-06-2013[164]	#82 HagaZiekenhuis #14 Het Reinier de Graaf Gasthuis & #63 Reinier de Graaf Groep	Open Open
94	Tweesteden Ziekenhuis St. Elisabeth Ziekenhuis	Tilburg/Waalwijk Tilburg	Elisabeth-TweeSteden Ziekenhuis	14-08-2013[165]	#64 Tweesteden Ziekenhuis	Open Open
95	Zorggroep Leveste Middenveld Ziekenhuis Refaja	Emmen/ Hoogeveen Stadskanaal	Zorggroep Leveste Middenveld / Refaja	10-2013[166]	#88 Zorggroep Leveste Middenveld	Open Open

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
96	Slotervaart Ziekenhuis	Amsterdam	MC Groep	02-01-2014[167]		Open
	MC Groep	Emmeloord/ Lelystad			#46 MC Groep	Open
97	Bronovo ziekenhuis	's-Gravenhage	Haaglanden Medisch Centrum	15-08-2014[168]		Open
	Medisch Centrum Haaglanden	's-Gravenhage			#65 Medisch Centrum Haaglanden	Open
98	Spaarne Ziekenhuis	Hoofddorp	Spaarne Gasthuis	22-03-2015[169]	#39 Het Spaarne Ziekenhuis	Open
	Kennemer Gasthuis	Haarlem			#54 Het Kennemer Gasthuis	Open
99	Lievensberg ziekenhuis	Bergen op Zoom	Bravis Ziekenhuis	01-01-2015[170]		Open
	Franciscus Ziekenhuis	Roosendaal			#15 St Franciscus Ziekenhuis	Open
100	Rijnland Zorggroep	Alphen a/d Rijn	Alrijne Zorggroep	01-01-2015[171]	#47 Stichting Rijnland Ziekenhuis	Outpatient facility only[172]
	Diaconessenhuis Leiden	Leiden				Open
101	Isala Klinieken	Zwolle	Isala / Noorderboog	01-01-2015[173]	#68 Isala Klinieken	Open
	Zorgcombinatie Noorderboog	Meppel				Open
102	Orbis Medisch en Zorgconcern	Sittart	Atrium-Orbis (Zuyderland)	01-01-2015[174]	#31 Maaslandziekenhuis	Open
	Atrium Medisch Centrum	Heerlen			#62 Atrium Medisch Centrum	Open
103	Vlietland Ziekenhuis	Schiedam	Sint Franciscus Vlietland Groep	01-01-2015[175]	#70 Vlietland Ziekenhuis	Open
	Sint Franciscus Ziekenhuis	Rotterdam				Open
104	Zuwe Hofpoort ziekenhuis	Woerden	St. Antonius Ziekenhuis	12-10-2015[176]	#87 St. Antonius Ziekenhuis	Open (planned to be outpatient facility (2018)[177])
	Sint Antonius ziekenhuis	Nieuwegein				Open

#	Hospitals before merger	City	Hospital name after merger	Merger date	Previous merger	Closed?
105	Reinier Haga Groep 't LangeLand Ziekenhuis	Delft Zoetermeer	Reinier Haga Groep	06-2015[178]	#93 Reinier Haga groep	Open Open
106	Universitair Medisch Centrum Groningen Ommelander Ziekenhuisgroep	Groningen Delfzijl/ Winschoten	UMCG/Ommelander Ziekenhuis-groep	12-2015[179]	#86 Ommelander Ziekenhuisgroep	Open Open

Notes: Den Hartog (2004) reported on hospital mergers that took place between 1978 and 2002 (i.e., merger #1 to merger #80). Den Hartog (2004) assumes that the approval date is equal to the actual merger date. On the approval date, the Ministry of Health acknowledged the merged entity as the single entity of meaning. However, the actual merger date may well precede the approval date by a year or more. Notwithstanding this inconsistency, Den Hartog (2004) is the most consistent and reliable source of mergers before 2002. Therefore, for mergers #1 to #80 we report the merger date that Den Hartog (2004) reported. If we found additional or other information on the actual merger date, we have reported this in the footnotes corresponding to the table. For mergers that took place after 2002 (i.e., merger #81 and beyond) we used the database of the Authority of Consumers and Markets (ACM) and its predecessor (Netherlands Competition Authority) which contains merger notifications by hospitals since 1998. We used the information from the Authority of Consumers and Markets to search for additional information (on, for example, the merger date) on the internet. We supplemented the dataset of Den Hartog and the ACM with information on previous mergers and closure information. The information on closures and conversions to outpatient facilities was also found online. In some cases, the closure or conversion date is not available. Outpatient facilities refer to facilities that provide either outpatient care or day care only. The information in the table is up to date until August 17, 2017

4 According to the website of Canisius-Wilhemina Ziekenhuis, the merger took place in 1974 (https://www.cwz.nl/over-het-cwz/historie/van-hout-markt-tot-weg-door-jonkerbos.html) [retrieved 25-02-2015)

5 Source: website of Canisius-Wilhelmina Ziekenhuis: https://www.cwz.nl/over-het-cwz/historie/van-houtmarkt-tot-weg-door-jonkerbos.html [retrieved 25-02-2015]

6 Source: Wikipedia page on Sint Gerardus Majella Ziekenhuis: http://nl.wikipedia.org/wiki/Sint_Gerardus_Majellaziekenhuis [retrieved 25-02-2015]

7 According to the website of St. Jansdal, the merger took place in 1976 (https://www.stjansdal.nl/over-st-jansdal/karakteristieken/geschiedenis) [retrieved 25-02-2015]

8 Source: website of St. Jansdal: https://www.stjansdal.nl/over-st-jansdal/karakteristieken/geschiedenis [retrieved 25-02-2015]

9 Source: website of St. Jansdal: https://www.stjansdal.nl/over-st-jansdal/karakteristieken/geschiedenis [retrieved 25-02-2015]

10 According to the website of Gemini Ziekenhuis, the merger took place in 1971 (http://www.gemini-ziekenhuis.nl/algemeen/Over-Gemini-Ziekenhuis/Geschiedenis) [retrieved 25-02-2015]

11 According to the website of Gemini Ziekenhuis, this was the Ludwina Ziekenhuis instead of the Luduïna Ziekenhuis (http://www.gemini-ziekenhuis.nl/algemeen/Over-Gemini-Ziekenhuis/Geschiedenis) [retrieved 25-02-2015]

12 Source: website of Gemini Ziekenhuis: http://www.gemini-ziekenhuis.nl/algemeen/Over-Gemini-Ziekenhuis/Geschiedenis [retrieved 25-02-2015]

13 According to the website of Ziekenhuis Amstelland, the merger took place in 1978 (http://www.ziekenhuisamstelland.nl/nl/over-zha/de-jood-se-identiteit/) [retrieved 25-02-2015]

14 Source: Wikipedia page of Centrale Israelitische Ziekenverpleging: https://nl.wikipedia.org/wiki/Centrale_Isra%C3%ABlietische_Ziekenverpleging [retrieved 14-08-2017]

15 Source: website of local historic society: http://oogopnederland.nl/tiel/2016/07/03/oud-oog-het-st-andreas-streekziekenhuis/ [retrieved 14-08-2017]

16 According to the Wikipedia page of Slingeland Ziekenhuis, the merger took place in 1975 (http://nl.wikipedia.org/wiki/Slingeland_Ziekenhuis) [retrieved 25-02-2015]

17 Source: website of the local historic society: https://www.archieven.nl/nl/zoeken?mivast=0&mizig=210&miadt=26&miaet=1&micode=0465&minr=5696484&miview=inv2 [retrieved 14-08-2017]

18 Source: Wikipedia page of Slingeland Ziekenhuis: http://nl.wikipedia.org/wiki/Slingeland_Ziekenhuis [retrieved 25-02-2015]

19 According to the website of Academisch Medisch Centrum, the merger took place in 1983 (https://www.amc.nl/web/Het-AMC/Organisatie/Academisch-Medisch-Centrum.htm) [retrieved 15-08-2017]

20 Source: website of Academisch Medisch Centrum: https://www.amc.nl/web/Het-AMC/Organisatie/Academisch-Medisch-Centrum.htm [retrieved 25-02-2015]

21 According to the website of the local historic society, the merger took place in 1974 (http://www.historischcentrumoverijssel.nl/doorzoek-de-collecties/archieven?mivast=141&mizig=210&miadt=141&miaet=1&micode=0564&minr=751549&miview=inv2) [retrieved 25-02-2015]

22 Source: website of the local historic society: http://www.historischcentrumoverijssel.nl/doorzoek-de-collecties/archieven?mivast=141&mizig=210&miadt=141&miaet=1&micode=0564&minr=751549&miview=inv2 [retrieved 25-02-2015] 23 According to the Wikipedia page of Van Dam-Ziekenhuis, the merger took place in 1980 (http://nl.wikipedia.org/wiki/Van_Dam-Ziekenhuis) [retrieved 25-02-2015]

24 Source: Wikipedia page of Van Dam-Ziekenhuis: http://nl.wikipedia.org/wiki/Van_Dam-Ziekenhuis [retrieved 25-02-2015]

25 Source: Wikipedia page of Van Dam-Ziekenhuis: http://nl.wikipedia.org/wiki/Van_Dam-Ziekenhuis [retrieved 25-02-2015]

26 According to the Wikipedia page of Schieland Ziekenhuis, the merger took place in 1981 (http://nl.wikipedia.org/wiki/Schieland_Ziekenhuis) [retrieved 25-02-2015]

27 Source: Wikipedia page of Schieland Ziekenhuis: http://nl.wikipedia.org/wiki/Schiela Ziekenhuis [retrieved 25-02-2015]

28 Source: Wikipedia page of Gemeentezieken-huis: http://nl.wikipedia.org/wiki/Gemeentezieken-huis_(Schiedam) [retrieved 25-02-2015]

29 According to the website of a local newspaper (http://www.mijngelderland.nl/#/culemborg/het-ziekenhuis-moet-dicht) [retrieved 25-02-2015] and the local historic society (http://culemborgnl.tripod.com/culemborg/id47.html) [retrieved 06-03-2015], the merger took place in 1975

30 Source: website of a local newspaper: http://www.mijngelderland.nl/#/culemborg/het-zieken-huis-moet-dicht [retrieved 25-02-2015]

31 Source: Wikipedia page of Reinier de Graaf Gasthuis: http://nl.wikipedia.org/wiki/Reinier_de_Graaf_Gasthuis [retrieved 06-03-2015]

32 Source: website of a local historic society: http://elisabethstichting-oudenbosch.jouwweb.nl/historie and the Wikipedia page of Franciscus Ziekenhuis: http://nl.wikipedia.org/wiki/Franciscus_Ziekenhuis [both retrieved 06-03-2015]

33 According to the Wikipedia page of St. Willibrord ziekenhuis, the merger took place in 1970 (http://nl.wikipedia.org/wiki/St._Willibrord_ziekenhuis) [retrieved 06-03-2015].

34 Source: Wikipedia page of St. Willibrord ziekenhuis: http://nl.wikipedia.org/wiki/St._Willibrord_ziekenhuis [retrieved 06-03-2015]

35 According to Van Proosdij. C. 1991. Honderd jaar Hilversumse Ziekenhuishistorie, 1891-1991, the merger took place 01-02-1983

36 Source: website of the municipality: http://www.tgooi.info/hilversum/ziekenhuis.php [retrieved 06-03-2015]

37 Source: website of the municipality: http://www.tgooi.info/hilversum/ziekenhuis.php [retrieved 06-03-2015]

38 Source: website of Streekziekenhuis Koningin Beatrix: http://www.skbwinterswijk.nl/Contact [retrieved 25-02-2015]

39 Source: website of the hospital broadcasting service: http://zsom.nl/geschiedenis.html [retrieved 25-02-2015]

40 Source: website of Streekziekenhuis Koningin Beatrix: http://www.skbwinterswijk.nl/Contact [retrieved 25-02-2015]

41 Source: website of Waterlandziekenhuis: http://www.waterlandziekenhuis.nl/over-het-waterland-ziekenhuis/#/over-ons/geschiedenis [retrieved 06-03-2015]

42 According to the website of Saxenburgh Groep, the merger took place in 1981 (http://sxb.nl/index.php?option=com_content&view=article&id=57&Itemid=57) [retrieved 06-03-2015] 43 Source: website of a local historic society: http://www.encyclopediedrenthe.nl/Aleida%20Kramer%20Stichting [retrieved 06-03-2015]

44 Source: Wikipedia page of Röpcke-Zweers Ziekenhuis: https://nl.wikipedia.org/wiki/R%C3%B6pcke-Zweers_Ziekenhuis [retrieved 14-08-2017]

45 Source: website of Deventer Ziekenhuizen: http://www.dz.nl/Organisatie/Gezondheidscentrum-Jozef/Paginas/default.aspx [retrieved 06-03-2015]

46 According to the Wikipedia page of Westfriesgasthuis, the merger took place in 1983 (https://nl.wikipedia.org/wiki/Westfriesgasthuis) [retrieved 14-08-2017]

47 Source: website of constructing company: http://www.djga.nl/projecten/westfriesgasthuis [retrieved 14-08-2017]

48 Source: website of Westfriesgasthuis: http://www.westfriesgasthuis.nl/over-het-westfriesgasthuis/Paginas/Historie.aspx [retrieved 06-03-2015]

49 According to the website of Admiraal de Ruyterziekenhuis, the merger took place in 1984 (http://www.adrz.nl/over-adrz/historie?steID=1&catID=428) [retrieved 6-03-2015]

50 According to the website of ZorgSaam Zeeuws-Vlaanderen, the merger took place in 1975 (http://www.zorgsaam.org/images/stories/over-zorgsaam/Historie_fusies_ZorgSaam.pdf) [retrieved 13-03-2015]. According to a document on the history of St. Elisabeth ziekenhuis, the merger took place in 1973 (http://www.zorgsaam.org/images/stories/over-zorgsaam/Heemkundige_informatie_ziekenhuizen_Zeeuws-Vlaanderen.pdf) [retrieved 13-03-2015].

51 Source: website of ZorgSaam Zeeuws-Vlaanderen: http://www.zz.nl/nl/werken/organisaties/94_zorgsaam-zeeuws-vlaanderen/98_zorgsaam-ziekenhuis/2.htm [retrieved 06-03-2015]

52 According to the website of Admiraal de Ruyterziekenhuis, the merger took place in 1981 (http://www.adrz.nl/over-adrz/historie?steID=1&catID=428) [retrieved 06-03-2015]

53 Source: website of Admiraal de Ruyterziekenhuis: http://www.adrz.nl/over-adrz/historie?steID=1&catID=428 [retrieved 06-03-2015]

54 Source: website of Admiraal de Ruyterziekenhuis: http://www.adrz.nl/over-adrz/historie?steID=1&catID=428 [retrieved 06-03-2015]

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179 Source: website of Ommelander Ziekenhuisgroep: https://www.ommelanderziekenhuis.nl/over-ozg/samenwerking-met-het-umcg [retrieved 16-08-2017]

CHAPTER 3

Does Price Competition Damage Healthcare Quality?

With Eddy van Doorslaer, Owen O'Donnell, Frederik T. Schut and Marco Varkevisser

Abstract

One of the reasons why regulators are hesitant about permitting price competition in healthcare markets is that it may damage quality when information on quality is poor. Evidence on whether this fear is well-founded is scarce. We provide evidence by examining the impact of a reform that permitted Dutch health insurers and hospitals to freely negotiate prices for elective procedures. Assuming that price liberalization creates greater competitive pressure in less concentrated hospital markets, difference-in-differences across more and less concentrated markets can identify the effect of increased price competition. Unlike previous research that has relied on indicators of the quality of urgent treatments that are largely shielded from competition, we take advantage of the plausible absence of selection bias in our setting to identify the effect on quality of non-acute hip replacements that are delivered in a competitive environment. Using administrative data on all admissions to Dutch hospitals, we find no evidence that increased exposure to price competition reduces quality measured by readmission rates, despite the lack of publicly available information on this outcome. In fact, there is evidence of a temporary, positive impact on quality. Our estimated null effect over the full post-liberalization period is robust to different definitions of market size as well as to using the 30-day, rather than 90-day, readmission rate.

3.1 Introduction

Health systems around the world are increasingly designed to encourage competition between providers in the hope that this will improve quality of care while slowing the growth of health spending (Propper, 2011). When prices are regulated, providers are forced to compete on quality to attract patients or contracts with insurers. But when prices are unregulated, the effect of competition on quality is less clear. If demand is more responsive to price than to quality, then the optimal competitive strategy will involve driving down the price and sacrificing quality (Gaynor, 2006). This is a plausible scenario when information on quality is poor, much of the variation in quality is unobservable and so demand is insensitive to it. However, not-for-profit healthcare providers may not adopt the most competitive strategy. Their intrinsic motivation may lead them to maintain quality even if this means forgoing opportunities to gain a competitive advantage by cutting prices at the expense of quality. Whether quality suffers in competitive healthcare markets with unregulated prices is an empirical question. To date, evidence to answer it is sparse. A highly regulated form of price competition introduced in the UK National Health Service (NHS) at a time when there was poor information on quality was found to be (weakly) associated with worse health outcomes from hospital treatment (Propper et al., 2008; 2004). Health outcomes also deteriorated in one US state when prices were deregulated in the hospital care market (Volpp et al., 2003). However, policy and market changes that occurred at the same time as the deregulation may have confounded the effect of deregulating prices.

This paper presents evidence on the impact of unconstrained price competition on the quality of hospital care delivered in the Dutch healthcare market in which insurers compete for customers and providers compete for contracts with insurers. We estimate the effect of moving from financing hospitals through prospective budgeting to allowing insurers and hospitals to freely negotiate prices in contracts for the delivery of certain medical procedures. We identify the effect of this price liberalization by exploiting variation in its consequences across hospitals differentiated by the concentration of the market in which they operate. Assuming that free negotiation of prices creates greater competitive pressure where the market is less concentrated, difference-in-differences (DID) across more and less concentrated markets can identify the

effect of liberalizing prices and this can be interpreted as the effect of exposure to greater price competition. This is similar to the approach taken by Propper et al. (2008), Cooper et al. (2011) and Gaynor et al. (2013) to evaluate the impact of competition in the UK NHS.

Most studies of the impact of hospital competition use mortality after acute myocardial infarction (AMI) as an indicator of quality (see e.g., Cooper et al., 2011; Gaynor et al., 2013; Kessler & Geppert, 2005; Mutter et al., 2011; Romano & Balan, 2011). The reason is that the urgency of AMI treatment greatly reduces the risk of selection bias. Patients are taken to the nearest hospital, which is obliged to treat them. There is little or no opportunity for difficult-to-treat patients selecting hospitals that deviate from the average in both quality and exposure to competition. And there is little scope for those hospitals to cherry pick the easier cases. The downside of this empirical strategy is that it identifies the impact of competition on the quality of a treatment that is demand inelastic with respect to quality. It identifies the impact of competition on quality only in so far as the pressure to compete in the delivery of some procedures affects the general management of a hospital and this feeds through to treatments, such as AMI, that are largely shielded from competition. This leaves us with little or no evidence on the effect of competition on treatments, such as elective surgeries, that hospitals directly compete for and that potentially exhibit much greater demand sensitivity to quality than is true of urgent procedures (Skellern, 2017; Gravelle et al., 2014; Bevan & Skellern, 2011). Provided quality is sufficiently observable, competition has the potential to impact more positively on the quality of elective surgery than on the quality of acute surgery (Colla et al., 2016).

We present evidence of the impact of competition on the quality of a procedure – non-acute hip replacements – over which hospitals directly compete, including through freely negotiated prices. We use unplanned readmission rates to indicate quality. Higher readmission rates following hip replacement have been shown to be related to suboptimal quality (e.g., Rosen et al., 2013; Mokhtar et al., 2012). In England, providers facing more competition were found to face a more elastic demand with respect to quality (and waiting times) for elective hip replacements than providers facing less competition (Moscelli et al., 2016).

The institutional context and our empirical strategy give us the option to identify the effect of competition on the quality of an elective procedure without running much risk of selection bias. Previous studies, particularly those of the UK NHS, have identified the impact of competition by exploiting reforms that intensified competitive pressure through increasing the scope for patient choice of the provider (Cooper et al., 2011 and Gaynor et al., 2013). These studies avoided using outcomes of elective procedures to measure quality because of the considerable potential for selection bias. The Dutch healthcare market reform we exploit introduced price competition but left patient choice unaffected. Before and after the liberalization of prices patients and insurers had unconstrained choice of provider. But the absence of any information on hip replacement readmission rates made it impossible for patients and insurers to select a hospital on the basis of the outcome. Further, to identify the effect of competition we separate hospitals into two broad (treatment/comparison) groups according to the concentration of the market in which they operate. If there was any selection correlated with the outcome, it would most likely involve switching between neighboring hospitals that will belong to the same group, which would not induce selection bias given our strategy. Baseline patient characteristics are similar across the treatment and comparison groups, changes in these characteristics do not differ between the groups and conditioning on these characteristics has little or no impact on the estimates. If the estimates are insensitive to conditioning observables, it is unlikely that they are even moderately biased by correlated unobservables.

Given that information on the quality of hospital care was absent at the time free price negotiation was introduced in the Dutch hospital market, there was a risk of a negative impact on quality if hospitals competed on price and neglected quality. We find no evidence of this. Our main point estimate is that exposure to price competition reduced the 90-day readmission rate of hospitals in less concentrated markets by almost 1 percentage point (baseline: 8.2 percent) compared with hospitals in more concentrated markets that were exposed to less competitive pressure. But this estimate is not significantly different from zero. In the year immediately after the prices were liberalized, we estimate that increased exposure to competition did significantly (p-value = 0.02) reduce the readmission rate but this was not sustained. The finding that there was no significant effect that persisted over the full post-reform period is robust to different definitions of market size and to using the 30-day, rather than 90-day,

readmission rate. Hence, although competition was introduced in the market for a potentially demand sensitive elective procedure and information on its quality was absent when prices were made freely negotiable, the quality of care does not seem to have suffered. If anything, there was a temporary improvement in quality. While it is merely speculation, one possible explanation for this is that providers, who were contracting for the delivery of specific procedures for the first time, initially did not appreciate the extent to which insurers would focus on price in the (re)negotiation of contacts. Consequently, the hospitals exposed to greater competitive pressure were careful to maintain, or even improve, quality in the first year operating under the new contracting regime. Only later, when they witnessed insurers' preoccupation with price, did they also concentrate on competing in that domain. More concretely, our study provides evidence that price competition in healthcare markets is not necessarily always at the expense of quality, even when information on quality is poor.

3.2 Competition and healthcare quality with unregulated prices: theory and evidence

When prices are unregulated, the impact of competition on quality depends on how it affects on the responsiveness of demand to quality relative to price. If consumers or insurers observe prices but have only imperfect information on quality, then competition might be expected to raise the price sensitivity relative to the quality sensitivity of demand, and so reduce quality. Gaynor (2006) makes this argument using an amended version of the Dorfman-Steiner condition (Dorfman & Steiner, 1954): $z = \frac{p}{d} \cdot \frac{\varepsilon_z}{\varepsilon_p}$ where z is quality, p is price, d is the marginal cost of quality, ε_z is the elasticity of demand with respect to quality and ε_p is the elasticity with respect to price[180]. If competition exerts downward pressure on the price relative to the marginal cost and/or raises the magnitude of the price elasticity relative to the quality elasticity, then it will reduce quality (Gaynor et al., 2015). However, if quality becomes sufficiently observable, then competition could conceivably raise the quality elasticity relative to the price elasticity. Quality would increase, provided price does not fall relative to the marginal cost of quality.

In the Netherlands, as in most high-income countries, consumers of healthcare can be expected to be rather price insensitive because of comprehensive health insurance with limited cost sharing. However, this does not imply that demand is perfectly price inelastic. Health

180 Although Dorfman & Steiner (1954) model a monopolist's behaviour, Dranove and Satterthwaite (2000) show that the model is an approximation to the behaviour of an oligopolistic or monopolistically competitive firm if we think of the demand function as a reduced form demand. Hence, the model has relevance for imperfectly competitive healthcare markets (Gaynor, 2006; Gaynor et al., 2015).

insurers are sensitive to prices (Gowrisankaran et al., 2015). The reform we use for identification was intended to make insurers more price sensitive. It gave them the freedom to negotiate prices for specific procedures with individual hospitals. This price liberalization would be expected to increase the price elasticity of the insurers' demand and push prices downward. According to the Dorfman-Steiner condition, quality would then suffer unless there was a sufficient countervailing increase in the quality elasticity[181]. This would occur only if quality was sufficiently observable such that insurers could monitor it and, the new contracting arrangements gave them greater motivation and scope to pressure hospitals for quality improvements.

The complexity of healthcare and its stochastic relationship with health outcomes makes measurement of its quality inherently difficult. This, together with a lack of published information on hospital quality both before and after the reform we examine, would be expected to result in hospitals exposed to greater competitive pressure shifting effort from maintaining poorly observed quality to cutting costs in order to become more price competitive (Propper et al., 2008). On the other hand, the new contracts involved hospitals and insurers negotiating for the first time over the delivery of specific procedures akin to diagnostic-related groups. Hospitals exposed to more competition might have exerted greater effort in improving the quality of these procedures for fear of losing a contract. Without experience of the weight the insurers would place on price relative to quality in contract renewal negotiations, the hospitals may have been motivated, at least initially, to ensure that price competitiveness was not achieved at the cost of quality. If this motivation was sufficiently strong, then potentially competition could even have raised quality. The effect of price competition on quality is therefore ambiguous. It depends on characteristics of the market, the observability of quality and the objective functions of the insurers and hospitals (Gaynor et al., 2015).

Evidence on the effect of price competition on healthcare quality is scarce[182]. This is mainly because only a few countries permit free price negotiation in healthcare markets and data on the performance of private healthcare providers are typically not accessible. Using data from Southern California, Gowrisankaran and Town (2003) find that increased competition for Health Maintenance Organization (HMO) patients is correlated with reduced risk-adjusted hospital mortality for both pneumonia and

181 It is unlikely that hospitals deliberately set out to lower quality of care. Studies that investigate the competition-quality relationship often assume that in response to competitive pressure, hospitals cut services that affect quality outcomes (Propper et al., 2008; Bloom et al., 2015). Nonetheless, models on the relationship between competition and quality assume a direct relationship between competition and quality rather than between competition and effort. Gaynor and Town (2012) show that for the purpose of modeling the distinction between effort and quality of care is irrelevant. A given service level generates an expected level of outcome of care (e.g., mortality or a readmission) and therefore it does not matter whether a model assumes hospitals to choose quality of services or any other outcome (Gaynor & Town, 2012).

182 There is more evidence on the impact of competition on quality when prices are regulated. Findings are mixed. Some studies find that competition improves quality in this context (Cooper et al., 2011; Gaynor et al., 2016; Gaynor et al., 2013; Gobillon & Milcent, 2017; Kessler & Geppert, 2005; Kessler & McClellan, 2000; Propper et al., 2010), others find evidence of the contrary (Moscelli et al., 2016b; Skellern, 2017), while one study finds no effect at all (Berta et al., 2016).

AMI. Consistent with this, Sari (2002) uses a similar methodology based on the Structure-Conduct-Performance (SCP) framework and finds that increased competition (lower hospital market share and market concentration) in 16 US states is associated with fewer hospital complications. However, the internal validity of these studies can be doubted because of endogeneity problems that are known to beset the SCP approach (Gaynor & Town, 2012), and their external validity is limited because the HMO markets studied are very particular to the US hospital market in the 1990s.

The few studies that exploit a policy change to identify the quality effect of a change in price competition are stronger with respect to internal validity but also difficult to generalize because the findings are obtained in specific settings with a particular design of price competition. Subject to this caveat, these studies generally find that price competition does damage hospital quality. Volpp et al. (2003) compare AMI mortality rates of New Jersey hospitals before and after the deregulation of prices in 1992 with those of New York hospitals where there was no deregulation. However, coincident to the reform, hospital prices were also pressured through rapid growth of large-volume buyers, such as HMOs, and large reductions in subsidies for hospital care of uninsured patients. The mortality rate of uninsured AMI patients increased in New Jersey relative to New York but it is not clear how much, if any, of this was attributable to the price deregulation. The switch from fixed budgets that hospitals received directly from the national government to negotiating over contracts with purchasing organizations in the British NHS in 1991 has been used to estimate the quality effect of a highly regulated form of price competition (Propper et al., 2004; 2008). The competition was highly regulated since contracts were written for blocks of services, including accident and emergency procedures and not for defined procedures, such as DRGs, and hospitals were not free to set prices. They were mandated to set price equal to average costs, had to publish the price and were not permitted to carry surpluses or losses across financial years. However, some form of price competition was possible at the specialty level because arbitrary apportionment of costs to a particular service made it difficult for the regulator to check on adherence to the pricing rule at that level (Propper et al., 2008). There is some evidence that prices in this period were indeed not solely determined by costs but were related to market forces (Propper, 1996). The evidence suggests that even this regulated form of price competition had a negative impact on

quality (measured by AMI mortality rates), which is attributed to incentives for hospitals to compete on prices rather than quality when the available information on the latter is poor (Propper et al., 2004; 2008). If this highly regulated form of price competition can damage quality, then entirely free price competition could potentially be seriously detrimental to the quality of care delivered by hospitals. The 2005 liberalization of price setting in the Dutch healthcare market allows us to test this hypothesis. Since there was no quality information available either publicly or to health insurers at the time of the reform, the risk of a negative impact on quality was substantial.

3.3 Price competition in the Dutch healthcare market

All Dutch hospitals are private nonprofit foundations. Before 2005, Dutch hospitals were financed by a prospective budgeting system with relatively stable revenue flows known at the beginning of each year. From 2005, revenues became contingent on contracts secured with individual health insurers. There were five health insurance companies plus a joint purchasing cooperative of small health insurers in the market[183]. Hospitals and insurers negotiate over volume and quality of care per product, which is defined by a Diagnosis and Treatment Combination (DTC), the Dutch equivalent of a DRG[184]. These DTC products had no relation to the output parameters of the pre-reform hospital budgets (e.g., number of admissions and hospital days). In 2005, free negotiation of price was permitted in writing contracts for a subset of DTCs that accounted for about 10% of hospital revenues. This included non-acute hip replacements, which is the procedure we use to evaluate the impact of the introduction of price competition on quality. The number of DTCs for which free price setting was permitted was extended over time. In 2008, 20% of all hospital revenues were obtained from DTCs with negotiated prices. This fraction increased to 34% in 2009 and 70% in 2012. Because of the high overall number of DTCs, insurers and hospitals often negotiate over clusters of DTCs. However, contracting is done separately for high-revenue/high-volume products like non-emergency hip replacements[185].

The goal of the contracting reform was to make insurers, acting as purchasing agents for their customers, more responsive to price, volume and quality. Health insurers were allowed to contract hospitals selectively, which would enable them to negotiate lower

183 The four largest companies account for 90 percent of the market. Market concentration by region is often even higher, which is due to the fact that these companies typically evolved from former regional sickness funds (Halbersma et al., 2010).

184 The DTC system is more comprehensive than DRGs. It includes outpatient consultations and the remuneration of medical specialists. There were 29000 DTCs in the period we examine (2005-2007).

185 This has been confirmed in interviews with representatives of insurers and hospitals involved in contract negotiations during the period we study.

prices with selected hospitals. In a competitive insurance market, these lower prices would feed through to lower premiums (Ho, 2009). A major reform of the health insurance market in 2006 increased price competition among health insurers, which were expected to put pressure on hospitals to cut their costs (Schut & Van de Ven, 2011). If consumers not only value lower premiums but also access to quality hospitals, then health insurers should compete both on premiums and the scope and quality of their provider networks (Determann et al., 2016). Hospitals are expected to compete on price and quality for inclusion in the insurers' network.

Existing evidence on the market response to the liberalization of prices in Dutch insurer-hospital negotiation of contracts is limited. Qualitative examination of insurer-provider contracting suggests that price rather than quality has been the primary focus of the contract negotiations (Meijer et al., 2010; Ruwaard et al., 2014; Schut & Van de Ven, 2011). This is perhaps unsurprising given the dearth of information available on quality. For example, hospital-specific readmission rates for hip replacement patients – the quality indicator we use – were not available to patients nor insurers during the period we study. The Dutch Healthcare Authority (NZa, 2009) found that hospital prices increased less in the free-pricing segment of DTCs than in the regulated segment between 2005 and 2008. Between 2006 and 2008 prices in the free-pricing segment even declined in real terms. There is no evidence that hospitals offset lower price increases by increasing service volume in the free-pricing segment (Krabbe-Alkemade et al., 2016; Schut & Van de Ven, 2011). Krabbe-Alkemade et al. (2016) found that the introduction of price competition led to lower total hospital costs.

The effect of the introduction of price competition on hospital quality has not previously been estimated. A few studies look at the relationship between price and quality variation or between hospital concentration and quality after prices were liberalized. Heijink et al. (2013) find only limited variation in hospital quality and no relationship between contract prices and quality for cataract care. Croes et al. (2017) report a negative relationship between hospital market share and quality scores for two of the three diagnostic groups studied. Bijlsma et al. (2013) find that hospital concentration is associated with various process indicators, but both positive and negative relationships are found

and there is no relationship between hospital concentration and any of a number of outcome indicators examined. None of these studies have a design capable of identifying a causal effect of competition on quality.

3.4 Data and measures

3.4.1 Sources and sample

We use comprehensive, hospital-level data from the National Medical Registry on patient discharges from all Dutch hospitals between 2001 and 2007. For each discharge, we observe the patient's gender, age, zip code, primary/secondary/tertiary diagnoses (ICD-9CM), admission period, admission hospital and procedures. Procedures are classified according to a Dutch method based on (and for the procedures examined equivalent to) the International Classification of Procedures in Medicine (WHO-FIC, 2017). We restrict attention to patients discharged after a non-acute hip replacement (see below for details of the selection criteria). We construct a hospital-level panel which includes information on quality of care and patient case mix, and supplement this with an index of socio-economic status that is averaged over all the non-acute hip replacement patients of a hospital in a given year. This index is constructed by the Netherlands Institute for Social Research from the education, income and labor market status of residents of a zip code area (SCP, 2017).

In total, our panel consists of 89 hospitals observed from 2003 to 2007, yielding 445 hospital-year observations. These hospitals admitted a total of 29,923 non-acute hip replacement patients per year, on average (SD: 1,525).

3.4.2 Quality measures

We use the unplanned 90-day readmission rate following non-acute hip replacement as our main quality indicator. This is preferred to the post hip replacement mortality rate because the latter was very low in the Netherlands in the period studied[186]. Higher (unplanned) readmission rates have been shown to be related to suboptimal quality of treatment both generally (e.g., Rosen et al., 2013; Mokhtar et al., 2012) and following hip replacement (e.g., Clement et al., 2013; Avram et al., 2014; Saucedo et al., 2014; Kurtz et al., 2016). Because planned readmissions (e.g., for a scheduled procedure) are not generally a signal of quality of care, we restrict attention to

186 Using the Causes of Death Register provided by Dutch Hospital Data and Statistics Netherlands, we calculate a within hospital mortality rate of 0.23 percent and a 30-day mortality rate of 0.29 percent following non-acute hip replacement in the period 2003-2007.

unplanned readmissions. All unplanned readmissions are attributed to the original treatment hospital. Unplanned readmissions following joint replacement are determined, in part, by the quality and safety of the initial hospital stay, transitional care services and post discharge support (Friebel et al., 2017). Widespread belief that readmissions are indicative of poor quality treatment is reflected in the fact that financial penalties for excess readmissions (including for hip replacements) have been imposed on hospitals in both the US and the UK since 2012 (Joynt & Jha, 2012). Consistent with this, in our data, four of the top five reasons (identified from diagnostic codes) for hip replacement patients to be readmitted within 90-days are related to complications, infections or inflammatory reactions due to prosthetic implants. There is no consensus on whether a 90-day or 30-day follow-up window to define orthopedic readmissions provides the better indicator of quality (Ramkumar et al., 2015). Since the two are highly correlated for hip replacements in our data ($r(81)=.84$, $p<0.01$ in 2003 and $r(61)=.87$, $p<0.01$ in 2007), it should make little difference which is used. As for 90-day readmissions, complications are the main reason to be readmitted within 30-days. We examine robustness of the estimates to using 30-day readmissions. Information on hip replacement readmission rates is not in the public domain or available to health insurers in the Netherlands, and so this indicator is unlikely to have been subject to manipulation by hospitals.

Sample inclusion and exclusion criteria were based on those defined in the technical specifications of the US Agency for Healthcare Research and Quality (AHRQ) Inpatient Quality Indicator #14 (AHRQ QI Version 5.0; IQI #14), which measures the hip replacement mortality rate. The population includes discharged patients aged 18 or older with any procedure code that indicates partial or full hip replacement and any diagnosis code that indicates osteoarthrosis of the pelvic region or thigh[187]. There were 79,140 such cases between 2003 and 2007. To exclude acute cases, we drop those with any listed diagnosis codes indicating hip fracture and those with codes indicating pregnancy, childbirth or puerperium. We also exclude those who transfer to another hospital because it is impossible to determine whether readmission in such cases indicates sub-optimal quality of the treatment received in the first or the second hospital. Cases with missing information on discharge address, gender, age, year or principal diagnosis (n=405) are also dropped, as are patients who died in the hospital (n=183)[188]. After imposing all these exclusion restrictions, we are left with 70,273 discharges following

187 See appendix 3.1 for the relevant procedure codes and ICD-9CM diagnosis codes.

188 Given the very low within hospital mortality rate following non-acture hip replacement, any selection bias arising from excluding those who die is likely to have a negligible impact on the estimates (Fischer et al., 2014; Laudicella et al., 2013).

non-acute hip replacement between 2003 and 2007. Of these, 8.2 percent were readmitted to a hospital within 90 days for any reason that was not planned.

3.4.3 Measures of hospital market structure

We measure concentration at the hospital level using the Herfindahl-Hirschman Index (HHI) based on the number of hospital beds[189]: $HHI_h = \sum_{i=1}^{N_h} m_i^2$, where m_i is the percent market share of hospital i that lies within a fixed radius of hospital h and N_h is the total number of hospitals in that market. Some hospitals have multiple locations that do not all lie within the same market defined by distance[190]. Appendix 3.2 explains how we calculate the HHI in these cases. For our baseline analysis, we use a 30 kilometers (by road) fixed radius because patients travel, on average, for 20 minutes to get to the hospital of their choice (Beukers et al., 2014; Varkevisser et al., 2012; Varkevisser et al., 2010) and most Dutch hospitals provide hip replacements (Roos et al., 2017). But since variation around the mean travel time is high (Beukers et al., 2014; Varkevisser et al., 2012; Varkevisser et al., 2010), we examine sensitivity to fixing the radius at 20, 40 and 50 kilometers to define the market. Because providers are anonymized in the data to protect confidentiality, we cannot use the continuous measure of HHI once the hospital data are linked with patient-level data. The HHI of each hospital was therefore constructed in a database not containing patient-level data. Next, an indicator of whether the HHI is under 2500 was derived and this was then linked to the patient-level dataset using the hospital identifier by Statistics Netherlands. Choice of the 2500 threshold is based on the convention in antitrust regulation that considers hospitals with an HHI at or above that value to be part of a highly concentrated market (e.g., FTC merger guidelines, 2010). It is assumed that these hospitals would be exposed to less price competition after 2005 when free negotiation of prices was allowed for hip replacements than hospitals operating in less concentrated markets.

3.5 Empirical strategy

We identify the effect of price competition on quality by comparing the change after price liberalization in hip replacement readmission rates of hospitals operating in less concentrated markets with the before-and-after difference in the readmission rates of hospitals in highly concentrated markets. Hospitals with

189 The information on the number of beds per hospital location per year was assembled using several datasets that are/were partly publically available (Bartels, 2001; 2002; Prismant, 2003; 2004; 2005; 2006; CIBG, 2008; 2009; CBS, 2010; RIVM, 2006; 2008; 2009).

190 Of the 103 hospitals, 5 had more than one location within the period that we study.

an HHI below 2500 form our treatment group, while those with a HHI of at least 2500 belong to the comparison group. Comparing changes in hip replacement readmission rates of these two groups does not identify the impact of introducing price competition *per se*, but identifies the effect of greater exposure to price competition provided the two groups would have followed parallel trends in readmission rates if price setting had not been liberalized.

Only hospitals with a HHI either always below 2500 or always above 2500 during the period of analysis are used. Hence, no hospital can switch from the treatment group to the comparison group or vice versa, and the composition of each group is held constant by construction. Sixteen hospitals out of a total of 103 are excluded because they fail to meet this criterion. This is mainly because of merger activity[191].

To avoid contamination from earlier and later policy changes[192], we focus on a relatively narrow time window around the implementation of price liberalization. We use data from 2003 and 2004 to capture the period before price liberalization and data from 2006 and 2007 for the post-reform period. We exclude data from 2005 as the policy was implemented on February 1 of that year.

We estimate the following fixed effects model by least squares:

$$RR_{ht} = \alpha + \delta\, 1(HHI_h < 2500) \times POST_t + \boldsymbol{X}_{ht}\boldsymbol{\mu} + u_h + \lambda_t + \varepsilon_{ht} \qquad \textbf{(3.1)}$$

where RR_{ht} is the unplanned 90-day readmission rate (percent) for non-acute hip replacements at hospital h in year t, 1() is the indicator function, $POST_t$ is a binary indicator equal to 1 for the post-reform period (2006 & 2007), $\boldsymbol{X}_{ht}$ is a vector of hospital characteristics that vary over time but are plausibly not affected by the introduction of price liberalization, u_h is a hospital fixed effect, λ_t is a year effect and ε_{ht} is a random error term.

The covariates consist of the Charlson index of comorbidity (Quan et al., 2011; 2005) averaged over a hospital's non-acute hip replacement patients in a year, the percentage of these patients aged 65+, 40-60 and 18-39 years, the percentage female, the percentage discharged to a skilled nursing facility[193], and the mean zip code-specific socioeconomic score of the patients. These indicators of case mix are included to increase efficiency and to allow

191 Two other hospitals had to be excluded because the number of hip replacement cases was too low in the post-reform period.

192 In 2008, the Health Care Inspectorate set up a program to develop reliable, comparable and valid quality information, free pricing negotiations were extended to about 20 per cent of hospitals' revenues, specialists' payments changed and entry to the hospital market became easier because of the abolishment of government approval over hospital construction. All of these changes potentially affect the relationship between market concentration and quality of care. Hence, we are limited to using data until 2007 to examine the impact of price liberalization for hip replacements introduced in 2005.

193 Our dataset indicates whether the patient went home, to another general hospital, to another academic hospital, to a nursing home or to another healthcare organization after discharge. According to a recent (and unpublished) study by Statistics Netherlands, the majority of patients that is included in the 'another healthcare organization' category is transferred to a nursing home facility (approximately 70 percent). In this paper, we assigned every patient that is included in the 'nursing home' and 'other healthcare organization' categories to a 'transferred to a skilled nursing home facility' variable. This measure is obviously not entirely correct but given that we are not able to distinguish specific organizations within the 'another healthcare organization' group, this was the best we could do.

for any change in the composition of hip replacement patients that differs between hospitals in less and more concentrated markets without being caused by the differential effect of price liberalization. We argue at the end of this section that there is little or no reason to expect the reform to have caused hip replacement patients to select different hospitals or hospitals to have selected different patients.

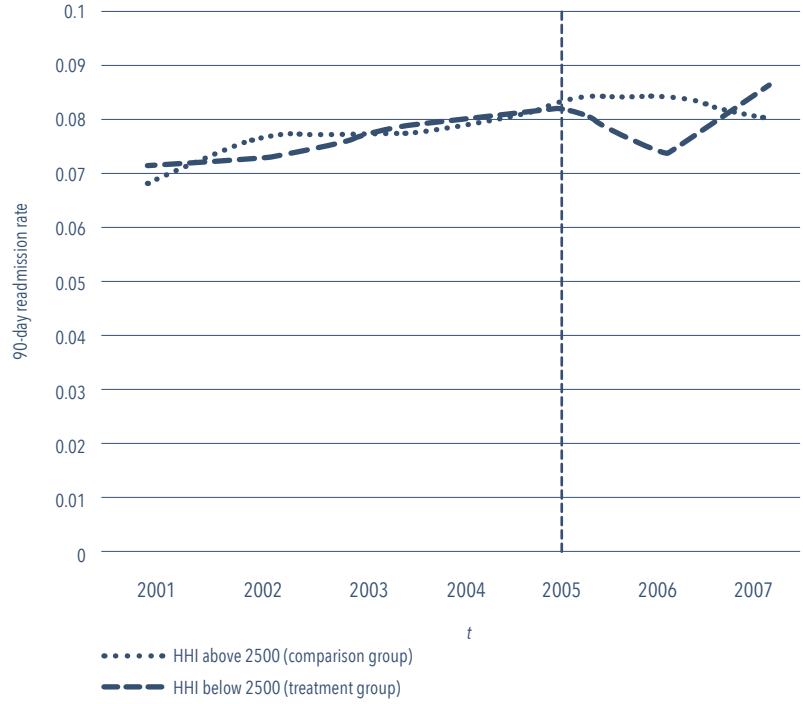
Table 3.1 presents means of the covariates before and after the reform for the treatment and comparison groups. Prior to the reform, there are some significant differences in the characteristics of the patients across the two groups. But the differences are rather small. Significance reflects the large sample size. The treatment group has a slightly higher proportion of females, its patients are older by about 1 year and they have higher socioeconomic status and propensity to be admitted to a skilled nursing facility after discharge, on average. There are no pre-reform differences in comorbidity measured by the Charlson index. The characteristics of the patients change relatively little between the two periods for both groups. None of the difference-in-differences of these characteristics are significantly different from zero, indicating that there was no differential change in the composition of the groups with respect to these observables.

If in the absence of price liberalization in 2005 the average readmission rate of hospitals in less concentrated markets would have changed in 2006-07 by as much as the change that actually occurred in the hospitals operating in the more concentrated markets, then the parameter δ in (3.1) corresponds to the average effect of the increased exposure to price competition on the readmission rate among the hospitals in the less concentrated markets.

Figure 3.1 supports the plausibility of the common trends identification assumption. Even going back to 2001, two years before the start of the pre-reform period that we use for identification of the effect, the trend in the readmission rate, and indeed its level, prior to the 2005 reform is very similar for hospitals operating in more and less concentrated markets. Estimation of a model similar to (3.1) using data from 2001 to 2004 and allowing the year effects to differ between hospitals located in more and less concentrated markets reveals no evidence of differential trends in the period immediately preceding the reform (Appendix 3.3; table 3.1; column (i)).

FIGURE 3.1 – 90-day readmission rate after hip replacement per year & per HHI group (radius 30 km)

Notes: The vertical dashed line indicates the event.



A gap opens up in the readmission rates in 2006 immediately after the liberalization of price setting (figure 3.1). The readmission rate falls in the less concentrated markets but not in the more concentrated markets. If the common trends assumption holds, this would suggest that hospitals that were more exposed to price competition raised the quality of the care they delivered. However, the divergence is not sustained. In 2007, the readmission rate rises again in less concentrated markets, while remaining constant for hospitals largely shielded from competitive pressures. Over the two-year post-reform period, the graph suggests that price liberalization did not consistently lower or raise the quality of hip replacements. Motivated by the figure and because hospitals and insurers may not have fully adjusted to the new contracting conditions immediately after prices became freely negotiable, we estimate a second model that allows the treatment effect to differ in the two post-reform years:

$$RR_{ht} = \alpha + \sum_{k=6,7} \delta_k \, 1(HHI_h < 2500) \times YEAR0k_t + \boldsymbol{X}_{ht}\boldsymbol{\mu} + u_h + \lambda_t + \varepsilon_{ht} \qquad \textbf{(3.2)}$$

where $YEAR06_t$=1 ($YEAR07_t$=1) if the year is 2006 (2007).

Under the same common trends assumption, δ_6 gives the average effect of increased exposure to price competition in 2006 and δ_7 gives the equivalent effect in 2007.

Market concentration is generally considered to be potentially endogenous because performance may feed back into structure and unobservable attributes may influence both quality and patients' choice of hospital (Evans et al., 1993). In this study, both the empirical strategy and the institutional context eliminate or, at least greatly minimize, the threat to identification from endogeneities of both types. Hospital fixed effects deal with any time invariant correlated unobservables. Further, we avoid using any time varying information on market concentration. Each hospital is categorized into one of two groups according to whether its HHI starts and remains either below 2500 or above 2500. Since barely any quality information was available around the time of the reform, it is unlikely that any change in quality would affect patient flows. But even if there was a feedback from quality to market concentration, any such endogenously induced variation in the HHI is not used in the estimation, and so cannot cause bias. Hospitals that cross the HHI threshold of 2500, possibly arising from a change in performance that either attracts or deters patients, are dropped from the sample. Quality-induced changes in market concentration of this magnitude, if they exist, are also not used in the estimation. Since we do not identify from time variation in HHI, there would be no advantage from calculating the HHI on the basis of predicted, rather than actual, patient flows, as some others have done (Kessler & McClellan, 2000; Cooper et al., 2011; Gaynor et al., 2013).

We deliberately choose an elective procedure to measure quality in order to obtain evidence on the effect of competition on a treatment that is likely to exhibit much greater demand elasticity with respect to quality than is the case with acute treatments (e.g., for AMI), the demand for which is likely dominated by proximity. Hitherto, the literature has made the opposite choice (see e.g., Cooper et al., 2011; Gaynor et al., 2013). Lack of direct relevance of competition to the acute procedure used to measure quality has been accepted in order to obtain a measure that is less vulnerable to endogeneity arising from patient selection of the provider. There are three reasons why our study is less vulnerable to this selection bias. First, we eliminate correlated, time invariant unobservable differences

in patient composition across hospitals with fixed effects. Only if the reform were to change unobservable patient characteristics differentially across the treatment and comparison groups would there be any potential bias. Second, as previously mentioned, patients and insurers lacked information on hospital quality, including readmission rates for hip replacements, before and after the reform. There was limited scope for selection on quality. Third, in contrast to the UK healthcare market reforms that have been the subject of many previous studies[194], price liberalization in the Netherlands did not change opportunities for patient choice. Patients and health insurers had free choice of provider before and after the reform. In addition to these conceptual arguments, the comparisons of patient characteristics in table 3.1 give empirical grounds to believe that identification is unlikely to be invalidated by endogenous patient selection. None of the observable indicators of case mix changed differently in the treatment group than in the comparison group. In fact, there was very little change at all in these characteristics. If observables changed little and, if at all, comparably, there is little reason to believe that unobservables changed markedly differentially across the groups.

Hospital initiated selection of patients is potentially of greater concern in the context of this study. Price liberalization could potentially give hospitals operating in competitive markets the incentive to drive down costs and simultaneously cherry pick more straightforward cases so that tighter budgets would not impinge on quality. However, because we identify from comparison across hospitals categorized by broad ranges of HHI, any cherry picking could bias our results only if it resulted in patients being shunted long distances. More likely is that a hospital would refer a patient who is at greater risk of readmission to a neighboring hospital, which is likely to be in the same treatment or comparison group. So, while the case mix of individual hospitals may change due to patient selection in response to the reform, it is rather unlikely that this would change the composition of the groups. The comparisons of observable patient characteristics given in table 3.1 again support this.

194 These studies either use rich data or intruments to deal with time varying patient selection. Skellern (2017) controls for risk-adjusted Patient Reported Outcome Measures (PROMs), while Gaynor et al. (2013); Cooper et al. (2011) and Moscelli et al. (2016) instrument hospital choice using GP/patient-hospital distances. Cooper et al. (2011) do not reject exogeneity of market structure and Moscelli et al. (2016) find that instrumenting has very little impact on the estimates, relative to controlling for a rich set of patient covariates.

TABLE 3.1 – Means of covariates by period and treatment group

Patients' characteristics		Treatment group (HHI < 2500)	Comparison group (HHI > 2500)	Difference (-in-differences)
Proportion female	*Pre-reform (2003-04)*	0.72	0.69	0.03***
		[0.05]	[0.05]	(0.01)
	Post-reform (2006-07)	0.69	0.67	
		[0.06]	[0.06]	
	Change	0.03***	0.01	-0.01
		(0.01)	(0.01)	(0.01)
Mean age	*Pre-reform (2003-04)*	70.97	69.96	1.01***
		[2.42]	[2.22]	(0.37)
	Post-reform (2006-07)	70.98	70.26	
		[2.69]	[1.84]	
	Change	-0.01	-0.31	-0.29
		(0.45)	(0.35)	(0.57)
Mean socioeconomic score	*Pre-reform (2003-04)*	7.46	6.88	0.58***
		[0.48]	[0.52]	(0.08)
	Post-reform (2006-07)	7.48	6.92	
		[0.49]	[0.55]	
	Change	-0.01	-0.04	-0.03
		(0.08)	(0.09)	(0.12)
Mean Charlson Score (comorbidity)	*Pre-reform (2003-04)*	0.0024	0.0015	0.0009
		[0.0089]	[0.0045]	(0.0011)
	Post-reform (2006-07)	0.0018	0.0008	
		[0.0048]	[0.0022]	
	Change	0.0006	0.0007	0.00
		(0.0012)	(0.0006)	(0.00)
Proportion discharged to skilled nursing facility	*Pre-reform (2003-04)*	0.08	0.05	0.03***
		[0.10]	[0.06]	(0.01)
	Post-reform (2006-07)	0.08	0.05	
		[0.13]	[0.01]	
	Change	-0.00	-0.00	-0.00
		(0.02)	(0.01)	(0.02)
Number of hospitals		72	72	72
Number of patients		25,197	30,281	55,478

Notes: Pre-/post-reform cell entries are obtained by first computing the mean across all non-acute hip replacement patients discharged from each hospital and then taking the simple average of these means across all hospitals within a group and period. Figures in square brackets are standard deviations across hospitals. Figures in parentheses are standard errors of the estimated change in the mean. Hospitals and patients are selected using the criteria described in section 3.4.2. The socioeconomic score is increasing in socioeconomic status and ranges from 0 to 10. The Charlson score (Quan et al. 2011) ranges from 0 to 9, with higher being more severe.
*** Significant at the 1 percent level.

3.6 Results

3.6.1 Main estimates

Prior to the reform, there was no significant difference in either the 90-day or the 30-day readmission rate between the treatment (high competitive pressure) group and the comparison (low competitive pressure) group (table 3.2). Post reform, the 90-day readmission rate remained constant in the treatment and comparison group, whereas the 30-day readmission rate increased (10% significance) in the comparison group. Consequently, the simple difference-in-differences is negative, which would indicate that increased competition led to lower readmission rates (i.e., higher clinical quality), but it is not significantly different from zero.

TABLE 3.2 – Unplanned 90-day and 30-day hip replacement readmission rates by period and treatment group

Outcome		Treatment group (HHI < 2500) (1)	Comparison group (HHI > 2500) (2)	Difference (-in-difference) (1)-(2)
90-day readmission rate	*Pre-reform*	0.0825	0.0788	0.0037
		(0.0037)	(0.0027)	(0.0045)
	Post-reform	0.0814	0.0855	
		(0.0041)	(0.0032)	
	Change (Post – Pre)	-0.0011	0.0067	-0.0077
		(0.0055)	(0.0042)	(0.0069)
30-day readmission rate	*Pre-reform*	0.0480	0.0434	0.0046
		(0.0027)	(0.0020)	(0.0034)
	Post-reform	0.0492	0.0486	
		(0.0031)	(0.0022)	
	Change (Post – Pre)	0.0012	0.0052*	-0.0040
		(0.0041)	(0.0030)	(0.0051)
Number of hospitals		36	36	72
Number of patients		25,197	30,281	55,478

Notes: Table gives the simple mean readmission rate averaged over all hospitals in the treatment (HHI<2500) group and the comparison (HHI>2500) group. Robust standard errors in parentheses. Hospitals and patients selected by criteria described in section 3.4.2.
* Significant at the 10 percent level.

The conditional difference-in-differences (DID) estimate given in the first column of the top panel of table 3.3 is essentially the same as the simple DID estimate in magnitude and lack of significance. The similarity provides a further indication that there is likely to be little bias from correlated time varying unobservables. These results suggest there was no effect of greater exposure to price competition on 90-day readmission rates. Consistent with what was observed in figure 3.1, the conditional DID estimates in the first column of the second panel of table 3.3 suggest that increased price competition reduced the 90-day readmission rate by 1 percentage point in the first year (2006) after the reform but had no effect in the second year (2007). As is apparent from figure 3.1, the significant effect in 2006 is driven by a fall in the readmission rate of the hospitals exposed most to competition while the readmission rate of hospitals that are dominant in their markets did not change.

TABLE 3.3 – Estimated effects of price competition on readmission rates after hip replacement

		90-day readmission (radius 30)	90-day readmission (radius 20)	90-day readmission (radius 40)	90-day readmission (radius 50)	30-day readmission (radius 30)
Model (3.1)						
	$\hat{\delta}$	-0.0095	-0.0041	-0.0094	-0.0084	-0.0042
		(0.0066)	(0.0067)	(0.0061)	(0.0075)	(0.0048)
	R^2	0.55	0.58	0.58	0.58	0.55
Model (3.2)						
	$\hat{\delta}_6$(2006)	-0.0189**	-0.0114	-0.0170**	-0.0179**	-0.0084
		(0.0074)	(0.0079)	(0.0076)	(0.0091)	(0.0056)
	$\hat{\delta}_7$(2007)	-0.0000	0.0040	-0.0011	0.0024	0.0001
		(0.0082)	(0.0083)	(0.0071)	(0.0085)	(0.0059)
	R^2	0.56	0.59	0.58	0.59	0.55
N treatment hospitals		36	19	44	52	36
N comparison hospitals		36	44	20	12	36
N hospitals×years		287	247	249	245	287
N patients		55,478	46,823	45,472	46,696	55,478
N readmitted patients		5,706	4,788	4,705	4,787	1,290

Notes: Top panel gives OLS estimates of δ from regression (3.1). Second panel gives OLS estimates of δ_6 and δ_7 from regression (3.2). All estimates obtained from regressions containing hospital and year fixed effects and covariates identified in table 3.1. Full estimates in appendix 3.3 tables 3.2 and 3.3. Robust standard errors in parentheses. Hospitals and patients selected by criteria described in section 3.4.2. Radius X indicates that the estimates are based on treatment/comparison groups formed on the basis of a HHI calculated with a radius of X km defining the boundary of a market. The sample size falls as the radius is reduced because more hospitals cross the HHI threshold of 2500 used to define the treatment/comparison groups during the estimation period.
** Significant at the 5 percent level.

3.6.2 Robustness

Market definition

The main estimates are generated on the basis of HHIs calculated with a radius of 30km used to define the boundary of the market around a hospital. To check robustness, we recalculate the HHI using a radius of 20, 40 and 50km to define a market, recategorize hospitals into the treatment and comparisons groups on the basis of the revised index and then re-estimate models (3.1) and (3.2) in each case. Estimates are given in the appropriately labelled columns of table 3.3. With a radius of 30km, hospitals are evenly split between the treatment and comparison groups. As the radius is widened, more hospitals get put into the treatment group because the HHI decreases as the area that defines the market increases.

Irrespective of the radius used, the treatment effect averaged over the two years of the post-reform period is insignificant. When the radius is increased, the year specific estimates obtained from model (2.3) continue to indicate that exposure to more intensive price competition significantly reduced the readmission rate by a similar magnitude in 2006. When the radius is reduced, the estimate of this effect falls in magnitude and loses significance. This may be because more hospitals are then in the comparison group. At least some of the hospitals that have a HHI below 2500 using a 30km radius but above 2500 with a radius of 20km may, in reality, be exposed to competitive pressure and so respond to the price liberalization similarly to those that remain in the treatment group irrespective of the radius used. This will reduce the DID between the groups. There is no significant effect in 2007 irrespective of the geographic radius used to define the market. In general, irrespective of the radius used to define a hospital market, there is no clear evidence that increased price competition consistently impacted on the readmission rate.

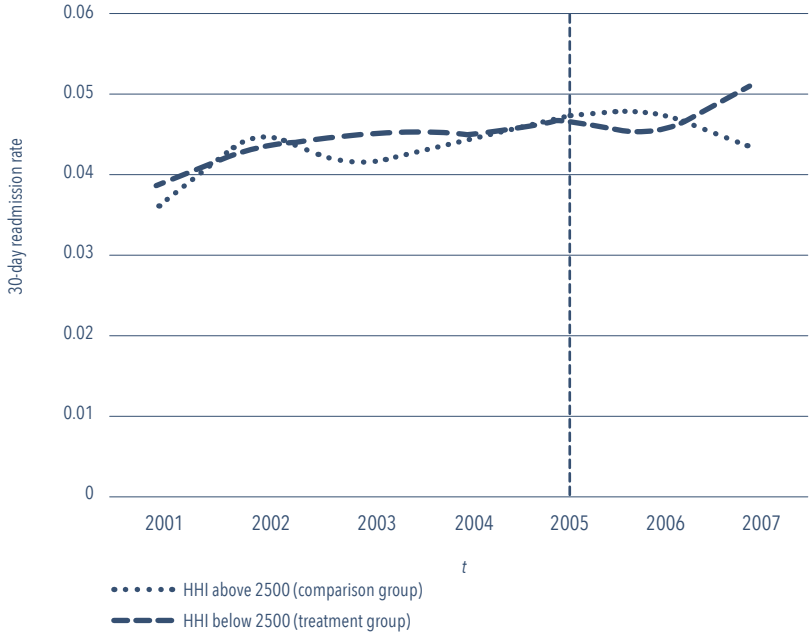
30-day readmission rate

Since arguments and evidence supporting the 90-day readmission rate as a better indicator of quality of care than the 30-day rate are lacking, we check robustness to using the shorter period. Pre-reform trends in 30-day readmission rates are reasonably parallel between the treatment and comparison groups, although there is a slight dip for the comparison group only in 2003 (see figure 3.2). The hypothesis that year effects in the 30-day readmission rate are equal for the treatment and comparison group hospitals in the

pre-treatment period is not rejected (appendix 3.3, table 3.1; column (ii)), which lends plausibility to the parallel trends identification assumption for this outcome also.

FIGURE 3.2 – 30-day readmission rate after hip replacement per year & per HHI group (radius 30 km)

Notes: The vertical dashed line indicates the event.



The final column of table 3.3 reveals that estimated effects on the 30-day readmission rate are generally smaller in magnitude than those on the 90-day rate. Over the full post-reform period, there continues to be no evidence that exposure to increased price competition consistently affected quality of care.

3.7 Conclusion

This is the first paper to credibly identify the effect of price competition on the quality of elective healthcare. When producers are free to compete on both price and quality, demand is potentially sensitive to both. However, when information on the latter is lacking or poor, organizations may increase profits by cutting both price and quality. This logic is one of the reasons why regulators have been leery of permitting price competition in healthcare markets. But in most countries, including

the Netherlands, hospitals are not-for-profit organizations that may not be prepared to grasp a competitive advantage obtainable by cutting prices if this requires skimping on quality. Our findings are consistent with this behavior, although they certainly do not confirm it. Freedom to negotiate prices for a number of elective procedures did not result in lower quality care measured by readmission rates after hip replacements in the hospitals in the most competitive markets.

In the absence of meaningful quality information, even in a market dominated by not-for-profit organizations, one would expect contract negotiations between insurers and hospitals to focus on price. This focus may result in a (unintended) deterioration of quality. We find that exposure to increased price competition initially had a positive impact on quality. The hip replacement readmission rate fell in the most competitive hospital markets in the first year in which prices were liberalized. This may result from one side of the market's (hospital administrators') initial misapprehension of how the other side (insurers) would behave in the new contacting arrangements. For the first time, hospitals and insurers were negotiating contracts for hospital products (DRG equivalents) rather than agreeing on prospective budgets and related parameters, like hospital days. Hospitals may have understood that the insurers would be sensitive to both price and the quality of the products. Hospitals in more competitive markets might have been afraid that they would lose out if they did not improve their quality, as well as keeping prices down. When hospitals came to realize that bargaining primarily focused on price and not on quality, they may have decided to scale down initial quality improvement efforts. Of course, this is no more than supposition. It would have been interesting to extend the post-reform period of analysis to check whether, over time, a negative impact on quality did emerge. Unfortunately, this is not possible because of later reforms of the healthcare market that would confound identification of the effect of the 2005 reform (see footnote 192).

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Dutch Classification of Procedures in Medicine procedure codes that indicate partial or full hip replacement:
58150; 58160; 58161; 58162; 58163; 58164; 581520; 581523; 581521; 581522; 581524; 581525; 581651.

ICD-9CM diagnosis codes that indicate osteoarthrosis of the pelvic region or thigh:
71500; 71509; 71510; 71518; 71520; 71525; 71528; 71530; 71535; 71538; 71580; 71589; 71590; 71595; 71598; 71650; 71655; 71658; 71659; 71660; 71665; 71668; 71690; 71695; 71698; 71699.

ICD-9CM diagnosis codes that indicate hip fractures:
82000; 82001; 82002; 82003; 82009; 82010; 82011; 82012; 82013; 82019; 82020; 82021; 82022; 82030; 82031; 82032; 8202; 8209

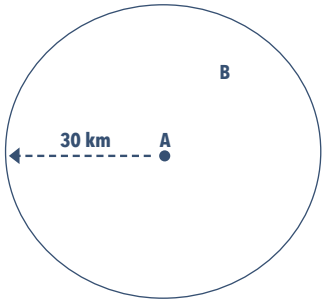
ICD-9CM diagnosis codes that indicate pregnancy, childbirth and puerperium: 630; 631; 632; 6331; 6339; 634; 635; 636; 637; 638; 639; 640; 6400; 64003; 641; 6410; 6411; 6412; 6419; 642; 6420; 6431; 6439; 644; 6441; 6442; 645; 6451; 6452; 646; 6460; 6461; 6462; 6463; 6464; 6465; 6466; 6467; 647; 6470; 6471; 6472; 6473; 6474; 6475; 6476; 648; 6480; 6481; 6482; 6483; 6484; 6485; 6486; 6487; 6488; 64883; 6489; 649; 6490; 6491; 6492; 6493; 6494; 6495; 6496; 6497; 650; 651; 6510; 6511; 652; 653; 654; 655; 65573; 656; 6560; 65611; 65631; 65653; 65661; 657; 658; 6580; 65803; 6581; 6588; 659; 6591; 6598; 660; 66001; 66011; 66041; 66061; 661; 6611; 6610; 6613; 662; 6621; 663; 6631; 6633; 664; 66404; 66414; 66434; 665; 6653; 666; 66604; 66614; 667; 668; 66951; 66970; 6699; 670; 67004; 671; 67144; 672; 673; 674; 675; 67514; 67594; 676; 67624; 678; 6780; 6781; 67902

In the Netherlands, some hospitals have multiple locations. We improve on previous research by using the hospital site-specific locations rather than the hospital's main location. Because not all treatment locations are within the same market if defined by the kilometers range, we can distinguish five different scenarios: (i) Hospital A has only one location; (ii) Hospital A1 has another treatment location (hospital A2) that lies within hospital A1's radius; (iii) Hospital A1 has another treatment location (hospital A2) that does not lie within hospital A1's radius; (iv) The competitor of hospital A (hospital B1) has multiple treatment locations (hospital B2) that do not lie within hospital A's radius and (v) The competitor of hospital A (hospital B1) has multiple treatment locations (hospital B2) that lie within hospital A's radius. Example calculations of the HHI in each scenario are given below.

SCENARIO I – HHI for hospital A with one location using 30 kilometer radius

Hospital	# of beds	m_h	m_h^2	HHI
A	100	33.33	1111.11	
B	200	66.67	4444.44	
Total	**300**	**100.00**	**5555.56**	**5555.56**

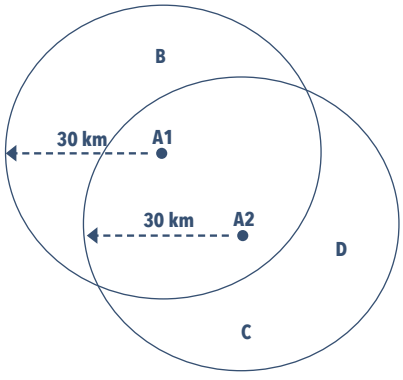
Notes: m_h is calculated by dividing the number of beds per hospital by the total number of beds in the market.



SCENARIO II – HHI for hospital A with two locations using 30 kilometer radius

Hospital	# of beds	m_h	m_h^2	HHI
A1 A2	100 50			
A	150	17.65	311.42	
B	200	23.53	553.63	
C	200	23.53	553.63	
D	300	35.29	1245.67	
Total	**850**	**100.00**	**2664.35**	**2664.35**

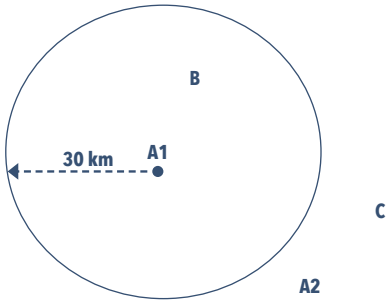
Notes: m_h is calculated by dividing the number of beds per hospital by the total number of beds in the market.



SCENARIO III – HHI for hopsital A with two locations (one not within the other's radius) using 30 kilometer radius

Hospital	# of beds	m_h	m_h^2	HHI
A1	100	33.33	1111.11	
B	200	66.67	4444.44	
Total	**300**	**100.00**	**5555.56**	**5555.56**

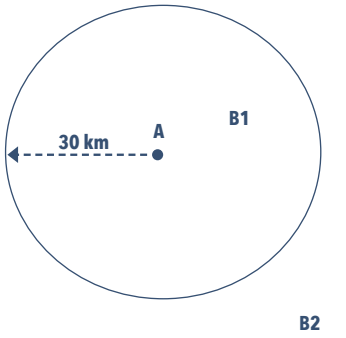
Notes: m_h is calculated by dividing the number of beds per hospital by the total number of beds in the market.



SCENARIO IV – HHI for hospital A using 30 kilometer radius. Competitor (hospital B) has two locations which are not both within hospital A's radius

Hospital	# of beds	m_h	m_h^2	HHI
A	100	33.33	1111.11	
B1	200	66.67	4444.44	
Total	**300**	**100.00**	**5555.56**	**5555.56**

Notes: m_h is calculated by dividing the number of beds per hospital by the total number of beds in the market.



SCENARIO V – HHI for hospital A using 30 kilometer radius. Competitor (hospital B) has two locations which are both within hospital A's radius

Hospital	# of beds	m_h	m_h^2	HHI
A	100	25	625	
B1	200			
B2	100			
B	300	75	5625	
Total	**400**	**100.00**	**6250**	**6250**

Notes: m_h is calculated by dividing the number of beds per hospital by the total number of beds in the market.

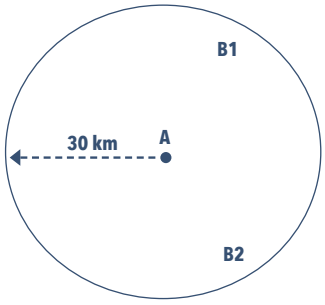


Table 3.1 – Estimated effects of price competition on readmission rates after hip replacement (pre-reform period)

Radius	90-day readmission rates after hip replacement (radius 30)	30-day readmission rates after hip replacement (radius 30)
YEAR01	-0.0073	-0.0053
	(0.0050)	(0.0042)
YEAR02	0.0004	0.0043
	(0.0055)	(0.0044)
YEAR03	-0.0004	-0.0007
	(0.0050)	(0.0038)
YEAR04 (reference category)	-	-
$\hat{\delta}_1$ (2001)	-0.0027	-0.0025
	(0.0084)	(0.0069)
$\hat{\delta}_2$ (2002)	-0.0110	-0.0087
	(0.0084)	(0.0068)
$\hat{\delta}_3$ (2003)	-0.0060	-0.0029
	(0.0084)	(0.0065)
Proportion female	0.0241	-0.0470
	(0.0526)	(0.0356)
Proportion age category 18-39 (reference category)	-	-
Proportion age category 40-64	-0.0484	-0.0560
	(0.1461)	(0.1142)
Proportion age category 65 and older	-0.0804	-0.0603
	(0.1389)	(0.1076)
Proportion SES score 0-5 (reference category)	-	-
Proportion SES score 6-8	0.0334	0.0335
	(0.0571)	(0.0497)
Proportion SES score 8-10	0.0548	0.0285
	(0.1075)	(0.0815)
Proportion discharged to skilled nursing facility	0.0827	0.0691
	(0.0412)	(0.0300)
(intercept)	0.0984	0.1045
	(0.1411)	(0.1122)
N treatment hospitals	41	41
N comparison hospitals	40	40
N hospitals×years	323	323
N patients	57,648	57,648
N readmitted patients	4,380	2,483
R^2	0.63	0.60

Notes: OLS estimates of $\hat{\delta}_1$, $\hat{\delta}_2$ and $\hat{\delta}_3$ (pre-treatment years) containing hospital and year fxed effects and covariates. All estimates from regressions containing hospital and year fixed effects and covariates identified in table 3.1. Charlson Score not included in this analysis as our dataset does not include information on comorbidities before 2001. Robust standard errors in parentheses. Hospitals and patients selected by criteria described in section 3.4.2. H_0: $\beta_4=\beta_5=\beta_6=0$ ($F_{3,212}=0.62$; *p*-value>0.6035 for the 90-day readmission rates and $F_{3,212}=0.62$; *p*-value>0.6007 for the 30-day readmission rates)

Table 3.2 – Estimated effects of price competition on readmission rates after hip replacement

Radius	90-day readmission rates after hip replacement (radius 30)	90-day readmission rates after hip replacement (radius 20)	90-day readmission rates after hip replacement (radius 40)	90-day readmission rates after hip replacement (radius 50)	30-day readmission rates after hip replacement (radius 30)
YEAR03	-0.0043	-0.0053	-0.0056	-0.0054	-0.0032
	(0.0038)	(0.0044)	(0.0046)	(0.0046)	(0.0031)
YEAR04 (reference category)	-	-	-	-	-
YEAR06	0.0050	0.0014	0.0063	0.0059	0.0034
	(0.0048)	(0.0048)	(0.0055)	(0.0072)	(0.0035)
YEAR07	0.0041	0.0047	0.0098*	0.0105	0.0009
	(0.0048)	(0.0050)	(0.0054)	(0.0073)	(0.0034)
δ	-0.0095	-0.0041	-0.0094	-0.0084	-0.0042
	(0.0066)	(0.0067)	(0.0061)	(0.0075)	(0.0048)
Proportion female	-0.0579	-0.0200	-0.0193	-0.0170	-0.0571*
	(0.0466)	(0.0468)	(0.0468)	(0.0480)	(0.0292)
Proportion age category 18-39 (reference category)	-	-	-	-	-
Proportion age category 40-64	-0.2404	-0.3268*	-0.1690	-0.1805	-0.2715
	(0.2159)	(0.1940)*	(0.1965)	(0.2014)	(0.1679)
Proportion age category 65 and older	-0.2397	-0.3346	-0.1730	-0.1911	-0.2433
	(0.2238)	(0.2013)	(0.2031)	(0.2097)	(0.1725)
Proportion SES score 0-5 (reference category)	-	-	-	-	-
Proportion SES score 6-8	-0.0440	-0.0684	-0.0662	-0.0485	-0.0579
	(0.0887)	(0.0692)	(0.0714)	(0.0754)	(0.0644)
Proportion SES score 8-10	0.0529	0.0661	0.0563	0.0682	0.0244
	(0.1271)	(0.1112)	(0.1143)	(0.1181)	(0.0963)
Charlson Score	-0.3242	-0.0292	0.1794	0.1103	-0.7032**
	(0.5515)	(0.4085)	(0.4603)	(0.4758)	(0.3197)
Proportion discharged to skilled nursing facility	-0.0113	-0.0262	-0.0333	-0.0272	0.0133
	(0.0327)	(0.0315)	(0.0307)	(0.0319)	(0.0203)
(intercept)	0.3943	0.4809**	0.3209	-0.3198	0.3826**
	(0.2395)	(0.2062)	(0.2095)	(0.2179)	(0.1878)
N treatment hospitals	36	19	44	52	36
N comparison hospitals	36	44	20	12	36
N hospitals×years	287	247	249	245	287
N patients	55,478	46,823	45,472	46,696	55,478
N readmitted patients	5,706	4,788	4,705	4,787	1,290
R_2	0.55	0.58	0.58	0.58	0.55

Notes: OLS estimates of δ from regression (3.1). All estimates from regressions containing hospital and year fixed effects and covariates identified in table 3.1. Robust standard errors in parentheses. Hospitals and patients selected by criteria described in section 3.4.2. Radius X indicates that the estimates are based on treatment/comparison groups formed on the basis of a HHI calculated with a radius of X km defining the boundary of a market.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 3.3 – Estimated effects of price competition on readmission rates after hip replacement (post-reform period differentiated)

Radius	90-day readmission rates after hip replacement (radius 30)	90-day readmission rates after hip replacement (radius 20)	90-day readmission rates after hip replacement (radius 40)	90-day readmission rates after hip replacement (radius 50)	30-day readmission rates after hip replacement (radius 30)
YEAR03	-0.0042	-0.0052	-0.0055	-0.0053	-0.0032
	(0.0038)	(0.0044)	(0.0046)	(0.0047)	(0.0031)
YEAR04 (reference category)	-	-	-	-	-
YEAR06	0.0096*	0.0036	0.0115*	0.0138*	0.0055
	(0.0051)	(0.0050)	(0.0063)	(0.0083)	(0.0037)
YEAR07	- 0.0005	0.0025	0.0043	0.0022	-0.0019
	(0.0049)	(0.0051)	(0.0054)	(0.0076)	(0.0035)
$\hat{\delta}_6$(2006)	-0.0189**	-0.0114	-0.0170**	-0.0179**	-0.0084
	(0.0074)	(0.0079)	(0.0076)	(0.0091)	(0.0056)
$\hat{\delta}_7$ (2007)	-0.0000	0.0040	-0.0011	0.0024	0.0001
	(0.0082)	(0.0083)	(0.0071)	(0.0085)	(0.0059)
Proportion female	-0.0607	-0.0192	-0.0197	-0.0099	-0.0584**
	(0.0457)	(0.0459)	(0.0459)	(0.0471)	(0.0289)
Proportion age category 18-39 (reference category)	-	-	-	-	-
Proportion age category 40-64	-0.2309	-0.3059*	-0.1601	-0.1641	-0.2672
	(0.2122)	(0.1827)	(0.1958)	(0.2004)	(0.1678)
Proportion age category 65 and older	-0.2266	-0.3179*	-0.1618	-0.1771	-0.2374
	(0.2195)	(0.1897)	(0.2020)	(0.2085)	(0.1719)
Proportion SES score 0-5 (reference category)	-	-	-	-	-
Proportion SES score 6-8	-0.0349	-0.0672	-0.0593	-0.0323	-0.0538
	(0.0905)	(0.0668)	(0.0722)	(0.0773)	(0.0644)
Proportion SES score 8-10	0.05449	0.0551	0.0535	0.0797	0.0251
	(0.1254)	(0.1077)	(0.1144)	(0.1178)	(0.0959)
Charlson Score	-0.3042	0.0158	0.2117	0.1544	-0.6942**
	(0.5579)	(0.3855)	(0.4489)	(0.4686)	(0.3207)
Proportion discharged to skilled nursing facility	-0.0090	-0.0256	-0.0315	-0.0272	0.0143
	(0.0345)	(0.0340)	(0.0320)	(0.0325)	(0.0204)
(intercept)	0.3764	0.4622**	0.3050	0.2857	0.3745
	(0.2346)	(0.1937)	(0.2085)	(0.2164)	(0.1863)
N treatment hospitals	36	19	44	52	36
N comparison hospitals	36	44	20	12	36
N hospitals×years	287	247	249	245	287
N patients	55,478	46,823	45,472	46,696	55,478
N readmitted patients	5,706	4,788	4,705	4,787	1,290
R^2	0.56	0.59	0.58	0.59	0.55

Notes: OLS estimates of $\hat{\delta}_6$ and $\hat{\delta}_7$ from regression (3.2). All estimates from regressions containing hospital and year fixed effects and covariates identified in table 3.1. Robust standard errors in parentheses. Hospitals and patients selected by criteria described in section 3.4.2. Radius X indicates that the estimates are based on treatment/comparison groups formed on the basis of a HHI calculated with a radius of X km defining the boundary of a market.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

CHAPTER 4

Price Effects of a Hospital Merger: Heterogeneity across Health Insurers, Hospital Products and Hospital Locations

With Ramsis R. Croes, Victoria Shestalova, Marco Varkevisser and Frederik T. Schut

Abstract

In most studies on hospital merger effects, the unit of observation is the merged hospital, whereas the observed price is the weighted average across hospital products and across payers. However, little is known about whether price effects vary between hospital locations, products and payers. We expand existing bargaining models to allow for heterogeneous price effects and use a difference-in-differences model in which price changes at the merging hospitals are compared to price changes at comparison hospitals. We find evidence of heterogeneous price effects across health insurers, hospital products and hospital locations. These findings have implications for *ex ante* merger scrutiny.

4.1 Introduction

An increasing number of empirical studies have been conducted concerning the price effects of hospital mergers. In general, the aim of these studies is to test the effectiveness of antitrust policy. In competitive markets, the aim of preventive merger control is to prohibit anticompetitive consolidation. To determine whether a merger between two or more firms will result in anticompetitive price increases and/or quality decreases, antitrust authorities need to carry out a prospective review of the merger. However, merger reviews in the healthcare sector encounter specific difficulties because there are unique factors that render the most commonly used tests for measuring geographic markets less reliable in healthcare than in other sectors (Elzinga & Swisher, 2011). Retrospective studies are aimed at providing a better understanding of the effects of mergers, which, in turn may improve future antitrust policy.

The majority of the studies on retrospective merger analyses indicate a positive correlation between hospital mergers and prices (see e.g., Gaynor & Town, 2012; Vogt & Town, 2006; Gaynor & Vogt, 2000 for reviews). In most of these studies, the unit of observation is the merged hospital, whereas the observed price is the weighted average across different hospital products and across different payers. However, little is known about whether price effects vary between different hospital locations, different products and different payers. Because merged hospitals often continue to operate at different locations, produce multiple products and negotiate prices with a range of payers, an interesting question is whether these differences matter. If it turns out that they do matter, this may have important implications for *ex ante* merger scrutiny by antitrust authorities.

This article considers the question of whether the price effects of a hospital merger vary between locations, products and third-party payers (i.e., health insurers). By means of a hospital-insurer bargaining model, we show that the price effects of a hospital merger may vary and that the differences between locations, products and insurers may influence the outcome of hospital-insurer price setting differently. We show that the price effects differ between locations, products and insurers depending on: (i) the degree of substitution between the merging hospitals for

different products, (ii) the relative bargaining ability of hospitals and insurers and (iii) the pre-merger price-cost margins. We then use a unique national dataset on hospital-insurer negotiated contract prices for each hospital product in the Netherlands to investigate whether the price effects of a merger between a general acute care hospital (henceforth hospital M1) and a neighboring general acute care hospital that also provides tertiary hospital care (henceforth hospital M2) vary between different hospital locations, different products and different insurers. The merger that we study was consummated in the Netherlands in year t[195].

Our article relates to two literatures. First, we build on the literature that structurally estimates multilateral bargaining models of healthcare competition. In general, these models contribute to our understanding of price setting mechanisms in the healthcare industry. This is relevant because standard oligopoly models are not applicable to the hospital industry (Gaynor et al., 2015). Because the current Dutch healthcare system bears evident similarities with the US healthcare system, we are able to build on the models that were developed for the US health market by Gaynor and Town (2012) (hereafter: GT) and Gowrisankaran et al. (2015) (hereafter: GNT). Following these models, we describe a bargaining model in which hospital-product prices are bilaterally negotiated between insurers and hospitals. We show how hospital-insurer negotiations translate into product prices, and by adapting the GT and GNT models for hospital mergers we show that the price effect of a merger between two hospitals may be heterogeneous depending on the degree of substitution between hospitals, the relative bargaining ability of hospitals and insurers and the pre-merger price-cost margins of different products at both merging hospitals. The most important contribution of this article to hospital-insurer bargaining models is that we, unlike GT and GNT, endogenize the product price ratio. That is, the models by GT and the GNT both assume that hospitals and health insurers bargain over a single base price per hospital, holding product-price ratios of each hospital fixed. This means that in both benchmark models each hospital entering a network always provides all treatments. Our model, in contrast, allows for the situation in which a hospital may be contracted only for a subset of treatments. In section 4.2, we explain that this assumption better matches current practice where contracts between hospitals and insurers can be concluded for a subset of treatments.

195 For reasons of confidentiality, we only report those results that are of direct interest to this article. We anonymize the names of the merged hospitals, rival hospitals and insurers. For the same reason, the merger year is reported as t (which was between 2005 and 2012), with the year preceding the merger as t-1 and the year following the merger as t+1.

Second, we build on the literature on retrospective analyses of hospital mergers. Since the 1980s, hospital sectors in many OECD countries have become increasingly concentrated as a result of mergers (Gaynor and Town, 2012). Merger activity has fueled a public and scientific debate about the consequences of mergers and the desirability of further concentration of healthcare sectors. An increasing number of empirical studies have been conducted concerning the price effects of hospital mergers. Most of these studies have shown that although mergers may bring about meaningful reductions in marginal costs and therefore improve welfare overall, mergers between rival hospitals are likely to raise the price of inpatient care in concentrated markets (Gaynor and Town, 2012). We build on these studies, but disaggregate the merger price effect and show that the price effects of a merger between two hospitals may differ between locations, providers and products. With that, we contribute to a better understanding of the effects of mergers, which, in turn may also improve future antitrust policy.

This article is structured as follows. We start with the bargaining model. We then discuss the applicability of this model to the Dutch hospital market (section 4.3) and describe the merger that we study (section 4.4). The next sections concern the empirical model (section 4.5) and the data (section 4.6). In section 4.7 we present the results and section 4.8 discusses the policy implications. Finally, our main findings are summarized in section 4.9.

4.2. The model

To explain the possibility of heterogeneous price effects of hospital mergers we consider a game-theoretical model of hospital-insurer bargaining, following the lines suggested by Gaynor and Town (2012) (GT) and Gowrisankaran et al. (2015) (GNT). These papers build on earlier literature analyzing hospital-insurer bargaining, notably Gal-Or (1997); Town and Vistnes (2001); Capps et al. (2003) and Gaynor and Vogt (2003).

To keep our model as simple as possible, we adopt a two-stage set-up following the base model of GNT. In the first stage of this model, health insurers[196] bargain and contract with hospitals on behalf of their insured and in the second stage, each consumer

196 GNT use the term managed care organization or MCO if they refer to insurers that use provider networks and negotiate prices with providers. We refer to similar organizations, but use the term 'health insurer' instead as this is the more commonly used term in the Netherlands.

receives a health draw and seeks treatment at the hospital that maximizes his utility. Because the consumer commits to a restricted network of hospitals when he buys health insurance, he has the option of visiting any of the contracted hospitals when he is in need of specific care.

Like in the models by GT and GNT, we simplify some elements of the bargaining game: we condition on the network of the insurer[197] and do not allow consumers to switch insurers in response to a network change. Following GT and GNT, the bargaining solution used in this article is based on the framework that was developed by Horn and Wolinsky (1988). While not imposing a complete non-cooperative structure, this framework nests a non-cooperative Nash equilibrium within a cooperative game theoretical concept of a Nash bargaining solution.

To be able to explain heterogeneous price effects over products, we need to allow for flexibility in the price ratios between different products of the same hospital. Both the GT and the GNT models consider heterogeneous insurers, hospital locations and hospital products. However, they fix all the product-price ratios at the level of the respective disease-weight ratios. In their models, the hospitals are constrained to negotiate a single base price per hospital location and the prices for different products are computed as a product of the base price and the disease weight[198]. Our model deviates from this assumption by freeing the product-price ratios. While in both benchmark models each hospital that enters a network always provides all treatments, our model allows for the situation in which a hospital may be contracted only for a subset of treatments. This also better matches practice where contracts between hospitals and insurers can be concluded for a subset of treatments. For example, in the US, we observe cases in which hospitals shifted resources and activities to central profitable services, while reducing or eliminating some loss making services (i.e., the so-called specialty service lines) (Berenson et al., 2006). This is in line with the anticipated strategy change towards integrated care delivery systems (Porter, 2009). Furthermore, there is an increase in the use of bundled payments, global payments or alternative quality contracts by health insurers (e.g., Chernew et al. 2011; Delbanco, 2014; Song et al. 2014). In these settings, a single payment covers the services that providers deliver to treat a given condition or provide a given treatment. Hence, in these cases, a price has to be determined for each bundle. Also in the Netherlands, which data we use when estimating the model

197 There is some work on network formation games, with Ho (2009) being the most notable. Ho (2009) estimates the parameters of managed care organizations' (MCO) choices of provider network focusing on the role of different networks on downstream MCO competition (Gowrisankaran et al., 2015). Like GT and GNT, we treat the insurers' network structure as given.

198 Each year, the Center for Medicare Services publishes DRG weights. The DRG weights measure the mean resource usage by diagnosis. In the model, they reflect the resource intensity of treatment. Using the DRG weights with a base price does not allow for heterogeneous price effects of mergers.

parameters, hospitals may be contracted only for a subset of services. Interviews with health insurers and hospital representatives who were involved in contractual negotiations during our study period indicated that especially for high-revenue products insurers and hospitals bargain separate prices. In the Netherlands, it is usually the insurers that initiate selective contracting of procedures. Dutch health insurers have imposed rules on contracting certain types of operations. For example, one insurer selectively contracts providers of breast cancer surgeries (CZ, 2015), whereas another selectively contracts 15 hospital products (VGZ, 2014). As a result of selective contracting or hospitals' choices, in practice, the full hospital or a subset of procedures in a hospital may be contracted.

199 Please note that *d* can also be a cluster of products.

4.2.1 Model set-up

Following GT and GNT, we analyze hospital-insurer bargaining in a model with multiple hospitals and health insurers. For ease of comparison, we follow the model notation by GNT. In this model, there is a set of hospitals that is indexed by $j = 1, \ldots, J$; and a set of health insurance companies indexed by $m = 1, \ldots, M$. Each consumer buys insurance at a particular health insurer and hence the set of enrollees for a particular health insurer is indexed by $i = 1, \ldots, I$. With probability f_{id} enrollees may be stricken by illness $d \in \{0, 1, \ldots, D\}$, where $d = 0$ means no illness.

In our model, we associate each illness with a hospital product[199]. Let Dj denote the list of all products of hospital j. We assume that the range of products may differ between hospitals. The set of all hospitals (each of which delivers a certain range of products) is subdivided over $S \leq J$ systems. Here J denotes the number of hospitals, and S denotes the number of hospital systems. M_s will denote the respective set of all systems. Each system $s \in M_s$ is associated with a subset in the hospital-product space of all treatment options (jd) that can be provided by this system, where index j refers to hospitals and index d to products. L_s denotes the list of treatment options (jd) with which hospital j of system s enters the hospital-insurer bargaining game. For the sake of simplicity, we consider the situation in which each system is initially represented by one hospital (i.e., $S = J$).

For any consumer i, we denote his health insurer by $m(i)$. Following the base model version of GNT, we assume that $m(i)$ is chosen via long-run employer/health insurer contracts and hence, we assume that $m(i)$ is fixed. This implies that we do not allow consumers to

switch insurers in response to a network change[200]. We also treat the network of each health insurer as given. That is, we assume that each health insurer enters the negotiations with some set of hospital systems and bargains with each of these systems over the prices of products. The network of insurer m denoted by N_m defines all hospital- product pairs available to the enrollees of insurer m. By introducing the notation N_{md} for the subset of hospitals that provide product d in network N_m, we obtain the expression:

$$N_m = \bigcup_{d \in \{1,\ldots,D\}, j \in N_{md}} (jd).$$

4.2.2 Value functions of a health insurer and a hospital system

When falling ill with illness d, the patient seeks treatment at a hospital that gives him the highest utility level. The utility function from the treatment of illness d at hospitals j is given by

$$u_{ijd} = \beta \mathbf{x}_{ijd} + e_{ij} \tag{4.1}$$

where $\mathbf{x}_{ijd}$ is a vector of hospital and patient characteristics such as travel time, hospital quality, or other characteristics, β is the associated vector of parameters and e_{ij} is an i.i.d. error term that is distributed type 1 extreme value. We assume that getting treated at a hospital does not require an out-of-pocket payment from the patient (see below). The patient with illness d may visit any of the contracted hospitals that provide this treatment in the insurer's network or an outside option. Following GNT, we assume that the outside option is treatment at a hospital located outside the market. The outside option is denoted by $j = 0$, so that the associated characteristics are normalized: $\mathbf{x}_{i0d} = 0$.

Health insurer m provides its enrollees a set of treatment options at hospitals in its network N_m, where each option $(jd) \in N_m$ listed in the insurance policy allows patients access to hospital j for treatment of disease d. Therefore, the utility function of enrollees introduced above results in the following expression for the probability that patient i with disease d chooses hospital j:

$$s_{ijd}(N_{m(i)}) = \frac{\delta_{ijd}}{\sum_{k \in \{0, N_{m(i),d}\}} \delta_{ikd}} \tag{4.2}$$

where $\delta_{ijd} = \beta \mathbf{x}_{ijd}, j \in \{0, N_{m(i),d}\}$. The notation $N_{m(i),d}$ denotes the subset of treatment options available to individual i enrolled at insurer m for treatment of illness d. Since the right hand side of equation (4.2) does not depend on prices and only includes product d, $s_{ijd}(N_{m(i)}) = s_{ijd}(N_{m(i),d})$.

200 GNT also present a modification of their base model to include the possibility that an enrollee may choose between different health insurers. In their posted premium model extension, the framework is as follows: (i) the health insurers set their network, (ii) the health insurers post their premiums simultaneously and (iii) the enrollees choose their health insurers. The bargaining process of the posted premium model is similar to the base model, except that the threat points are different. Since the results of the base model broadly align with the extended posted premium model, we follow the relatively simpler base model.

It is important to note that GT and GNT differ in their position towards copayments. GT assumes that enrollees pay a premium to their insurer, which gets them access to the provider network without any additional payments, whereas GNT considers an extension in which they also model out-of-pocket payments (i.e., the negotiated base price multiplied by the coinsurance rate and the resource intensity of the illness). The GT model without copayments is in this respect similar to the GNT model with zero coinsurance rates. Because our empirical analysis focuses on the Netherlands and in the Netherlands, coinsurance as defined by GNT in the hospital sector is nonexistent[201], we follow the approach of GT or, put differently, the approach of GNT with zero coinsurance rates. For our model this means that the utility from treatment does not depend on hospital prices and hence the resulting choice probabilities are also independent of product prices.

201 Also copayments are very limited. There is a yearly mandatory deductible that the patient pays when he starts using healthcare. However, the deductible is limited to a fixed amount. Since most hospital prices are higher than this amount, each patient receiving treatment at any hospital would generally pay the same deductible. Hence, deductibles are expected to hardly affect patient hospital choice.

The *ex ante* expected utility to patient i from network $N_{m(i)}$ is then:

$$w_i(N_{m(i)}) = \sum_{d=1}^{D} f_{id} \ln\left(\sum_{j\in\{0,N_{m(i),d}\}} \exp(\delta_{ijd})\right) \tag{4.3}$$

Aggregating over the enrollees of insurer m, we obtain:

$$W_m(N_m) = \sum_{i=1}^{I} 1\{m(i) = m\} w_i(N_m)$$

Denoting the prices that insurer m pays to hospital j for treatment d by p_{mjd}, we obtain the insurer's total cost as follows:

$$TC_m(N_m, \mathbf{p}_m) = \sum_{i=1}^{I} \sum_{d=1}^{D} 1\{m(i) = m\} f_{id} \sum_{j\in\{0,N_{md}\}} p_{mjd} s_{ijd}(N_m) \tag{4.4}$$

Following GNT, we assume that the health insurer is seeking to maximize the sum of the enrollee surplus (equal to $w_i - premium_m$ for each consumer) and the insurer's profit (equal to $premium_m - expected\ cost_m(i)$ for each consumer) over all enrollees. Under this assumption, the value function of the health insurer is the difference between the *ex ante* expected utility of all the enrollees and the total payment to the hospitals treating these enrollees:

$$V_m(N_m, \mathbf{p}_m) = W_m(N_m) - TC_m(N_m, \mathbf{p}_m) \tag{4.5}$$

Note that in GNT the health insurer acts as an agent for the employer and, thus, cares equally about both enrollee welfare and insurer profit[202]. With that, it is assumed that the incentives of health insurers and enrollees are perfectly aligned which implies that both terms in equation (4.5) will have equal weights[203].

Substituting into this expression equations (4.3) and (4.4), and rearranging the terms, we derive the same expression in terms of prices and choice probabilities. Since both expected utility and the payment to the hospital are separable in products d, the total value function of a health insurer has an additive structure over the products. This can be seen as follows:

$$
\begin{aligned}
V_m(N_m,\mathbf{p}_m) &= W_m(N_m) - TC_m(N_m,\mathbf{p}_m) \\
&= \sum_i 1\{m(i) \\
&= m\} \sum_d f_{id} \left(\ln\Big[\sum_{j\in\{0,N_{md}\}} \exp(\delta_{ijd}) \Big] \right. \\
&\left. - \sum_{j\in\{0,N_{md}\}} p_{mjd} s_{ijd}(N_m) \right) \\
&= \sum_d \sum_i 1\{m(i) = m\} f_{id} \left(\ln\Big[\sum_{j\in\{0,N_{md}\}} \exp(\delta_{ijd}) \Big] \right. \\
&\left. - \sum_{j\in\{0,N_{md}\}} p_{mjd} s_{ijd}(N_m) \right) \\
&= \sum_d W_{md}(N_{md}) - TC_{md}(N_{md},\mathbf{p}_{md}) = \sum_d V_{md}(N_{md},\mathbf{p}_{md})
\end{aligned}
$$

where $\mathbf{p}_m$ is the price vector of all product prices negotiated by insurer m, $\mathbf{p}_{md}$ denotes the subvector of product d's prices, N_{md} is the subset of options for product d, $W_{md}(N_{md}) = \Sigma_i 1\{m(i) = m\} f_{id} \ln[\Sigma_{j\in\{0,N_{md}\}} \exp(\delta_{ijd})]$ and $TC_{md}(N_{md}, \mathbf{p}_{md}) = \Sigma_d \Sigma_i 1\{m(i) = m\} \; f_{id} \Sigma_{j\in\{0,N_{md}\}} p_{mjd} s_{ijd}(N_m)$. Since the choice probabilities do not depend on product prices, the enrollee surplus from each product also does not depend on prices of other products.

Following GT and GNT, we assume profit maximizing hospitals, which is typical in the health economics literature, especially because numerous studies found that the behavior of for-profit and not-for-profit hospitals is similar[204]. The marginal cost of providing

202 This is also a reasonable assumption in the Netherlands, where the provision of basic insurance is subject to strict rules so that Dutch health insurers too not only care about profit maximization, but also enrollee welfare. Having originated from social insurance funds, some insurers even explicitly state that they continue to carry out a social mission. See section 4.3 for more details.

203 If we assume stronger power on the enrollee or the health insurer side, we would have to impose a higher weight to the respective term (as discussed in Gowrisankaran et al., 2015 and Gaynor et al., 2015).

204 In this article, we assume that hospitals are profit maximizers, but Lakdawalla and Philipson (2006) and Gaynor et al. (2015) have shown that output maximization can be incorporated in the standard hospital utility function in addition to profit maximization by using perceived marginal costs instead of actual marginal costs.

product d in hospital j for health insurer m can then be denoted by mc_{mjd}:

$$mc_{mjd} = \gamma v_{mjd} + \epsilon_{mjd} \tag{4.6}$$

where v_{mjd} denotes a fixed effect, γ is the associated parameter and ϵ_{mjd} is an error term. Because we assume that hospitals are maximizing their profits, we let each hospital system s maximize the total profits earned from the contracts with health insurers:

$$\pi(M_s, N_m, \mathbf{p}_m) = \sum_{m \in M_s} \sum_{(jd) \in L_s} (p_{mjd} - mc_{mjd})\, q_{mjd}(N_m) \tag{4.7}$$

where q_{mjd} denotes the production volumes of the hospitals under hospital-product system s and mc_{mjd} is the marginal cost of treatment d at hospital j for enrollees of insurer m.[205] Because of our assumption on the consumer utility function, the volume delivered by the hospital system only depends on the set of treatment options included in the network and not on the prices of these options. The production quantities of hospital j are then expressed by:

$$q_{mjd}(N_m) = \sum_i 1\{m(i) = m\} f_{id}\, s_{ijd}(N_m) \tag{4.8}$$

4.2.3 Bargaining problem

There are $M \times S$ potential contracts. However, in our model, each contract specifies the prices of treatment options that are contracted by the insurer and the hospital system, and not the base prices of the hospitals that enter the system, as in the models by GT and GNT. Following GT and GNT, we assume that bargaining occurs under complete information about the characteristics of enrollees and hospitals and we consider the Nash Bargaining solution price vector that results from the maximization of the product of the exponentiated value functions of both parties from agreement, conditional on all other prices. Based on the theoretical contributions by Binmore et al. (1986), Horn and Wolinsky (1988) and Collard-Wexler et al. (2014), it is assumed that the prices of each contract are negotiated conditional on the prices of all other contracts and that the agents do not change their strategies when they observe the outcome of the contracts that have already been concluded. That is, if one negotiating pair fails, the other

205 Marginal costs may differ between insurers, for example because of differences in administrative costs. If we assume, however, that marginal costs are the same over insurers, we could drop index m from the notation of marginal costs.

pairs will continue the negotiation process conditional on their initial assumptions regarding the pricing outcomes of the other pairs ('passive beliefs'). The introduction of these assumptions corresponds with the models that were developed in the recent literature on hospital-insurer negotiations (in particular, GT and GNT). Here, we additionally assume that both insurers and hospitals appoint their negotiating teams per product. Therefore, bargaining on one product occurs separately from other products.

Under these assumptions, the objective of the Nash bargaining problem of health insurer m and system s is as follows:

$$NB^{m,s}(\mathbf{p}_{m,s} \mid \mathbf{p}_{m,-s}) = \left(\sum_{d}\left[\sum_{(jd)\in L_s} q_{mjd}(N_m)\,(p_{mjd} - mc_{mjd})\right]\right)^{b_{s(m)}} \times \left(\sum_{d}\left[V_m(N_m, \mathbf{p}_m) - V_m(N_m \setminus L_s), \mathbf{p}_m)\right]\right)^{b_{m(s)}}$$

where $b_{s(m)}$ and $b_{m(s)}$ are the bargaining weights of system s and health insurer m respectively. The weights characterize the bargaining abilities of both negotiating parties. They are normalized to sum up to one. $\mathbf{p}_{m,s}$ and $\mathbf{p}_{m,-s}$ denote the insurer's prices of the treatment options at hospitals that participate in hospital system s and those that do not participate in the system, respectively.

The Nash equilibrium is a vector of prices that maximizes the Nash bargaining value specified above. Each price vector maximizes the value for the negotiating pair, conditional on the other prices:

$$p^*_{mjd} = \underset{p_{mjd}}{\operatorname{argmax}}\, NB^{m,s}(p_{mjd}, \mathbf{p}^*_{m,-(jd)} \mid \mathbf{p}^*_{m,-s}) \qquad \textbf{(4.9)}$$

The new notation $\mathbf{p}^*_{m,-(jd)}$ denotes the equilibrium price vector consisting of all negotiated prices between insurer m and system s except for p_{mjd}.

Although each team negotiates separately, different negotiating teams of the same agent would generally take into account the effect of their decisions on patient flows for other products of

the same agent. However, as according to equation (4.2) patient flows are fully determined by the network structure (i.e., the set of treatment options) and not by prices, the decisions of different product teams of the same agent will not be dependent on each other. This can be seen as follows. Consider that hospital j negotiates with insurer m over the price of product d, conditional on the other prices. We partition the set of all diseases into $\{D', d, D''\} = \{d_1, \ldots, d_D\}$, where $\{D', d\}$ covers the subset of products with which hospital j enters the network of insurer m and D'' covers the rest. Because $m(i)$ is fixed, a hospital system that fails to reach agreement with a particular insurer regarding treatment option (jd) cannot capture any profit on this treatment option from the enrollees of this health insurer. Therefore, the disagreement outcome of the hospital system in negotiation over this treatment option will be zero. The payoff structure in bargaining between insurer m and hospital j over (jd) will then be:

$$j^d_{agree} = \pi_{jd}(N_{md}, \mathbf{p}_{md}) + \pi_{j,D'}(N_{mD'}, \mathbf{p}_{mD'})$$

$$j^d_{disagree} = \pi_{jD'}(N_{mD'}, \mathbf{p}_{mD'})$$

$$m^d_{agree} = V_{md}(N_{md}, \mathbf{p}_{md}) + V_{mD'}(N_{mD'}, \mathbf{p}_{mD'}) + V_{mD''}(N_{mD''}, \mathbf{p}_{mD''})$$

$$m^d_{disagree} = V_{md}(N_{md} \backslash j, \mathbf{p}_{md}) + V_{mD'}(N_{mD'}, \mathbf{p}_{mD'}) + V_{mD''}(N_{mD''}, \mathbf{p}_{mD''})$$

This payoff structure implies that the difference between the agreement and disagreement payoffs in negotiations on any product d only depends on the part related to that particular product. In particular, $j^d_{agree} - j^d_{disagree} = \pi_{jd}(N_{md}, \mathbf{p}_{md})$ and $m^d_{agree} - m^d_{disagree} = V_{md}(N_{md}, \mathbf{p}_{md}) - V_{md}(N_{md} \backslash j, \mathbf{p}_{md})$. Hence, only these terms will be relevant for the derivation of the price p_{mjd}. Note that bargaining over this price only occurs if the sum of the payoffs is positive: $j^d_{agree} - j^d_{disagree} + m^d_{agree} - m^d_{disagree} > 0$, therefore each 'link' (jd) included in the network must satisfy:

$$\pi_{jd}(N_{md}, \mathbf{p}_{md}) + V_{md}(N_{md}, \mathbf{p}_{md}) - V_{md}(N_{md} \backslash j, \mathbf{p}_{md})$$

$$= W_{md}(N_{md}) - W_{md}(N_{md} \backslash j) - mc_{mjd} q_{mjd}(N_{md})$$

$$- \sum_{l \neq j, l \in \{0, N_{md}\}} p_{mjd}(N_{md}) \left(q_{mld}(N_{md} \backslash j) - q_{mld}(N_{md}) \right) > 0$$

Hence, hospital j will produce product d only if this condition is satisfied. The payoff structure outlined above leads to the following Nash bargaining problem with respect to p_{mjd}:

$$\max_{p_{mjd} | N_{md},\ \mathbf{p}_{m,-j,d}} (j^{d}_{agree} - j^{d}_{disagree})^{b_{s(m)}} (m^{d}_{agree} - m^{d}_{disagree})^{b_{m(s)}}$$

where $\mathbf{p}_{m,-j,d}$ corresponds to the price vector of contract prices of hospitals other than j in the subset of treatments options N_{md}. The same type of Nash bargaining problem as described above is considered in GNT and GT, with the difference that their problem is formulated for a hospital's base price, keeping a product weight fixed in accordance to the disease weights of different diagnoses.

From the first order condition (FOC) of this problem, we derive the expression for product prices:

$$p_{mjd} = b_{s(m)} \frac{W_{md}(N_{md}) - W_{md}(N_{md} \setminus j)}{q_{mjd}} + b_{m(s)} mc_{mjd} \quad + b_{s(m)} \sum_{k \neq j} [p_{mkd} d^{jk}_{md}]$$

where $d^{jk}_{md} = \frac{q_{mkd}(N_{md} \setminus j) - q_{mkd}(N_{md})}{q_{mkd}}$. The numerator of this ratio shows how many patients of insurer m with illness d will flow to hospital k if hospital j no longer treats this illness, and therefore d^{jk}_{md} defines the disease-specific diversion share of patients with illness d from hospital j to hospital k. A higher value of the diversion share suggests a higher degree of substitution between two hospitals in treating this illness.

The expression for p_{mjd} suggests that a product price of a hospital is increasing in the hospital's marginal costs of this product, the product prices of other hospitals, and net value that the inclusion of treatment option (jd) brings to the insurer's network. In addition to these factors, negotiated prices also depend on the bargaining abilities/weights of the hospital and the insurer. Differences in these parameters can explain the presence of price differences between health insurers, hospital locations and hospital products.

4.2.4 Merger analysis

The merger analysis considered in our article adopts a method proposed by GT. The method by GT allows us to derive the expressions of product price changes in a closed form, which simplifies the price comparison across products and players.

GT consider two alternative approaches to model a hospital merger of hospitals j and k. In the first approach, it is assumed that after the merger, these hospitals still negotiate prices per hospital, but take into account the impact of disagreement on the flow of patients to each other. In the second approach it is assumed that hospitals negotiate jointly and will charge the same price after the merger. Because our empirical application deals with the situation in which hospitals continue to charge different prices after they merged, we follow the first approach. Please note that because in our model the patient flows of different products are independent of each other, the problem can be split and analyzed separately for each product.

Drawing from GT, we analyze the situation in which two hospitals that enter the same network are merging and consider the bargaining problem for product d after their merger has taken place (assuming that the network covers treatment options of d at both hospitals). If each of the merged hospitals negotiates its own price of the product, but accounts for the effect on the other's patient flow, we obtain the following expressions for the agreement and disagreement payoffs in the bargaining problem of hospital j:

$$(j+k)^{d}_{agree} = [p_{mjd} - mc_{mjd}]q_{mjd}(N_{md}) + [p_{mkd} - mc_{mkd}]q_{mkd}(N_{md})$$

$$(j+k)^{d}_{disagree} = [p_{mkd} - mc_{mkd}]q_{mkd}(N_{md} \setminus j)$$

$$m^{d}_{agree} = W_{md}(N_{md}) - p_{mjd}q_{mjd}(N_{md}) - \sum_{l \neq j} p_{mld}q_{mld}(N_{md})$$

$$m^{d}_{disagree} = W_{md}(N_{md} \setminus j) - \sum_{l \neq j} p_{mld}q_{mld}(N_{md} \setminus j)$$

Writing down the Nash bargaining solution for this game and transforming the FOC of this problem, we derive the price of hospital j's product d after the merger, $p^{(j+k)}_{mjd}$, as follows:

$$p^{(j+k)}_{mjd} = b_{s(m)} \frac{W_{md}(N_{md}) - W_{md}(N_{md} \setminus j)}{q_{mjd}} + b_{m(s)}mc_{mjd} + \frac{p_{mkd}d^{jk}_{md}}{q_{mjd}} + b_{s(m)} \sum_{l \neq j} [p_{mld}d^{jl}_{md}]$$

If we then take the difference between this price and the initial price level of hospital j, we obtain the expression for price change due to merger (given that the marginal costs are not affected by the merger):

$$p_{mjd}^{(j+k)} - p_{mjd} = b_{m(s)}(p_{mkd} - mc_{mkd})d_{md}^{jk} \quad \textbf{(4.10)}$$

The same type of derivations can be done for hospital k, with indices k and j changing places.

4.2.5 Heterogeneous price effects of hospital mergers

There are a few important conclusions that can be drawn from equation (4.10) with respect to the price effect of a hospital merger. The first important finding is that product d's price change after the merger in each hospital is increasing in the diversion share between these hospitals. Since the diversion share reflects the degree of substitution between the hospitals, this result tells us that a merger will increase the product's price more if the hospitals that partner in the merger are close substitutes with respect to that product. Therefore, if substitution between hospitals is stronger for one product than for another product[206], the price increase after the merger will be higher for the first product and hence hospital mergers may lead to heterogeneous price effects across different products and different locations.

The second most important conclusion that follows from our model is that, according to equation (4.10), the price change caused by merger is proportional to the difference between the price and the marginal cost of the other hospital (i.e., the merger partner). Therefore, these differences also contribute to explaining the heterogeneity of price changes after the merger for different products and locations. Merging with a hospital whose price of product d is higher, whereas the marginal cost are lower, would result in a greater price increase (other things being equal).

Finally, we observe, perhaps at first sight somewhat contra-intuitively, that a price increase caused by merger is proportional to the bargaining ability $b_{m(s)}$ of the insurer. Thus, a health insurer with greater bargaining ability against hospital system s is confronted with a higher price increase after the merger. This result suggests that, although a greater relative bargaining ability of the insurer in comparison to hospitals provides the insurer with more leverage

206 The substitution rates may differ across products, for example, because for some hospital products patients' willingness to travel might be higher, there is more intense competition with nearby hospitals over those products or the transparency of different product markets differs.

against these hospitals, this leverage advantage is reduced after the merger of the hospitals.

4.3 The Dutch hospital market

In this article, we estimate the price changes of a merger between two Dutch hospitals. From the viewpoint of the bilateral bargaining model, the current Dutch healthcare system bears important similarities with the US healthcare system. In recent decades, the Netherlands, like several other OECD countries, has embraced a market-oriented approach to healthcare. After decades of strict governmental supply-side regulation, the Dutch healthcare system is currently undergoing a transition towards regulated (or 'managed') competition (Van de Ven & Schut, 2009; 2008; Schut & Van de Ven, 2005). The main goal of the market-oriented healthcare reforms is to increase the efficiency of the system and its responsiveness to patients' needs, whereas maintaining universal access to care (Schut & Van de Ven, 2005).

Of particular importance to this article are the introduction of the Health Insurance Act (HIA) in 2006 and the introduction of hospital-insurer bargaining in 2005. Under the HIA, all Dutch citizens are obliged to buy standardized individual basic health insurance from a private insurer. The standardized basic benefits package specified in the HIA is fairly comprehensive and includes hospital care, GP services, prescription drugs and maternity care. Having bought an insurance policy, the enrollee gets access to all hospitals of the contracted network without co-payments. As described in section 4.2, there is an annual deductible per adult individual, although most hospital product prices are higher than the fixed amount that is set by the deductible[207] and hence the deductible does not play a role in patients' hospital choices. Dutch health insurers are furthermore required to offer all applicants standardized coverage at a community-rated premium, the insurers have to offer all basic health insurance policies to all applicants (i.e., a guaranteed issue requirement) and consumers are free to choose their health insurer during an annual enrolment period. Risk equalization across insurers takes place to ensure a level playing field for health insurers and to prevent risk selection. The insurers' market shares are relatively stable[208].

207 Just 11% of all patients received treatments that cost less than 165 euro in 2011. The prices of the products that we consider in our article all exceed the deductible during the study period.

208 For example, the switching rate between health insurance companies in the Netherlands was 6% in 2012.

In 2005, a product classification system for hospital and medical specialist care was introduced. Each activity and/or service provided by a hospital, including outpatient care, which is associated with a patient's demand for care, is referred to as a Diagnosis and Treatment Combination (DTC)[209]. Following the introduction of the DTC system, the scope for free negotiations of prices between hospitals and health insurance companies has gradually increased from 10% of hospital revenue in 2005, to 20% in 2008, to 34% in 2009 and to 70% in 2012. For the remaining part, hospital prices are still regulated. For products and services included in the free-pricing segment, each hospital typically renegotiates the terms of its contracts with health insurers on an annual basis. Dutch health insurers are allowed to engage in selective contracting with healthcare providers. As explained in section 4.2, there are several cases in which the insurer contracts only a subset of treatments in hospitals.

The two-stage model that underlies the bargaining theory developed above reflects how Dutch health insurers and hospitals negotiate over the products in the free-pricing segment: consumers buy health insurance from health insurers and health insurers bargain and contract with hospitals on behalf of those that they insure. In the early years of the reform selective contracting was limitedly used, but over the years, the number of health insurers offering contracts with restricted provider networks has increased. Furthermore, the available evidence on the nature of hospital-insurer negotiations in the Netherlands suggests that until 2012, hospital-insurer bargaining focused on price, rather than on quality of volume of care (Ruwaard et al., 2014; Meijer et al., 2010; NZa, 2009). The introduction of the HIA has led to strong price competition between health insurers and health insurers have put increasing pressure on hospitals to charge lower prices (Schut & Van de Ven, 2011). It seems as if the threat of selective contracting, rather than its actual use, may already have had an impact on hospital-insurer bargaining.

4.4 The merger

Dutch local and regional hospital markets are highly concentrated[210] and mergers represent the largest change in the Dutch hospital industry nowadays as no hospitals have entered or exited the market since 2005. Between 2005 and 2012,

209 The DTC system is based on the concept of Diagnosis-Related Groups but constitutes a newly developed classification system. The Dutch system originally contained 29,000 DTCs. In 2007, a project was initiated to decrease the number of DTCs to about 3,000. This was known as the 'DOT revision' and was implemented in January 2012.

210 In 2006, the average HHI of Dutch hospitals equaled 2.350 (Halbersma et al., 2010) and since then no hospitals entered or exited the hospital market. Only mergers have decreased the number of hospitals.

17 mergers involving 34 hospitals were cleared by the Authority for Consumers and Markets (ACM)[211] (www.acm.nl), among which the merger that we study in this article. All mergers took place between neighboring hospitals.

The merger that we study was consummated in year t (which was between 2005 and 2012). The merger was notified to the ACM prior to taking place[212]. Following the notification, the ACM carried out a general review of the proposed merger in which they made prospective inferences regarding the expected anticompetitive effects of the merger on the market. In the Netherlands, a merger requires a license when there is reason to assume that 'a dominant position that appreciably restricts competition on the Dutch market or a part thereof could arise or be strengthened as a result of the said concentration' (Mededingingswet, Section 37.2). The merger that we study did not require a license and was cleared after the first general review. The decision to clear the merger evoked critisim by health economists, however, who argued that the prospective merger analysis by the antitrust authority had been lacking and that it was likely that the merger had created a dominant position for the two hospitals involved (Varkevisser & Schut, 2008). Hence, this merger seems to be on the enforcement margin, making it an interesting case for further retrospective studies.

4.4.1 The locations

The merger involved a general acute care hospital (hospital M1) and a neighboring general acute care hospital that also provides tertiary hospital care (hospital M2). Hospital M1 is located in an isolated geographical area, whereas hospital M2 is located in a more densely populated region with several other hospitals nearby. The distance between hospitals M1 and M2 is about 50 kilometers[213]. According to the ACM, the merging hospitals were subject to competition from five other hospitals before the merger took place. Prior to the merger, hospital M2 was the largest competitor to hospital M1 and therefore posed a major constraint on hospital M1's prices, whereas hospital M2 had multiple competitors. After the merger, hospital M1 was expected to experience competitive pressure from only one rival hospital, whereas hospital M2 was expected to experience notable competitive pressure from five other hospitals[214]. The differences in competitive pressure in the markets of hospitals M1 and M2 may result in heterogeneous price effects of the merger (see section 4.2). To find out whether the merging hospitals exploited this opportunity, we disaggregated the merger effect for each of the two merging hospital locations.

211 The Authority for Consumers and Markets is the Dutch antitrust agency. The legal predecessor of the Authority for Consumers and Markets, the Netherlands Competition Authority, has carried out the review of some of these mergers. For reasons of clarity, however, we ascribe the decisions made by the Netherlands Competition Authority to its legal successor, which has been in charge since April 1, 2013: the Authority for Consumers and Markets.

212 According to most antitrust laws, mergers must be reported to an antitrust authority prior to consummation (see 15 USC §18A for the US and the competition laws of the EU Member States or EC: 2004 for the European Union's rules on prior merger notification). The Dutch antitrust law is no exception (Mededingingswet, section 37.2).

213 1 kilometer is approximately 0.621 miles

214 None of these rivals provides tertiary hospital care.

4.4.2. The products

In this article, we estimated the impact of the merger in three separate product markets that jointly make up 47.5 percent of the merged hospital's turnover in the segment for which Dutch insurers and hospitals were allowed to freely negotiate prices at the time of the merger. We looked at hip replacements, knee replacements and cataract surgery. Most hospitals provide these services. In year *t*, 95% of all Dutch hospitals (n=97) and 2.7% of all Dutch Independent Treatment Centers (ITCs)[215] (n=73) provided hip replacements, 95% (hospitals) and 7% (ITCs) provided knee replacements and 96% (hospitals) and 15% (ITCs) provided cataract surgery. These products were also provided by hospitals M1 and M2 and all five rivals in year *t*. At time of the merger, there were no ITCs in the regional market that offered any of the hospital products considered. Table 4.1 presents descriptive statistics on the patients for each product in hospitals M1 and M2 and four rivals[216] before and after the merger.

After merger, the hospitals had an opportunity to concentrate care in one of the two hospital locations. This does not seem to have occurred, however. Even though it follows from table 4.1 that hospital M2 provided many more hip replacements in year *t*+1 than in *t*-1, the provision of hip replacements in hospital M1 did not change significantly. The hospitals therefore do not seem to have concentrated care in hospital M2 after the merger. Rather, it seems that hospital M2 is, post-merger, better able to attract patients in need of hip replacements because the number of hip replacements performed in rival hospitals decreased slightly whereas the total number of patients in the market did not change significantly.

In hospital M1, the average age of patients undergoing knee replacements dropped between *t*-1 and *t*+1. Again, this does not seem to be an attempt to change patient flows in the merged hospitals, as the mean age of patients undergoing knee replacement surgery in hospital M2 did not change. However, according to hospital M1's website, the hospital has been testing out an innovative procedure for knee replacements since year *t* for which only patients under 60 years old are eligible. This is likely unrelated to the merger, but could potentially explain the decrease in the patients' average age observed in the data.

215 ITCs are comparable to freestanding Ambulatory Surgery Centers (ASCs) that operate in the US and UK healthcare markets (see e.g., Gaynor & Town, 2012; Carey et al., 2011). Independent Treatment Centers (ITCs) are typically much smaller than general hospitals and only compete on a narrow range of specialties. Their market share is relatively small, but their influence has increased because they usually offer elective care treatments, focus on the free-pricing segment and have rapidly grown in number and size (NZa, 2012; 2009). The joint market share of all ITCs increased from 1.5 percent (2005) to 4 percent (2007) of the free-pricing segment's total returns (NZa, 2009) and from 1 percent (2007) to 2.3 per cent (2010) of total medical specialist care (NZa, 2012).

216 We excluded all hospitals that had more than 15% missing prices for either hip or knee replacements or cataract surgeries in the period *t*-2 to *t*+2. The fifth rival hospital was therefore excluded from the analysis. See section 4.5 for more information on the exclusion criteria.

Table 4.1 – Descriptive statistics

	Hip replacements		Knee replacements		Cataract surgery	
	t-1	*t*+1	*t*-1	*t*+1	*t*-1	*t*+1
Panel A. Hospital M1						
Volume	174	175	223	293	387	361
Gender (% male)	0.28	0.38	0.34	0.43	0.38	0.35
Patients' average age	68	68	64	56	72	73
Patients' average SES score	0.05	-0.14	0.15	0	0.09	-0.06
Panel B. Hospital M2						
Volume	390	511	271	299	2144	2113
Gender (% male)	0.34	0.35	0.34	0.32	0.41	0.40
Patients' average age	68	70	69	69	72	73
Patients' average SES score	0.31	0.42	0.39	0.48	0.35	0.42
Panel C. Rival 1						
Volume	165	154	164	135	1026	1045
Gender (% male)	0.27	0.36	0.27	0.29	0.41	0.37
Patients' average age	70	71	71	69	75	75
Patients' average SES score	-0.22	-0.05	-0.06	-0.09	-0.09	-0.02
Panel D. Rival 2						
Volume	237	195	162	162	881	1088
Gender (% male)	0.32	0.34	0.32	0.38	0.43	0.41
Patients' average age	70	68	68	68	73	72
Patients' average SES score	0.15	0.12	0.15	0.28	0.22	0.26
Panel E. Rival 3						
Volume	136	114	146	118	650	972
Gender (% male)	0.34	0.28	0.40	0.29	0.38	0.42
Patients' average age	70	62	70	70	75	74
Patients' average SES score	-0.83	-0.88	-0.76	-0.69	-1.01	-0.96
Panel F. Rival 4						
Volume	169	155	101	151	855	763
Gender (% male)	0.34	0.26	0.38	0.35	0.43	0.44
Patients' average age	69	73	70	71	75	75
Patients' average SES score	0.24	0.46	0.09	0.36	0.17	0.4
Panel G. Other hospitals						
Volume	231 (14)	234 (15)	196 (12)	199 (12)	1590 (146)	1545 (137)
Gender (% male)	0.33	0.34	0.32	0.33	0.39	0.41
Patients' average age	69 (0.37)	69 (0.25)	69 (0.27)	69 (0.26)	73 (0.32)	73 (0.29)
Patients' average SES score	-0.04 (0.05)	-0.18 (0.08)	0 (0.05)	-0.11 (0.07)	0.01 (0.05)	-0.09 (0.07)

Notes: The standard errors are in parentheses. We excluded all hospitals that had more than 15% missing prices for either hip or knee replacements or cataract surgeries in the period *t*-2 to *t*+2. The fifth rival hospital was therefore excluded from this analysis. Panel G displays the descriptive statistics of the hospitals other than hospitals M1, M2 and the rival hospitals. Within panel G, 51 hospitals performed hip replacements, 56 hospitals performed knee replacements and 57 hospitals performed cataract surgeries. The rows on volume only report cases which have a valid gender, age and SES-score.

4.4.3. The health insurers

At the time of the merger, at least five health insurers were active in the region[217]. Four of these were independent health insurers, whereas the fifth was in fact a joint purchasing organization representing the majority of smaller health insurers. For reasons of clarity, we will henceforth treat this purchasing entity as a health insurer. All five health insurers are active on the national insurance market. According to table 4.1, the volume of patients has not changed significantly across hospitals, indicating that health insurers did not shift enrollees away from the merged hospitals to rival hospitals in t+1.

Table 4.2 shows the insurers' market share for each product and for each hospital in years t-1 and t+1. The market shares have not changed significantly over the years.

Table 4.2 – Health insurers' market share per product per hospital in t-1 and t+1

	Market share insurer 1		**Market share insurer 2**		**Market share insurer 3**		**Market share insurer 4**		**Market share insurer 5**	
	t-1	t+1	t-1	t+1	t-1	t+1	t-1	t+1	t-1	t+1
Panel A. Hospital M1										
Hip replacements	0.76	0.74	0.05	0.04	0.09	0.13	0.05	0.02	0.05	0.07
Knee replacements	0.69	0.61	0.05	0.06	0.16	0.20	0.06	0.08	0.05	0.06
Cataract surgery	0.84	0.77	0.01	0.03	0.09	0.09	0.04	0.05	0.02	0.06
Panel B. Hospital M2										
Hip replacements	0.62	0.62	0.08	0.06	0.19	0.17	0.04	0.06	0.07	0.08
Knee replacements	0.69	0.62	0.04	0.03	0.17	0.20	0.01	0.06	0.09	0.08
Cataract surgery	0.70	0.71	0.04	0.05	0.16	0.14	0.02	0.03	0.08	0.08

Notes: The health insurers' market shares are based on the number of cases per hospital-insurer-product combination.

Although insurer 1 has the largest market share per product per hospital (its market share ranges from 61% to 84%) it is not the largest health insurer nationally[218]. Regional market shares reflect the continuing effect of the former regional legal monopoly positions of local health insurers (a policy that was abolished in 1992) (Halbersma et al., 2010).

217 In fact, there are six health insurers active in the region. However, for the sixth health insurer, we did not have valid prices in the post-merger year (t-1) for the merging hospitals M1 and M2. This health insurer was therefore not included in the difference-in-differences estmates or in any other analysis. The effect of excluding this health insurer for hospital M1 and hospital M2 is most likely neligible, however, because the health insurer only accounts for less than 2% of all hip, knee and cataract patients in hospital M1 and M2.

218 For reasons of confidentiality, we cannot report the national market shares of the health insurers.

4.5 Empirical model specification

We use data on hospital-insurer negotiated contract prices in the Netherlands for each of the three hospital products considered, to investigate whether the merger between hospitals M1 and M2 has led to price changes and if so, whether this effect varies between locations, payers and products. There are several ways to calculate price changes post-merger. The first method is to calculate the post-merger price change for each hospital product indexed on, for example, the average price change over all hospitals. However, these price changes would only give us a crude indication of the effect of the merger as it does not take account of changes in prices that would also have occurred if the merger had not taken place.

Although our model focuses on the price effects that follow from the interaction between health insurers and hospitals, large post-merger price increases for merged hospitals in comparison to prices among a control group could be consistent with at least four hypotheses according to the empirical literature (Haas-Wilson & Garmon, 2011; Adams & Noether, 2011): (i) the merger created or enhanced the hospital's power to raise its prices for general acute inpatient services; (ii) between the years t-1 and t+1 there was an increase in the product complexity of inpatient cases or an increase in the severity of patients' illness in the merging hospitals relative to non-merging hospitals; (iii) between the years t-1 and t+1, the quality of care associated with the products improved at the merging hospitals relative to non-merging hospitals, which increased value and (perhaps) cost and (iv) pre-merger prices at the merging hospitals were lower than the competitive equilibrium prices. In other words, the post-merger price increases at the merged hospital could be an adjustment towards equilibrium (Garmon & Haas-Wilson, 2011). We call this latter phenomenon 'catching up'. When interpreting our results in section 4.8, we will also reflect on these alternative explanations, arguing that the first explanation is the most likely in our case.

Because we wanted to control for price changes that would have occurred even if the merger had not taken place, we used a difference-in-differences (DID) model in which price changes at the merging hospitals are compared to price changes among a group of comparison hospitals which were unaffected by the merger (i.e., the control group). The identifying assumption of a difference-

in-differences estimation is that trends (price trends) would be the same in both groups in the absence of the event (merger). This assumption is referred to as the 'common trend assumption'. We visually investigated whether the common trend assumption applies by using data on multiple periods.

To examine the effect of aggregating the merger price effect, we estimated difference-in-differences models at various aggregation levels. As a benchmark, we started with the most aggregated model. In other words, we first estimated the price effect for the merged hospital fully aggregated over hospital locations, products and insurers. We then disaggregated this effect stepwise to ultimately arrive at the most differentiated model in which we fully differentiated the merger price effect across hospital locations, products and insurers. Table 4.3 provides a summary of the different models.

Table 4.3 – Continuum of aggregated and disaggregated models

Models	Merger price effect
Baseline model (equation (4.11))	Fully aggregated over hospital locations, products and insurers
First disaggregated model	Aggregated over hospital products and insurers; disaggregated across locations
Second disaggregated model	Aggregated over hospital locations and insurers; disaggregated across products
Third disaggregated model	Aggregated over insurers; disaggregated across products and locations
Fourth disaggregated model	Aggregated over hospital locations and products; disaggregated across insurers
Fifth disaggregated model	Aggregated over hospital products; disaggregated across insurers and locations
Disaggregated model	Fully disaggregated across hospital locations, products and insurers

We first estimated the most aggregated model:

$$\ln p_{jt} = \alpha + \lambda \cdot POST_t + \delta \cdot POST_t \cdot MERGED_j + \vartheta_j + \varepsilon_{jt} \qquad \textbf{(4.11)}$$

where p_{jt} is the weighted average hospital negotiated price. $POST_t$ is one in year t+1 (the post-merger year) and zero in year t-1 (the pre-merger year), $MERGED_j$ is one for the merger hospitals and zero for the control group hospitals, $\lambda \cdot POST_t$ denotes the change in the average price in year t+1 compared to year t-1, δ is the DID estimator (i.e., the average treatment effect on the treated; see Blundell & Costa Dias, 2009) and ϑ_j is a hospital fixed effect. To account for potential endogeneity of the merging policy, we matched a control group to the event group (i.e., hospitals M1 and M2). In this control group, we included all Dutch hospitals that provided the three products and excluded any other hospitals that also merged between years t-2 and t+2 and Independent Treatment Centers.

To estimate the most aggregated difference-in-differences model we aggregated the patient-level hospital data to an average price per hospital. It is important to note that in the Netherlands, negotiated prices differ between health insurers but not between patients with the same health insurer who are treated in the same hospital. Therefore, we can aggregate the data to hospital-insurer level without a loss of information. Furthermore, due to aggregation, we do not have to consider the correlation between prices within each hospital-insurer combination, which would otherwise lead to biased standard errors (see for example Thompson, 2011; Donald & Lang, 2007 and Bertrand et al., 2004). First, we calculated an average price per product for each hospital-insurer pair. Second, we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year t-1. Third, we aggregated over the products to an average price per hospital, whereby we weighted the hospital-product prices with the market-wide revenue shares for each product in t-1[219]. We calculated an average price for the merged entity M1 + M2 by weighting the prices for hospitals M1 and M2 with their corresponding revenue shares in year t-1. We then removed the aggregations stepwise to show the effect of aggregating over products, locations and insurers until, finally, our results were disaggregated over all three sources of heterogeneity.

We investigated whether our results from the disaggregated model were robust to changes in the control groups by using six different control groups[220]: (1) all Dutch hospitals that provide the product, excluding hospitals that also merged between years t-2 and t+2 and Independent Treatment Centers; (2) control group 1, excluding all university hospitals; (3) control group 2, excluding rivals of the merged hospitals; (4) control group 3, excluding the hospitals with low market power; (5) control group 3, excluding all hospitals with low health insurers concentration; and (6) control group 3, excluding hospitals of a different size to hospitals M1 and M2. We thus had twelve control groups: six for each hospital. Table 4.4 summarizes the number of hospitals in the control group.

219 We also estimated the models using the per hospital-product revenue in t-1 as a weighting factor for the aggregation over products. The results of these models do not differ from the main model and are therefore not included in this article. The results are available from the authors upon request.

220 We also wanted to know whether our disaggregated model was robust to hospital-specific covariates. As a sensitivity check, we therefore also included hospitals-specific covariates in an additional difference-in-differences model (i.e., the number of patients, the percentage of males, the average (standardized) socio-economic status score, the average age of the patients and the weighted market share per hospital). The results using this model did not differ from the other disaggregated model effects and are therefore not included in this article. The results are available from the authors upon request.

Table 4.4 – Number of hospitals in control groups for hospitals M1 and M2

	Hospital M1	Hospital M2
Panel A. Hip replacements		
Control group 1	55	55
Control group 2	50	50
Control group 3	46	46
Control group 4	38	38
Control group 5	41	41
Control group 6	36	40
Panel B. Knee replacements		
Control group 1	60	60
Control group 2	56	56
Control group 3	52	52
Control group 4	46	46
Control group 5	44	44
Control group 6	44	44
Panel C. Cataract surgery		
Control group 1	61	61
Control group 2	55	55
Control group 3	51	51
Control group 4	49	49
Control group 5	42	42
Control group 6	36	45

Notes: Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers; control group 2 is control group 1 excluding all university hospitals; control group 3 is control group 2 excluding rivals of the merged hospitals; control group 4 is control group 3 excluding the hospitals with low market power; control group 5 is control group 3 excluding all hospitals with low health insurers concentration and control group 6 is control group 3 excluding hospitals of a different size to hospitals M1 and M2.

221 Measured by the inverse LOgit Competition Index – see section 4.6 for more information

The reasons behind the various exclusion criteria for the control groups were as follows. Control group 2 excludes all university hospitals because these generally spend more time on research and education and they usually treat patients with more complex problems than general acute care hospitals. This could result in different price trends. Control group 3 excludes the merged hospital's rivals, which were identified as such in the *ex ante* merger review by both the merged hospitals and the ACM. If the merger hospitals exercise their newly acquired market power by raising prices, their rivals may respond by also raising their prices (see e.g., Dafny, 2009; Gaynor & Vogt, 2003). Because of this rival-effect, rivals are excluded from control group 3. Hospitals with limited market power are excluded from control group 4. It is generally assumed that hospitals with a 55 percent market share or higher have significant market power (NZa, 2008; EC, 2004). Both hospital M1 and hospital M2 have a weighted average market share[221] of 55 or higher for all three products. In control group 4, we therefore only take into account those hospitals that also have significant market power. We ranked the hospitals from control group 3 according to their weighted average market share and excluded the hospitals in the bottom quintile. Furthermore,

to control for the effect of health insurers' concentration in each hospital in control group 5, we ranked the hospitals according to health insurers' HHI and excluded the hospitals in which the insurers' HHI was in the bottom quintile. Finally, in control group 6, we matched the hospitals that were in control group 3 with the volume of the merged hospitals. Hospital M2 had a much higher volume than hospital M1 and this difference in volume may have reflected different costs per unit product. We therefore matched two groups of equally sized hospitals with hospitals M1 and M2. For hospital M2, we ranked the hospitals by volume per product and excluded the bottom quintile. For hospital M1, we ranked the hospitals by volume for each product and excluded the top quintile (for hip replacements and cataract surgeries) or the bottom quintile (for knee replacements).

4.6 Data

We used a comprehensive nationwide patient-level dataset containing all inpatient and outpatient visits at all hospitals in the Netherlands. For each visit, the patient's zip code, age (year of birth), gender, health insurer, and DTC were observed, as well as the price negotiated for each hospital-insurer-product combination between years t-2 and t+2. Access to all patient-level data including negotiated prices from all insurers makes our dataset unique. The patient-level data that we used came from the insurers' claims administration and hospital registries, and was provided by the Dutch Healthcare Authority.

We focused on three products for which prices are freely negotiable: hip replacements[222], knee replacements[223] (both orthopedics) and cataract surgery[224] (ophthalmology). In year t-1, these product markets jointly accounted for 47.5 percent of turnover in the free-pricing segment at the merging hospitals[225]. We checked for obvious outliers in the negotiated price data by studying the following for each outlier: the average price of the hospital-product combination; the average price of the health insurer-product combination; the price change in the hospital-product combination; the price change in the health insurer-product combination; and the price change in the hospital-insurer-product combination over the years. Only if the price deviated markedly from all the averages excluded the observation from the analysis[226]. In all other cases, we could not detect measurement error with certainty and we kept the prices in the dataset. All hospitals where

222 The definition used in the Dutch hospital product classification system is 'joint degeneration of pelvic/hip/upper leg; surgery with clinical admission and joint prosthesis'.

223 The definition used in the Dutch hospital product classification system is 'joint degeneration of knee; surgery with clinical admission and joint prosthesis'.

224 The definition used in the Dutch hospital product classification system is 'cataract; outpatient treatment with intervention'.

225 In hospital M1, hip replacements represented 18 percent, knee replacements represented 27 percent, and cataract surgeries represented 6 percent of the turnover in the competitive segment in year t-1. In hospital M2, hip replacements represented 16 percent, knee replacements represented 14 percent, and cataract surgeries represented 14 percent of the turnover in the competitive segment in year t-1. By way of comparison: in control group 1, hip replacements represented 15 percent, knee replacements represented 14 percent, and cataract surgeries represented 14 percent of the turnover in the competitive segment in year t-1.

226 In total, 73 hip replacements (n=66,437 before cleaning), 57 knee replacements (n=61,404 before cleaning) and 281 cataract surgeries (n=47,6205 before cleaning) were excluded from the dataset.

more than 15% of prices were missing for one or more years between t-2 and t+2 were excluded from the dataset[227].

The pre-merger price was based on data from the year preceding the merger (t-1) and the post-merger price was based on data from the year after the merger (t+1). Table 4.5 presents summary statistics on the volume and mean prices of the products within hospital M1, hospital M2 and control group 1.

Hospitals with limited market power are excluded from control group 4. The weighted average market share that was used to determine the hospitals' market power was based on the LOgit Competition Index (LOCI), developed by Akosa Antwi et al. (2006; 2009). The application of the method is explained in Gaynor and Town (2012) and NZa (2014). First, we calculated the hospitals' market share for each product in each zip code. The market share of hospital j for product d in zip code z is defined as $s_{jd,z} = \frac{q_{jd,z}}{\sum_{j=1}^{J} q_{jd,z}}$ where $q_{jd,z}$ is the total number of patients at hospital j (j=1,..,J) for product d (d=*1,2,3*) in zip code z (z=*1*,...,Z). Second, for each hospital and product, we calculated a weighted average market share $\bar{s}_{jd} = \sum_{z=1}^{Z} w_{jd,z} s_{jd,z}$,where we weighted each market share with its share in hospital j, i.e., $w_{jd,z} = \frac{q_{jd,z}}{\sum_{z=1}^{Z} q_{jd,z}}$.

227 For hip replacements, 31 out of 90 hospitals had more than 15% missing prices in one or more years in the period t- 2 and t+2 and were therefore excluded. For knee replacements, 25 out of 89 hospitals had more than 15% missing prices in one or more years in the period t-2 to t+2 and were therefore excluded. For cataract operations, 25 out of 89 hospitals had more than 15% missing prices in one or more years in the period t-2 to t+2 and were therefore excluded. The threshold of 15% was arbitrary. As a sensitivity check, we therefore also used other thresholds for the disaggregated model. This had no effect on the overall results or the conclusions of the article. The results are available upon request by the authors.

Table 4.5 – Volume and mean prices for hip and knee replacements and cataract surgery in hospitals M1, M2 and control group 1

	Hip replacements		**Knee replacements**		**Cataract surgeries**	
	t-1	t+1	t-1	t+1	t-1	t+1
Panel A. Hospital M1						
Volume	172	173	222	282	381	355
Mean price (in €)	9189.58	10188.05	11022.98	11291.41	1405.00	1421.27
	(348.00)	(559.08)	(494.94)	(651.32)	(40.78)	(45.08)
Panel B. Hospital M2						
Volume	389	503	271	295	2140	2077
Mean price (in €)	9181.96	8991.34	10959.49	10321.76	1400.10	1313.40
	(144.25)	(109.09)	(185.30)	(245.90)	(20.34)	(29.83)
Panel C. Control group 1						
Volume	224	227	189	194	1520	1498
Mean price (in €)	9045.00	9160.96	10592.34	10608.52	1340,94	1349.43
	(338.64)	(620.08)	(473.51)	(786.32)	(72.83)	(104.12)

Notes: The hospitals' volume per product in this table slightly deviates from the hospitals' volume per product reported in table 4.1. In this table we only report the records with a valid price, whereas in table 4.1 only records with a valid gender, age and SES-score per product per hospital are reported. The mean prices for each hospital are the averaged over all patients. The mean price for control group 1 is the average over the mean prices of the hospitals within control group 1. The standard errors are in parentheses.

The insurer's HHI that was used to construct control group 5 is based on the insurer's market shares for each product and ranged from zero to one[228]. The insurer's HHI for hospital j and product d: insurer's $HHI_{jd} = \sum_{m=1}^{M} \left(\frac{q_{mjd}}{\sum_{m=1}^{M} q_{mjd}} \right)^2$, where q_{mjd} is the total number of patients of insurer m ($m=1, \ldots, M$) in hospital j for product d.

4.7 Empirical results

To gain a picture of the change in the market structure as a result of the merger, we calculated the market share of the combined entity M1 + M2 for each product and compared it to the weighted average of the separate market shares of hospitals M1 and M2. Both calculations were based on the pre-merger market shares (i.e., from year t-1)[229]. As expected, the weighted average market shares of the hospitals' products increased as a result of the merger. The increase is from 76.7% to 82.5% for hip replacements, from 78.2% to 85.7% for knee replacements, and from 83.5% to 86.6% for cataract surgeries. In table 4.6, we present the diversion shares of hospitals M1 and M2 that follow from the bargaining model presented in section 4.2. Diversion shares reflect the degree of substitution between hospitals. As indicated in section 4.2, a higher value of the diversion share suggests a higher degree of substitution between two hospitals in treating the same disease.

Table 4.6 – Diversion shares to/from hospitals M1 and M2 (in t-1)

	Hip replacements		**Knee replacements**		**Cataract surgeries**	
To \ From	M1	M2	M1	M2	M1	M2
M1	-	0.105	-	0.158	-	0.034
M2	0.735	-	0.663	-	0.850	-

Notes: The diversion shares are calculated using a conditional logit model of hospital choice, following Capps et al. (2003). We used patient-level data from t-1 to estimate the model, which included the travel time between the patient's zip code and hospital location, a dummy indicating whether the patient is older or younger than 65, a dummy for the patient's gender and the socio-economic status score for the patient's zip code.

From table 4.6 it follows that the diversion shares of hospital M1 to hospital M2 are much higher. Hospital M1 is located in a more isolated region with hospital M2 being its strongest competitor pre-merger. As expected, a large share of patients is diverted to hospital M2 once hospital M1 is not available. If the more centrally located hospital M2 would not be available, however,

228 Although it is also possible to calculate the hospitals' HHI, we opted for the weighted average market share that was based on the LOgit Competition Index (LOCI) because market delineation is necessary for the hospitals' HHI (in contrast to the insurers' HHI), but the use of market delineation methods in healthcare markets is the subject of increasing criticism (e.g., Elzinga & Swisher, 2011).

229 Measured by the inverse LOgit Competition Index – see section 4.6 for more information.

only few patients are expected to be diverted to hospital M1. When comparing the diversion shares over products, we find that the variation in diversion shares across products within each hospital is much smaller than the variation in diversion shares across hospital M1 and M2 for each product. Table 4.7 shows the average price increases for hip replacements, knee replacements and cataract surgeries for control group 1 and the merged hospitals M1 and M2, indexed on the average price in control group 1 in year *t*-1.

Table 4.7 – Price changes of hospitals M1, M2 and the control group pre- and post-merger (indexed on the average price in control group 1 in year *t*-1)

	Hospital					Control group 1				
	t-2	*t*-1	*t*	*t*+1	*t*+2	*t*-2	*t*-1	*t*	*t*+1	*t*+2
Panel A. Hospital M1										
Hip replacements	99	102	110	113	111	99	100	101	101	100
Knee replacements	101	104	105	107	105	99	100	100	99	101
Cataract surgery	101	103	102	104	100	98	100	99	99	95
Panel B. Hospital M2										
Hip replacements	99	102	97	99	99	99	100	101	101	100
Knee replacements	100	103	95	97	97	99	100	100	99	101
Cataract surgery	99	103	94	96	94	98	100	99	99	95

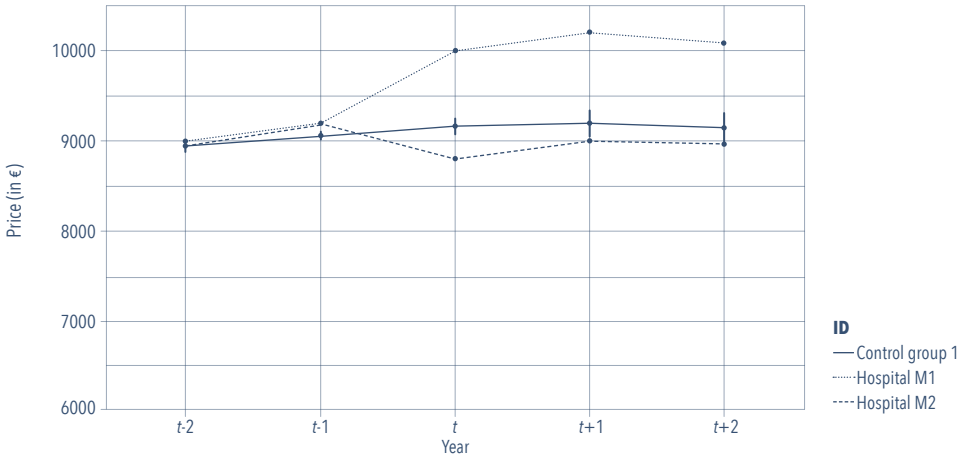
Notes: Indexed on the average price in control group 1 in year *t*-1; that is, the average price in control group 1 in *t*-1 is 100. The price for the control group is averaged over the mean prices of the hospitals in control group 1.

The table suggests that following the merger, both hospital locations charged different prices. As argued in section 4.4, the differences in competition intensity between the markets of hospitals M1 and M2, may induce the merged hospital to charge different prices. The prices for hip replacements did not change substantially between years *t*-2 and *t*+2 in control group 1. In comparison to the average control group prices in year *t*-1, the prices for hip replacements in hospital M1 increased by 13 percent after the merger (year *t*). This was the most substantial deviation from the average prices of control group 1 for year *t*-1.

As explained in section 4.5, however, price changes only give us a crude indication of the effect of the merger because they do not control for changes in prices that would have occurred anyway. We therefore estimate a model in which price changes at the merging hospitals are compared to price changes at a group of comparison hospitals which were unaffected by the merger (i.e., a difference-in-differences model). We visually investigate the common trend

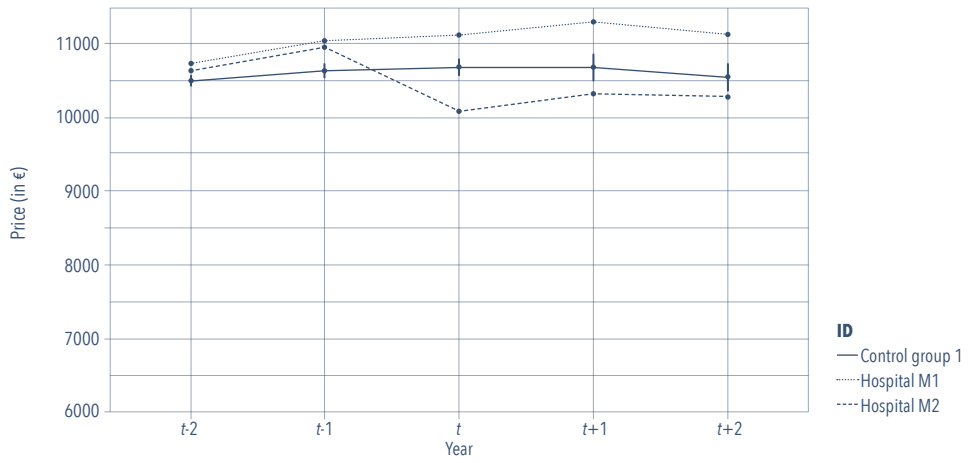
assumption on which the DID model is based. Figures 4.1-4.3 suggest that the pre-merger price change in the merged hospital did not deviate substantially from the pre-merger price changes in control group 1.

FIGURE 4.1 – Average price development hip replacements in hospitals M1, M2 and control group 1



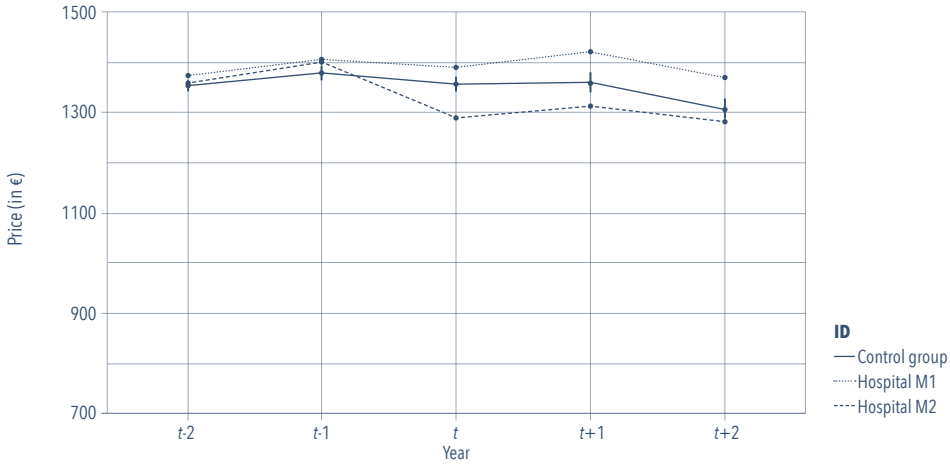
Notes: The prices plotted for control group 1 are averaged over all hospitals in control group 1. Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers.

FIGURE 4.2 – Average price development knee replacements in hospitals M1, M2 and control group 1



Notes: The prices plotted for control group 1 are averaged over all hospitals in control group 1. Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers.

FIGURE 4.3 – Average price development cataract surgery in hospitals M1, M2 and control group 1



Notes: The prices plotted for control group 1 are averaged over all hospitals in control group 1. Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers.

Table 4.8 presents the results of the difference-in-differences model aggregated over locations, insurers and products.

Table 4.8 – Merger effect aggregated over all three products, health insurers and hospital locations[a].

	Hospitals M1 & M2
(intercept)	8.869***
	(0.029)
Post-merger price change in the common trend (λ)	0.009
	(0.009)
Post-merger price change	-0.017
	(0.057)
Observations	54
R-Squared	0.719
Adjusted R-Squared	0.422

Notes: Models estimated by Ordinary Least Squares (OLS) with standard errors in parentheses under coefficients. In this model, hospitals M1 and M2 together are compared to control group 1. Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers. We aggregated the patient-level hospital data to a mean price per hospital. First, we calculated an average price per product for each hospital-insurer pair. Second, we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year *t*-1. Third, we aggregated over the products to an average price per hospital, whereby we weighted the hospital-product prices with the market-wide revenue shares for each product in *t*-1. We calculated an average price for the merged entity M1 + M2, by weighting the prices for hospitals M1 and M2 with their corresponding revenue shares in year *t*-1.

[a] For clarity reasons, we do not report the hospital dummies here.

*** Significant at the 1 percent level.

Table 4.8 shows that no significant merger effect was observed when the result was aggregated over locations, insurers and products.

In table 4.9, we again show the price effect, aggregated over insurers, products and locations (panel A, column 1) but we then disaggregated the effect by location (panel A, column 2 and 3), by product (panels B to D, column 1), by location and product (panels B to D, columns 2 and 3), by insurer (panel E, column 1), and, finally, by insurer and location (panel E, columns 2 and 3).

Table 4.9 – Merger effect for hip and knee replacements and cataract surgery stepwise disaggregation[a]

	Hospitals M1 & M2	Hospital M1	Hospital M2
Panel A. Aggregated over insurers & products			
(intercept)	8.869***	8.869***	8.869***
	(0.029)	(0.029)	(0.029)
Post-merger price change in the common trend (λ)	0.009	0.008	0.008
	(0.009)	(0.008)	(0.008)
Post-merger price change	-0.017	0.053	-0.053
	(0.057)	(0.057)	(0.057)
Observations	54	54	54
R-Squared	0.719	0.725	0.720
Adjusted R-Squared	0.422	0.434	0.423
Panel B. Hip replacements: aggregated over insurers			
(intercept)	9.130***	9.130***	9.130***
	(0.027)	(0.026)	(0.026)
Post-merger price change in the common trend (λ)	0.014*	0.014*	0.014*
	(0.007)	(0.007)	(0.007)
Post-merger price change	0.005	0.090*	-0.035
	(0.053)	(0.053)	(0.053)
Observations	57	57	57
R-Squared	0.733	0.745	0.734
Adjusted R-Squared	0.452	0.476	0.453
Panel C. Knee replacements: aggregated over insurers			
(intercept)	9.311***	9.311***	9.311***
	(0.031)	(0.031)	(0.031)
Post-merger price change in the common trend (λ)	0.003	0.004	0.004
	(0.008)	(0.008)	(0.008)
Post-merger price change	-0.021	0.021	-0.064
	(0.063)	(0.062)	(0.062)
Observations	57	62	62
R-Squared	0.708	0.709	0.707
Adjusted R-Squared	0.401	0.403	0.399
Panel D Cataract surgery: aggregated over insurers			
(intercept)	7.249***	7.249***	7.249***
	(0.029)	(0.028)	(0.028)
Post-merger price change in the common trend (λ)	-0.015**	-0.015**	-0.015**
	(0.007)	(0.007)	(0.007)
Post-merger price change	-0.038	0.027	-0.049
	(0.057)	(0.057)	(0.057)

Table 4.9 – Merger effect for hip and knee replacements and cataract surgery stepwise disaggregation[a]

	Hospitals M1 & M2	Hospital M1	Hospital M2
Observations	57	63	63
R-Squared	0.693	0.697	0.697
Adjusted R-Squared	0.371	0.378	0.378
Panel E. Per insurer: aggregated over products			
(intercept)	8.869***	8.869***	8.869***
	(0.029)	(0.029)	(0.029)
Post-merger price change in the common trend (λ)	0.008	0.008	0.008
	(0.008)	(0.008)	(0.008)
Post-merger price change insurer 1	-0.008	0.074	-0.052
	(0.057)	(0.057)	(0.057)
Post-merger price change insurer 2	-0.008	0.049	-0.032
	(0.057)	(0.057)	(0.057)
Post-merger price change insurer 3	-0.088	-0.137**	-0.070
	(0.057)	(0.057)	(0.057)
Post-merger price change insurer 4	0.054	0.115	-0.019
	(0.057)	(0.057)	(0.057)
Post-merger price change insurer 5	-0.011	0.106*	-0.046
	(0.057)	(0.057)	(0.057)
Observations	54	53	53
R-Squared	0.742	0.796	0.728
Adjusted R-Squared	0.430	0.549	0.398

Notes: Models estimated by Ordinary Least Squares (OLS) with standard errors in parentheses under coefficients. In this model, hospitals M1, M2 and M1 and M2 together are compared to control group 1. Control group 1 includes all Dutch hospitals that provide the product, excluding hospitals that also merged between years *t*-2 and *t*+2 and Independent Treatment Centers. The data for the model in *Panel A, columns 2 & 3* is aggregated over health insurers and products: (i) we calculated an average price per product for each hospital-insurer pair, (ii) we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year *t*-1 and (iii) we aggregated over the products to an average price per hospital, whereby we weighted the hospital-product prices with the market-wide revenue shares for each product in *t*-1. The data for the model in *Panels B, C & D, columns 2 & 3* is aggregated over health insurers: (i) we calculated an average price per product for each hospital-insurer pair, and (ii) we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year *t*-1. The data for the model in *Panel E, column 2 & 3* is aggregated for the *control group as in Panel A*. For the merged hospital entity M1+M2 (*column 1*) the data is aggregated: (i) we calculated an average price per product for each hospital-insurer pair, (ii) we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year *t*-1. We calculated an average price for the merged entity M1 + M2, by weighting the prices for hospitals M1 and M2 with their corresponding revenue shares in year *t*-1.

[a] For clarity reasons, we do not report the hospital dummies here.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

If we only disaggregate by location, product or insurer, no significant merger effect is found. However, if we disaggregate by both product and location, we find that the merger led to significantly increased prices for hip replacements in hospital M1, by a total of 9 percentage points. This was the overall price effect of the merger for hip replacements in hospital M1. When the price effect was estimated over hospital locations and products, the effect disappeared. Also, if we disaggregated by

Table 4.10 – Merger effect for hip and knee replacements and cataract surgery per health insurer in hospitals M1 & M2[a]

	Hip replacements	Knee replacements	Cataract surgeries
Panel A. Hospital M1			
(intercept)	9.130***	9.311***	7.249***
	(0.026)	(0.031)	(0.028)
Post-merger price change in the common trend (λ)	0.014*	0.004	-0.015**
	(0.007)	(0.008)	(0.007)
Post-merger price change insurer 1	0.113**	0.049	0.037
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 2	0.099*	0.024	-0.053
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 3	-0.118**	-0.153**	-0.114**
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 4	0.157***	0.089	0.067
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 5	0.147***	0.080	0.059
	(0.053)	(0.062)	(0.057)
Observations	57	62	63
R-Squared	0.828	0.767	0.740
Adjusted R-Squared	0.617	0.487	0.429
Panel B. Hospital M2			
(intercept)	9.130***	9.311***	7.249***
	(0.026)	(0.031)	(0.028)
Post-merger price change in the common trend (λ)	0.014*	0.004	-0.015**
	(0.007)	(0.008)	(0.007)
Post-merger price change insurer 1	-0.032	-0.066	-0.051
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 2	-0.029	-0.035	-0.016
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 3	-0.049	-0.084	-0.074
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 4	-0.021	-0.016	-0.010
	(0.053)	(0.062)	(0.057)
Post-merger price change insurer 5	-0.044	-0.049	-0.022
	(0.053)	(0.062)	(0.057)
Observations	57	62	63
R-Squared	0.738	0.716	0.706
Adjusted R-Squared	0.417	0.375	0.354

Notes: Models estimated by Ordinary Least Squares (OLS) with standard errors in parentheses under coefficients. In this model, hospital M1 and M2 are compared to control group 1 which includes all hospitals excluding other merging hospitals and Independent Treatment Centers. The data for this model is aggregated for the control group as follows: (i) we calculated an average price per product for each hospital-insurer pair, (ii) we aggregated these prices over the insurers to an average price for each hospital-product combination, whereby we weighted the prices with the insurer's specific volume shares in year t-1. For the merging hospitals the data is aggregated as follows: an average price per product for each hospital-insurer pair.

[a] For clarity reasons, we do not report the hospital dummies here.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

insurer and location, we found that the merger only resulted in price changes for specific health insurers and only at hospital M1. In table 4.10, we disaggregate the merger effect by location, product and insurer.

In section 4.4 we explained that we disaggregated the post-merger price change for each hospital location to see whether the merging hospital differentiated a potential price increase after merger across locations. Table 4.7 suggested that the hospitals had done so and when we use the difference-in-differences approach we also found that the post-merger increase in prices for hip replacements in hospital M1 varied significantly from the control group, whereas the prices for hip replacements in hospital M2 were unaffected by the merger. Apparently, the merged hospital differentiated its prices across locations.

We also disaggregated the effect of the merger for each product. We found that the price effects of the merger varied significantly between hospital products. Specifically, the merger resulted in higher prices for hip replacements in hospital M1, whereas the prices for knee replacements and cataract care in hospitals M1 and M2 remained unaffected.

Finally, we disaggregated the post-merger price changes for each hospital-insurer combination. For four out of five health insurers that negotiated prices with hospital M1, the post-merger price increases for hip replacements were on average 13 percentage points higher than for the control groups. The merger's price effect varied between health insurers from -12 to 16 percentage points relative to the control groups. Also, the largest health insurer – insurer 1, which represented 76 percent of hospital M1's patients – was unable to negotiate lower prices: the prices it paid for hip replacements rose by 11 percentage points as a result of the merger. In contrast, one of the four other much smaller health insurers – insurer 3, which represented only 11 percent of hospital M1's patients – was able to negotiate prices that were much lower than the control groups. These results were robust between the control groups. It is therefore less likely that the merger effect estimated was driven by unobserved characteristics in the control group[230].

Hence, what we can deduct from these tables is that aggregating the merger effect over locations, products and insurers masked considerable variations between locations, products and insurers. In other words, failing to disaggregate would prevent us from detecting the price effects of a hospital merger.

230 These findings are not reported in the article, but are available upon request by the authors.

4.8 Discussion

The main finding of our study is that a merger between two hospitals in overlapping geographical markets generated heterogeneous prices effects at the two different hospital locations, for different hospital products and for different health insurers. The theoretical model that was presented in section 4.2 explains why this might be the case.

4.8.1 Different price effects for different products

First, when we compare the price effects of a hospital merger on hip replacements, knee replacements and cataract surgery, we find a significant increase in the post-merger price of hip replacements but not of the other two products. This result was robust across all control groups and model specifications. In section 4.5, we explained that large post-merger price increases for the merged hospitals in comparison to prices among a control group could be consistent with at least four hypotheses. By a close consideration of the market under study, we can rule out the possibility that the increase in the post-merger price of hip replacements can be explained by a catching-up effect, or by an increase in quality or case mix severity. This because the pre-merger prices of hip replacements in hospital M1 were no lower than the prices at the comparison hospitals, as table 4.5 shows. Also, the pre-merger price for hip replacements at hospital M1 corresponds to the pre-merger price for hip replacements at hospital M2. According to the 'learning about demand' explanation, following a merger, a hospital is able to observe the prices paid to one of its former competitors, revealing potentially important information about the willingness of health insurers to pay for hospital services (see Adams & Noether, 2011). This explanation, however, cannot apply here as the pre-merger prices are similar. Furthermore, it is unlikely that the quality of care for hip replacements increased in hospital M1 following the merger. Although the hospital advertised quality increases in other procedures during the study period, this did not include the quality of its hip replacements. Furthermore, if it were the case that hospital M1 increased its quality because it learned from hospital M2 following the merger, we would expect prices to converge between the locations, but this did not happen. Also, an increase in quality that would justify such a large price increase (9 percentage points on average) would most likely also have an effect on patient volume at the expense of patient numbers at hospital M2 or rival hospitals, but this did not occur either.

Therefore, we find it unlikely that an increase in quality between t-1 and t+1 can account for the price increase for hip replacements in hospital M1. From table 4.1 it also follows that the demographic characteristics of the patients at hospital M1 did not change much following the merger. The number of males increased slightly, but as the number of males increased in almost all hospitals, this cannot explain the increase in the prices for hip replacements at hospital M1. Also, it is more likely that if the patients' case mix had increased post-merger, more complex cases would have gone to hospital M2 rather than to hospital M1 because hospital M2 is a larger general hospital that also provides tertiary care. In view of this, the most plausible explanation out of the four possible explanations that follow from the empirical literature is that the merger enhanced the market power of the hospitals.

However, this raises the question of why the price rise only occurred for hip replacements and not for knee replacements and cataract surgery. It is possible that this was due to a different level of competition intensity for these products. Indeed it followed from the theoretical framework that product d's price change after the merger in each hospital is increasing in the diversion share between these hospitals, as well as the price-cost margin of the partnering hospital. We found that the diversion shares in hospital M1 of hip replacements were no higher than the diversion shares of other products. In fact, the diversion share of cataract surgeries is higher, whereas the price change for cataract surgeries in hospital M1 after merger is not significant. Hence, based on the conclusions from the theoretical model, the difference in product-price effects after merger must be explained by other factors, i.e., the pre-merger price-cost margins of hospital M2. Unfortunately, we have no information on the product's price-cost margins of hospitals in this market. However, because the pre-merger prices for hip replacements in hospitals M1 and M2 were remarkably similar according to table 4.5, the theory suggests that the pre-merger cost of hip replacements at hospital M2 were lower than the pre-merger cost of hip replacements at hospital M1.

Nevertheless, the finding that price effects *are* heterogeneous across hospitals' top-revenue products highlights the importance of using a more disaggregated approach rather than the more aggregated approach, when defining product markets. In practice, it is often assumed that the merger price effect will be the same for all hospital products because acute care, inpatient services can

be considered as a single and thus homogeneous hospital product in cases of hospital mergers. Typically, antitrust agencies use a cluster approach to define hospital product markets and most empirical studies follow this approach and look at the aggregated price effects of hospital mergers. Also, the bargaining models that were developed to reflect hospital-insurer bargaining assume that a hospital system and an insurer bargain over a single base price per hospital location. In section 4.2, we already noted that freeing the product price ratios would more closely correspond to hospital-insurer bargaining in practice. The hospital market is highly complex due to the multiplicity of services offered and the heterogeneity of consumers and therefore many different hospital products exist. Sacher and Silvia (1998) show that using the standard inpatient cluster may mask considerable variability in the concentration statistics across the inpatient categories that make up an overall cluster. They argue that disaggregation can provide a better understanding of the potential competition effects of a merger in a range of market configurations. A similar point is made by Hentschker et al. (2014).

Also, from the theoretical model it followed that price effects after merger may differ between hospital products. For that reason, when we estimated the model parameters, we also disaggregated the effects of the merger by product markets. Like Sacher and Silvia (1998), we find that disaggregation can provide a fuller understanding of the potential competitive effects of the merger. However, if potential competitive effects are not homogeneous over product markets this may have important implications for future antitrust scrutiny. If the rules for market definition that are formulated in the EC merger guidelines (EC, 1997)[231], as well as in the US merger guidelines (FTC, 2010)[232], were applied strictly, hundreds or maybe thousands of separate hospital product markets would have to be distinguished because many hospital products and services are not demand or supply substitutes as prescribed by these rules. Clearly this would not be a feasible strategy in cases of hospital mergers. Hence, only a certain level of disaggregation would be warranted. Although our theoretical model defines each product d as a treatment of one illness, d may also be understood as a product cluster combining several illnesses based on revenue or volume or specialism or otherwise. Hence, the model conclusions also hold for the situation in which some clustering (aggregation) is applied in order to reduce the number of product dimensions in the analysis or because this more closely

231 According to the EC (1997) Commission Notice, 'A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use'.

232 According to the FTC (2010) Merger Guidelines: 'Market definition focuses solely on demand substitution factors, i.e., on consumers' ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service'.

corresponds with practice. Sacher and Silvia (1998) show that even a very limited disaggregation of the standard inpatient cluster can lead to a more accurate merger analysis. Zwanziger et al. (1994), too, propose a manageable disaggregation of the standard clusters. Because it is unclear how often antitrust outcomes would be affected by using a different level of aggregation (Sacher & Silvia, 1998), we suggest using both the clustered approach as well as a limited disaggregated approach when defining product markets in the case of hospital mergers. One feasible approach may then be similar to our approach in which at least the top 3 or top 5 of the highest revenue products affected by the merger are analyzed separately. If the initial disaggregated approach gives rise to suspicions, the analysis can be further disaggregated[233].

If antitrust authorities indeed decide to conduct disaggregated analyses, it is an interesting question how an antitrust authority should deal with differences in merger outcomes between products. It is unlikely that the antitrust authority will block a merger if the prospective analysis indicates that the prices for one product will increase, whereas the prices of other products will not be affected. Rather, finding different effects across products may lead to interventions that are specifically addressed only to the product that is found to be affected by the merger. For example, antitrust authorities may impose remedies requiring the divestiture of a specific product, imposing the obligation to support new entrants (like ITCs) or introducing a price ceiling on particular products at one or more hospital locations.

4.8.2 Different price effects at different locations

Second, the merged hospital raised its price for hip replacements significantly at one location (hospital M1), but not at the other (hospital M2). To establish whether the merging hospitals experienced different price changes after merger, we aggregated the post-merger price change according to hospital location. It followed from the theoretical model that price changes caused by merger are proportional to the merging hospitals' diversion shares and the initial price-cost margins of the merger partner. To date, however, most studies have not controlled for this potential source of heterogeneity. Only Tenn (2011) examines and finds evidence of differential pricing strategies after merger.

In our case study, the merging hospitals' diversion shares were different due to their geographic location. Hospital M1 is located in

233 In practice, antitrust authorities occasionally take potential differences between products into account. For example, in one case the UK Competition Commission performed a detailed analysis of the appropriate product markets (CC, 2013) and in the FTC v. ProMedica Health System case, the US antitrust authority paid special attention to the inpatient obstetrical services in addition to general acute-care inpatient services (FTC, 2012).

a more geographically isolated area. Hospital M2 was the strongest competitor to hospital M1 and therefore posed a major constraint on hospital M1's prices prior to the merger. Hospital M2, however, faced additional competition from other hospitals. This difference manifests itself in higher diversion shares for hospital M1 than for hospital M2 before merger (table 4.6). After the merger, the two hospitals were likely able to internalize this constraint, leading to higher prices at hospital M1. They were able to do this without being penalized by rivals because hospital M1 experienced competitive pressure from only one rival hospital after the merger. By contrast, hospital M2 still experienced significant competitive pressure from five other hospitals after the merger. In this setting, differentiating prices according to the location may be a profitable strategy for the merged hospital: hospital M1 was in a position to raise its prices whereas maintaining a steady flow of patients, whereas hospital M2 maintained its prices at the pre-merger level in order to prevent losing patients to a rival hospital. Our results are consistent with this line of reasoning: the price change after merger was higher for hospital M1 whose diversion shares to hospital M2 were much higher than the diversions shares from hospital M2 to hospital M1.

By means of our empirical analysis we showed that it needs to be recognized that a merger between a rather isolated hospital location and its closest substitute creates opportunities for post-merger price increases that may be overlooked when not taking the disaggregate approach. Our findings suggests that the competition intensity that merging locations experience before and after merger may differ considerably between locations even if the merger entails two neighboring hospitals. Because this difference may result in a heterogeneous merger effects across locations, antitrust agencies should take the difference between locations into account. Given that these hospitals initially function as separate entities, the data that would be needed for the analysis at the location level should be available. However, then the question remains how antitrust authorities should deal with differences in merger outcomes between locations. We discussed product-specific remedies in the previous paragraph. Likewise, antitrust authorities may think about location-specific remedies in case they predict the merger effect to be differentiated across locations. Like product-specific remedies, location-specific remedies might entail structural remedies or behavioral remedies that are only aimed at the location(s) that is (are) affected by merger[234].

234 Occasionally, antitrust authorities have opted for imposing remedies at the entire location level. Divestitures of hospital locations were, for example, ordered by the US antitrust authority in the FTC v. ProMedica Health System case (FTC, 2012) and by the German antitrust authority in the Asklepios/LBK Hamburg case (Bundeskartellamt, 2005), whereas in the Evanston Northwestern/Highland Park Hospital case the US antitrust authority imposed a firewall so that the two firms had to negotiate separately with insurers after merger (FTC, 2008). See Gowrisankaran et al. (2015) for a critical review of the latter remedy.

4.8.3 Different price effects for different insurers

The theoretical model that we presented in this article showed that the price change caused by merger may differ between health insurers. In our empirical analysis we disaggregated the overall results for each hospital-insurer combination which revealed that there is considerable heterogeneity across health insurers in the change in the post-merger negotiated prices. For four out of five health insurers that negotiated prices with hospital M1, the post-merger price increases for hip replacements were on average 13 percentage points higher than the control group. The merger's price effect varied between health insurers from -12 to 16 percentage points relative to the control group. This finding corresponds to the results from an earlier retrospective study from the US (Thompson, 2011), which indicated that two health insurers experienced price increases due to the hospital merger under study, whereas a third insurer experienced a price decrease and a fourth experienced no price effect from the merger.

The theoretical model suggests that the insurer-specific price differences may arise due to differences in the insurers' bargaining abilities. In particular, a health insurer with more bargaining weight or ability is confronted with a higher price increase after the merger.

The source of bargaining ability of health insurers is the topic of many studies. The evidence suggests that idiosyncratic effects such as bargaining skills of the individuals at the negotiating table might have a sizeable impact on the market outcomes (Sorensen, 2003; Halbersma et al., 2010; Grennan, 2014). Thompson (2012) furthermore suggests that the differences between insurers may be attributed to variations in the types of plans that the insurers offer and the services that they provide. Hence, although the bargaining model gives us some ideas on the source of heterogeneity in the post-merger price effects across health insurers, it remains largely unclear why such large differences exist across insurers within markets and why some health insurers experience price increases whereas others experience price decreases after merger. Because this is an issue that has been indicated a few times in research on hospital mergers (Thompson, 2012; Gaynor & Town, 2012), we suggest that further research on hospital-insurer bargaining should aim to establish the source of bargaining ability of health insurers in relation to hospital mergers.

From a policy perspective, the fact that post-merger price effects are not homogeneous across insurers within markets is an interesting finding, however. It is furthermore interesting to note that the heterogeneities are large. In *ex ante* merger reviews in the Netherlands, the Authority for Consumers and Markets (ACM) asks representatives of large health insurers in the region about their expectations regarding competitive effects of the merger. In fact, in the guidelines for assessing mergers and collaborations in healthcare, issued in 2013, the ACM says: 'When assessing a concentration's implications, the arguments put forward by insurers and patient organizations will be central.' (ACM, 2013). Like in most prospective merger cases, the representatives of the two largest health insurers in the region indicated that they did not anticipate negative competitive effects from the consolidation that we studied; and partly because of that reason the merger was cleared. However, the retrospective analysis indicates that the health insurers that believed to be able to counteract post-merger price increases were not both able to do that. We therefore suggest that a more critical assessment of health insurers' bargaining ability in merger cases is warranted.

4.9 Conclusion

In this study, we expanded existing bargaining models to allow for heterogeneous product-price effects and used a difference-in-differences model in which price changes at the merging hospitals are compared to price changes at a group of comparison hospitals. The main finding of our study is that the merger led to heterogeneous prices effects for different health insurers, hospital products and hospital locations and that these differences depend on (i) the degree of substitution between hospitals, which may also vary over products, (ii) the relative bargaining ability of hospitals and insurers and (iii) the pre-merger price-cost margins of different products delivered by these hospitals.

The theoretical model provided us with valuable insights on the sources of heterogeneity, whereas our detailed empirical analysis of a hospital merger improved our understanding of the magnitude of differences. The analysis, however, also gives rise to three areas for future research. First, it would be interesting to replicate this study for different hospital mergers to find out which of our findings persist. Second, more insight into the sources of insurers' bargaining ability would be valuable. Third, analysis of pre-merger

price-cost margins will improve our understanding of heterogeneous post-merger price effects across products.

Nevertheless, the fact that price effects of a merger are heterogeneous across products, locations and insurers signals important conclusions for *ex ante* merger scrutiny. First, it highlights the importance of using a disaggregated approach rather than the current cluster approach when defining product markets. Second, it suggests that future prospective merger analyses should take potential differences across hospital locations into account. Finally, it asks for a critical assessment of health insurers' bargaining ability in merger cases.

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CHAPTER 5

Back to the Future: Predictive Power of the Option Demand Method in the Dutch Hospital Industry

With Ramsis R. Croes

Abstract

Antitrust authorities need new approaches to predict the effects of healthcare mergers. Merger simulation models are promising alternatives to highly debated traditional approaches, but they have only been validated to a limited extent. This paper evaluates the predictive power of the Option Demand method, a merger simulation model developed specifically for the US hospital market. We contrast the predictions of the merger simulation model to the estimated price effects of a consummated merger between two Dutch hospitals. We find that the Option Demand method could be a valuable addition to the antitrust agencies' toolkit, but that more research is necessary.

5.1 Introduction

In competitive markets, the aim of preventive merger control is to prohibit anticompetitive consolidation. To determine whether a merger between two (or more) firms will result in anticompetitive price increases (and/or quality decreases), antitrust authorities need to carry out an *ex ante* (prospective) review. Unfortunately, the approaches that are commonly used to prospectively review mergers are problematic. Generally, these methods first define the relevant market for the industry being studied and then use market shares to infer how the merger could affect competition in that market (Shapiro, 2010; Werden & Froeb, 2006). However, in order to delineate the relevant market, they typically rely on disputed methodologies and the conclusions drawn from the resulting analysis will depend heavily on how that market is defined. Moreover, these measurements are imperfect indicators of market power and so they do not necessarily reveal the actual exercise of market power. Merger reviews in the healthcare sector are subject to an additional difficulty because there are unique factors that render the most commonly used tests for measuring geographic markets less reliable in healthcare than in other sectors (Elzinga & Swisher, 2011). Antitrust authorities therefore struggle to delineate the healthcare market effectively (Gaynor & Town, 2012; Varkevisser & Schut, 2012; Capps et al., 2002).

The most promising alternatives to these traditional approaches to review mergers are Merger Simulation Models (MSMs). The use of MSMs has clear advantages over the traditional approaches. MSMs use structural models to represent specific industries. By calibrating these models to the specifics of the market being studied, they can be used to predict the price effects of a merger directly (Werden, 2005). Merger simulations take into account more than just market shares and concentration levels; they do not require or depend upon arbitrary market definitions (Argue & Shin, 2009). For all these reasons, interest in MSMs is growing, both in the US and the EU (see e.g., Budzinski & Ruhmer, 2009; Argue & Shin, 2009; Walker, 2005; Kalbfleisch, 2005). However, the important question of whether MSMs are able to predict anticompetitive price increases accurately has not yet been answered conclusively. So far, MSMs have only been validated to a limited extent; they are always used in combination with traditional approaches and have rarely been subject to public scrutiny (Budzinski & Ruhmer, 2009). Only merger

simulation models that can produce reliable predictions are useful for merger policies, and the key issue with any merger simulation is its predictive capacity.

This paper contributes to the small, but growing, body of literature relating to the evaluation of merger simulation methods by evaluating the predictive powers of a reduced-form MSM that was developed specifically for hospital markets. The reduced-form MSM that we tested is referred to by its developers as the Option Demand method (OD method). In the literature, this model is also referred to as the Capps, Dranove and Satterthwaite (CDS) or Willingness-to-Pay (WTP) model. The OD method is designed specifically to model markets in which managed care organizations or health insurers (selectively) contract with hospitals (Capps et al., 2003; Town & Vistnes, 2001). Recently, this model has been generalized by Gowrisankaran, Nevo and Town (2015)[235].

In this paper, we use the OD method to predict the price effects of a hospital merger between a general acute care hospital (hospital M1) and a neighboring general acute care hospital that also provides tertiary hospital care (hospital M2) that took place in the Dutch hospital market[236]. From the viewpoint of the Option Demand method, the current Dutch healthcare system bears evident similarities with the US healthcare system. We explicitly take the multiproduct nature of hospitals into account by examining the price effects of the hospital merger for different hospital products. We also allow for potential differences in bargaining outcomes between neighboring locations by predicting the merger effects for each location. We use an instrumental variable approach to control for potential endogeneity issues. The actual price effects of the merger that we study are determined through a difference-in-differences (DID) technique (Roos et al., 2017). By contrasting the simulated price effects with the actual price effects of the merger, we are able to evaluate the predictive power of the Option Demand method for hospital mergers in the Dutch context.

This paper is structured as follows. In section 5.2, we discuss how to identify unilateral effects after a horizontal merger and we consider the small number of available studies that evaluate the accuracy of merger simulation models. Section 5.3 describes the Option Demand model and discusses the applicability of the Option Demand method to the Dutch healthcare industry. Section 5.4 focuses on the modeling details of the Option Demand method

235 For an extensive review of the literature on modeling hospital competition, see Gaynor et al. (2015).

236 For reasons of confidentiality, we anonymize the merged hospitals' and health insurers' names. For the same reason, the merger year is reported as *t* (*t* lies in the period 2005 – 2012).

and in section 5.5 we focus on the details of the estimation that we carried out. Section 5.6 describes the data that were used and section 5.7 presents the results. In section 5.8 we briefly discuss the findings of the retrospective study and compare the simulation results with the effects of the actual merger. In section 5.9 we present our conclusions on the predictive power of the reduced-form merger simulation model that we have applied.

5.2 Merger simulation models

5.2.1 Identifying unilateral effects after a horizontal merger

According to most national and supranational antitrust laws, mergers must be reported to an antitrust authority prior to being consummated[237]. After notification, the antitrust authorities carry out a review of the proposed merger, in which they make inferences regarding the expected anticompetitive effects of a merger in the relevant market. In general, horizontal mergers may give rise to two types of anticompetitive effects: (i) unilateral and (ii) coordinated effects. Both unilateral and coordinated effects may lead to higher post-merger prices, but prospective merger analyses focus predominantly on predicting the unilateral effects that a merger may cause (Baker, 2003). In this paper, we also focus on the potential for unilateral effects.

Two methods are available to determine unilateral effects quantitatively: (i) a market definition approach and (ii) methods to predict unilateral effects directly. The market definition approach first defines the market and then hypothesizes on the merger-effect in that market. However, the market definition approach has several shortcomings, particularly when applied to the hospital industry (Dranove & Ody, 2016; Elzinga & Swisher, 2011; Gaynor et al., 2011; Kaplow, 2011; Shapiro, 2010; Varkevisser et al., 2008; Capps et al., 2002). For example, the approach assumes that a product is either inside or outside the market. The products in the market are assumed to be subject to equal competitive pressure, while the products outside the market are not taken into account. However, in a market with differentiated products – which is typically the case for hospital markets – the degree of competition between two products depends on their substitutability and it is often difficult to draw meaningful boundaries between markets (Werden & Froeb, 2006). Furthermore, it is only when very specific assumptions are made (e.g., homogeneous goods) that market shares can

237 See 15 USC §18A for the US and the competition laws of the EU Member States or EC:2004 for the European Union's rules on prior merger notification.

be translated into unilateral price effects (Kaplow, 2011). The Elzinga-Hogarty test, in particular, has also been criticized because of its limited applicability to the hospital industry, mainly because of what has become known as the silent majority fallacy (e.g., Elzinga & Swisher, 2011; Capps et al., 2001).

Given the drawbacks of the market definition approach, alternatives such as MSMs that screen or predict anticompetitive effects directly and that circumvent the need for market delineation are promising alternatives.

5.2.2 Merger Simulation Models

An MSM builds a structural model of the industry being studied. Typically, a structural model consists of (i) a demand model, which models the consumers' decision-making process and (ii) a model of competition, which models the supply-side of the market on the basis of the firm's behavior, the actions of its rivals and the consumer demand model. Having defined the competition model that best fits the industry being studied, the demand model can be estimated and the model of competition should be calibrated with pre-merger data. Next, a merger can be simulated by changing the ownership structure, for example by modeling that the number of competitors in a market decreases from 4 to 3 after merger (Budzinski & Ruhmer, 2009).

A major issue with merger simulations is their predictive power and, thus, their credibility as a technique in the prospective merger review process (Budzinski & Ruhmer, 2009). Only MSMs that are able to predict the actual effects of mergers accurately are useful for merger policy. Weinberg and Hosken (2013) stipulate that there are two methods for testing structural models: (i) the marginal costs approach, in which the actual (observed) marginal costs are contrasted with the marginal costs calculated by the calibrated simulation model; and (ii) the market structure approach, in which actual (observed) changes in price and/or quality following a merger are contrasted with the changes in price and/or quality simulated by the structural model. Budzinski and Ruhmer (2009), Werden and Froeb (2006) and Davis and Garcés (2010; chapter 8) describe both these methods in detail. Our study employs the second approach. Hence, we use past changes in market structure and the resulting price effects to test the accuracy of a (reduced-form) merger simulation model.

There are a handful of studies that have used the market structure approach to test merger simulation models. In addition to the three studies reviewed by Budzinski and Ruhmer (2009) (i.e., Pinkse & Slade, 2004; Peters, 2006 and Weinberg & Hosken, 2013[238]), Weinberg (2011), Friberg and Romahn (2015), Greenfield et al. (2015) and Björnerstedt and Verboven (2016) also apply this approach. The studies differ in their efficacy (i.e., whether they are able to accurately predict price effects). In terms of methodology, they most often use a Bertrand model to model market competition. The studies use different demand functions to reflect the differences in industries and data and they also differ in the methodology that they employ to compare the simulated price changes to the actual price changes induced by the merger. Also, none of the previous studies have focused on hospital merger cases, although the problems that arise from using the more traditional market definition approaches are particularly striking in this sector (e.g., Elzinga & Swisher, 2011). A notable exception is a recent FTC working paper (Garmon, 2016) that reflects on the accuracy of hospital merger screening methods. The study concludes that the market definition approach is less accurate at predicting post-merger price effects than more recently developed models, including the Option Demand method (Garmon, 2016). In contrast to Garmon (2016), we do not focus on contrasting the results of traditional approaches versus MSMs but rather on the predictive powers of one reduced-form MSM that is tailor-made for the healthcare industry: the Option Demand model.

238 Budzinski and Ruhmer (2009) review an earlier version (working paper: Weinberg. Matthew C. and Daniel Hosken. 2008. 'Using Mergers to Test a Model of Oligopoly'. *Working paper*. University of Georgia) of Weinberg & Hosken (2013).

5.3 The Option Demand method and its applicability to the Dutch healthcare system

5.3.1 What are Option Demand markets?

The Option Demand model that we evaluate in this paper was developed by Town and Vistnes (2001) and further refined by Capps et al. (2003) and Gowrisankaran et al. (2015). The papers developed a framework for analyzing bargaining relationships between hospitals and insurers under selective contracting. Under such a healthcare system, consumers buy health insurance from health insurers. The consumers decide on a specific health insurance policy on the basis of the network of hospitals that the insurance contract offers and the premium. Each hospital renegotiates the terms of its contracts with health insurers on a regular basis. The idea is that the (threat of) selective contracting

of hospitals may enable insurers to negotiate lower prices and/or higher quality, which may lower premiums (Ho, 2009).

The OD method builds on this two-layer model of the hospital industry; that is, it models that (i) consumers buy health insurance from health insurers before fully knowing their medical needs and (ii) health insurers bargain and contract with healthcare providers (here: hospitals) on behalf of their insured. Following Dranove and White (1996), Capps et al. (2003) refer to markets that exhibit these two layers as 'Option Demand' markets (or OD markets), since the consumer commits to a possibly restricted network of hospitals when he buys health insurance prior to knowing his future healthcare needs and when he is in need of specific care, he has the option of visiting any of the contracted hospitals. The value that a consumer then places on health insurance depends on his expected demand for healthcare and the expected utility that a particular hospital from this network will provide him. This value can be expressed as Willingness-To-Pay (WTP). The notion of WTP gives an estimate of how much consumers are willing to pay *ex ante* to retain access to this hospital in the network. The WTP is therefore a proxy of the hospital's market power: a hospital with a high WTP score will be better able to secure higher prices from the health insurer than a hospital with a low WTP score (Capps et al., 2003:738).

5.3.2 The applicability of the Option Demand method to the Dutch healthcare sector

To date, the OD method has been applied by Capps et al. (2003), by Dranove and Sfekas (2009) and by Dranove and Ody (2016) who find a positive relationship between hospital profits and WTP. Garmon (2016) finds an imprecise relationship between prices and WTP. The OD method has also been applied by the US Federal Trade Commission (Dranove & Ody, 2016; Garmon, 2016).

From the viewpoint of the Option Demand method, the current Dutch healthcare system bears similarities with the US healthcare system. In recent decades, the Dutch healthcare system has moved away from strict governmental supply-side regulation and towards regulated (or 'managed') competition (Van de Ven & Schut, 2008; Schut & Van de Ven, 2005). Of particular importance to this paper is the gradual introduction of hospital-insurer bargaining since 2005. In 2005, a product classification system for hospital and medical specialist care was introduced. Each activity and/or hospital service associated with a patient's demand for care, including outpatient

care, is referred to as a Diagnosis and Treatment Combination (or DTC)[239]. Following the introduction of the DTC system, the room for free negotiations between hospitals and health insurers on prices, volume and quality was gradually increased from 10% of hospitals' revenue in 2005, to 20% in 2008, to 34% in 2009 and to 70% in 2012. The remainder of hospital prices is regulated by the Dutch Healthcare Authority. For those services in the free-pricing segment, each hospital typically renegotiates the terms of its contracts with health insurers on an annual basis. Health insurers are allowed to contract selectively with healthcare providers.

239 The DTC system is based on the concept of DRGs (Diagnosis-Related Groups) but constitutes a newly developed classification system.

The two-layer model that underlies the OD method seems to reflect the Dutch healthcare system accurately; consumers buy health insurance from health insurers and health insurers bargain and contract with hospitals on behalf of their enrollees. In the early years of the reform selective contracting was limitedly used. However, over the years, the number of health insurers offering contracts with restricted provider networks has increased. Furthermore, the introduction of a new Health Insurance Act has led to strong price competition between health insurers, and health insurers have put increasing pressure on hospitals to charge lower prices (Schut & Van de Ven, 2011). The threat of selective contracting, rather than its actual use, may already have had an impact on hospital-insurer bargaining. We therefore consider the OD method applicable to the free-pricing segment of the Dutch hospital industry.

5.4 The Option Demand method: the modeling details

In this section, we describe how to estimate the demand model and Willingness-To-Pay (WTP) (section 5.4.1), how to estimate the supply side and the competition model (section 5.4.2) and how to simulate a merger with the WTP (section 5.4.3). Our paper makes two modifications to the model by Capps et al. (2003).

First, we explicitly take into account the multiproduct nature of hospitals by examining the price effects of the hospital merger for different hospital products. Typically, antitrust agencies use a cluster approach to define hospital product markets, assuming that 'acute care, in-patient services' can be considered as a single and thus homogenous hospital product. Most empirical studies follow this approach and examine the aggregated price effects of hospital mergers. However, the hospital market is highly complex

due to the multiplicity of services provided and the heterogeneity of consumers, which is in turn caused by differences in medical treatment needs and third-party payer coverage. Sacher and Silvia (1998) show that using the standard in-patient cluster may mask considerable variability in the concentration statistics across the in-patient categories that make up a whole cluster. They show that disaggregation can provide a fuller understanding of the potential competitive effects of a merger in a variety of market configurations. Roos et al. (2017) also find evidence of heterogeneous price effects across products in their retrospective case study. They studied the same merger case as the one simulated in this paper. We therefore also disaggregate the effect of the merger by product markets. We estimate the impact of the merger in three separate product markets that jointly represent 47.5 per cent of the merged hospital's turnover in the segment for which Dutch insurers and hospitals at the time of the merger were allowed to freely negotiate prices. The products included in this study are hip replacements, knee replacements and cataract surgery.

Second, our study allows for potential differences in bargaining outcomes between neighboring locations of merged hospitals by predicting the merger effects for each location. Hitherto, most studies have aggregated the merger effect, thereby disregarding the fact that post-merger differences in market power for each location may lead to opportunities to differentiate pricing strategies. In the case of multiple locations, price differentiation across locations may be a profitable strategy for the merged hospital. In retrospectives studies, Roos et al. (2017) and Tenn (2011) find evidence of differential pricing strategies in hospital mergers. However, most previous studies on mergers have not controlled for this potential source of heterogeneity. We disaggregate the predicted price change for each hospital location. In sections 5.4.2 and 5.5, we will explain in more detail how we handled the modification of the model by Capps et al. (2003) in our paper. We also discuss the relationship with the extension of the OD model by Gowrisankaran et al. (2015).

5.4.1 Step 1: demand model and Willingness-To-Pay (WTP)

Under the OD method, a consumer's demand for hospital treatment is modeled using a conditional logit demand function (see McFadden, 1974). Under this model, patient i seeks treatment after falling ill. His health insurance gives him access to network G of hospitals (all the available hospitals in the market). The expected utility of patient i for receiving treatment at hospital j is given by:

$U_{ij} = U(H_j, X_i, \lambda_i) + \varepsilon_{ij}$ where H_j is a vector of hospital j characteristics. X_i is a vector which combines the characteristics and clinical attributes of patient i. The patient's travel time (λ_i) is determined by the distance between the patient's location (e.g., zip code) and the hospital j. Under the conditional logit demand function, we assume that the residuals (ε) are i.i.d. with the double standard exponential distribution (see McFadden 1974)[240].

Using a logit demand model, the probability that patient i chooses hospital j is given by: $s_j(H_j, X_i, \lambda_i) = \frac{exp[U(H_j, X_i, \lambda_i)]}{\sum_{g \epsilon G} exp[U(H_g, X_i, \lambda_i)]}$.

Denote the utility of patient i for access to network G as $V^{UI}(G, X_i, \lambda_i)$. The WTP of patient i for hospital j, denoted by $\Delta V_{ij}^{UI}(G, X_i, \lambda_i)$, is the reduction in V^{UI} due to the exclusion of hospital j from network G. Hence, $\Delta V_{ij}^{UI}(G, X_i, \lambda_i) = V_{ij}^{UI}(G, X_i, \lambda_i) - V_{ij}^{UI}(G/j, X_i, \lambda_i)$, where G/j is the network of hospitals G excluding hospital j. Capps et al. (2003) show that it follows from the logit demand that for the WTP of patient i for hospital j that:

$$\Delta V_{ij}^{UI}(G, X_i, \lambda_i) = ln\left[\frac{1}{1 - s_j(H_j, X_i, \lambda_i)}\right].$$

The *ex ante* WTP for the entire population (with N ill consumers) of hospital j is the weighted sum of the patients' WTPs (Capps, Dranove, and Satterthwaite 2003:743):

$$W_j = N \int_{x,\lambda} \frac{1}{\gamma} ln\left[\frac{1}{1 - s_j(H_j, X_i, \lambda_i)}\right] f(X_i, \lambda_i) dX_i d\lambda_i,$$

where the population density distribution of all ill consumers is given by $f(X_i, \lambda_i)$ and constant γ convert utils into monetary terms. Since we do not observe constant γ, we use WTP up to the unidentified scale factor. For our application this is sufficient, since we are not interested in the exact value of the WTP.

We apply the discrete equivalent of the above equation to calculate the WTP of each hospital (see also Garmon, 2016; Balan & Brand, 2015; Farrell et al., 2011). Further, following Farrell et al. (2011), we rescale the WTP according to the hospital's expected number of patients. The rescaled discrete WTP equation for hospital j is[241]:

$$w_j = \frac{\sum_{i=1}^{N} ln\left[\frac{1}{1 - s_j(H_j, X_i, \lambda_i)}\right]}{\sum_{i=1}^{N} s_j(H_j, X_i, \lambda_i)}. \quad \textbf{(5.1)}$$

240 To avoid the IIA property that underlies the conditional logit functions, some studies use the mixed logit model to analyze patient hospital choice (see e.g., Pope, 2009; Varkevisser et al., 2012). Farrell et al. (2011) find that there is almost no difference in the estimated hospital-level diversions in the patient-level mixed logit compared to the standard patient-level conditional logit model. Recent studies on hospital choice use the conditional logit model (e.g., Chandra et al., 2016; Gaynor et al., 2016; Gutacker et al., 2016; Frank et al., 2015; Chou et al., 2014; Ho & Pakes, 2014).

241 The unscaled WTP employed by Capps et al. (2003) also increases with the number of patients that a hospital treats. This is undesirable. The rescaled WTP is high only if a hospital does not have close substitutes.

5.4.2 Step 2: supply side and competition model

Under the OD method, the idea is that if a hospital adds a high value to the health insurance network, it will be able to extract more profits from its negotiations and vice versa. Hospitals and insurers thus bargain according to the total value that hospital j adds to the health insurance network, i.e., w_j . Following Capps et al. (2003), we model this negotiation with a reduced-form bargaining model:

$$p_j - c_j = \alpha \cdot w_j, \tag{5.2}$$

where p_j is the revenue per patient and c_j is the variable cost per patient. This equation thus gives the relationship between the margin of hospital j, i.e., the per-patient revenue minus the variable cost per patient, and the WTP per patient for hospital j. The per-patient gain of including hospital j in the network is split between the hospital and the insurer. Parameter α is the proportion that each hospital captures ($0 \leq \alpha \leq 1$). Parameter α is fixed and depends on the parties' relative bargaining abilities (Farrell et al., 2011).

Gowrisankaran et al. (2015) present a structural bargaining model that is more general than the Capps et al. (2003) model that we present here. Gowrisankaran et al. (2015) show that the Capps et al. (2003) model is a special case of their structural bargaining model. An important extension in the model of Gowrisankaran et al. (2015) is that patients face coinsurances. The Capps et al. (2003) model assumes that there is no coinsurance, which simplifies the bargaining model. In the Dutch market, there is no coinsurance. There is a yearly mandatory deductible that the patient pays when he starts using healthcare. However, the deductible is limited to a relatively small fixed amount (220 euro per year in 2012). Since most hospital prices are higher than this amount, each patient receiving treatment at any hospital would generally pay the same deductible. Hence, deductibles are expected to hardly affect patient hospital choice, which implies that the no out-of-pocket payment assumption is also justifiable in our application of the model. Another extension of Gowrisankaran et al. (2015) is that they take health insurers' costs into account in the bargaining model. However, following Capps et al. (2003) and as is often done in practice (Gaynor et al., 2015), we regress price on WTP measures and add marginal cost controls to the regression in our reduced-form merger simulation[242].

242 In a Monte Carlo setting, Balan and Brand (2015) compared the true price effects of more general bargaining models with WTP-based merger simulation methods. They conclude that generally the WTP-based merger simulation methods perform well.

5.4.3 Step 3: merger simulation with WTP

In a merger review, antitrust authorities need to make an *ex ante* review to find out whether the merger between two (or more) hospitals will result in anticompetitive price increases. In our model, this means that we are interested in the increase in the post-merger prices of entity j+k compared to the pre-merger prices of hospitals j and k. If we know the demand, WTP and bargaining model, we can calculate the post-merger WTP of the new entity and the post-merger price increase of the merged entity by estimating α (Capps et al., 2003).

This works as follows. Let us assume that we want to predict the increase in prices due to a merger between hospitals j and k. With equation (5.1), we can calculate the pre-merger WTP of hospitals j and k, which we will denote with w_j^{pre} and w_k^{pre}. Post-merger, hospitals j and k form one entity. The weighted joint pre-merger WTP of hospitals j and m is: $w_{j+m}^{pre} := S_j w_j^{pre} + S_k w_k^{pre}$ where S_j is the post-merger revenue share of hospital j in the merged hospital and S_k is the post-merger share of hospital k in the merged hospital. We assume that the merged firm will bargain on an all-or-nothing basis (i.e., the merged hospitals are either in or out of the insurer's network and reimbursement for patients visiting that hospital is therefore either 100% or 0%[243]). Thus, post-merger, the WTP of entity j+k is:

$$w_{j+k}^{post} = \frac{\sum_{i=1}^{N} ln\left[\frac{1}{1-s_j(H_j,Y_i,Z_i,\lambda_i)-s_k(H_k,Y_i,Z_i,\lambda_i)}\right]}{\sum_{i=1}^{N}\left(s_j(H_j,Y_i,Z_i,\lambda_i)+s_k(H_k,Y_i,Z_i,\lambda_i)\right)}.$$

The increase in WTP due to the merger for the combined entity is then $w_{j+k}^{post} - w_{j+k}^{pre}$.

Given bargaining model (5.2), we can calculate the increase in the j+k entities' margin with: $(p_{j+k}^{post} - c_{j+k}^{post}) - (p_{j+k}^{pre} - c_{j+k}^{pre}) = \alpha \cdot (w_{j+k}^{post} - w_{j+k}^{pre})$. Using equation (5.2) the α can be estimated and post-merger prices can be predicted. Capps et al. (2003) estimate α with an OLS regression of total hospital profits on the unscaled WTP and use the above equation to predict the increase in total profits due to the merger. However, we are interested in the predicted price changes due to the merger. As is common in the MSM literature, we assume that the variable costs per patient do not change due to the merger (i.e., $c_{j+k}^{post} = c_{j+k}^{pre}$) and we can therefore rewrite the latter equation as:

243 In practice, this is the most common negotiating strategy of hospitals. The assumption can, however, be relaxed by adapting WTP to separate bargaining scenarios (Brand & Garmon, 2014).

$$(p_{j+k}^{post} - p_{j+k}^{pre}) = \alpha \cdot (w_{j+k}^{post} - w_{j+k}^{pre}) \quad \textbf{(5.3)}$$

244 The intuition behind this assumption is that the hospital for which the diversion ratio is relatively high, can profit more from the merger.

Following Balan and Brand (2013), we divide the merged entity's increase in WTP into a per-hospital WTP increase. To this end, we have to determine the post-merger WTP of hospital j and k: w_j^{post} and w_k^{post}. We do this by using two assumptions. The first assumption stipulates that the increase in the joint WTP is divided between the two hospitals according to their revenue share in the merged entity: $w_{j+k}^{post} - w_{j+k}^{pre} = S_j\,(w_j^{post} - w_j^{pre}) + S_k\,(w_k^{post} - w_k^{pre})$. But this equation does not yet identify a unique pair (w_j^{post}, w_k^{post}), since there is an infinite number of combinations that satisfies this assumption. The second assumption therefore stipulates that the increase in the hospitals' WTP is divided in proportion to their diversion ratios:

$$(w_j^{post} - w_j^{pre}) = \frac{D_{jk}}{D_{kj}}\,(w_k^{post} - w_k^{pre}),$$

where diversion ratio D_{jk} is the share of patients from hospital j that would go to hospital k if hospital j were no longer accessible to them[244]. From the IIA property of the conditional logit model it follows that if patient i can no longer visit hospital j, the diversion of hospital j to hospital k for patient i is equal to $\frac{s_k(H_k, X_i, \lambda_i)}{1 - s_j(H_j, X_i, \lambda_i)}$ (see for example Conlon & Mortimer, 2013). We calculated the weighted average diversion of hospital j to hospital k (D_{jk}) by summing over all patients and weighting each patient with their predicted share in hospital j:

$$D_{jk} = \sum_i^N \left(\frac{s_j(H_j, X_i, \lambda_i)}{\sum_i^N s_j(H_j, X_i, \lambda_i)} \frac{s_k(H_k, X_i, \lambda_i)}{1 - s_j(H_j, X_i, \lambda_i)} \right).$$

Similarly, diversion ratio D_{kj} is the share of patients from hospital k that would go to hospital j if hospital k were no longer accessible to them. Together, the above assumptions can identify the unique pair (w_j^{post}, w_j^{post}) of hospital specific post-merger WTPs.
The hospital-specific increase in WTP for hospitals j and k are $(w_j^{post} - w_j^{pre})$ and $(w_k^{post} - w_k^{pre})$ respectively.

Following equation (5.3), the hospital-specific price increase for hospital j is then given by:

$$(p_j^{post} - p_j^{pre}) = \alpha \cdot (w_j^{post} - w_j^{pre}). \quad \textbf{(5.4)}$$

Similarly, the hospital-specific price increase for hospital k is given by:

$$(p_k^{post} - p_k^{pre}) = \alpha \cdot (w_k^{post} - w_k^{pre}). \quad \textbf{(5.5)}$$

In the following, we will use equations (5.4) and (5.5) to predict the price increases resulting from the merger that we examined in this paper.

245 As a robustness check several alternative patient choice sets were used. Our results are robust to these other assumptions. The results are available from the authors upon request.

5.5 Estimation

5.5.1 Specification of our choice model

Following Capps et al. (2003), we first estimated a conditional logit model (see section 5.4.1). Unlike Capps et al. (2003), however, we ran the model for each of the products separately (rather than aggregating all the products for each hospital). We used the following specification for patient utility:

$$U_{ij} = \sum_{j}^{J-1} \alpha_j \cdot D_j + \beta_1 \cdot TRAVELTIME + \beta_2 \cdot TRAVELTIME \cdot D_{AGE} + \beta_3 \cdot TRAVELTIME \cdot D_{FEMALE} + \beta_4 \cdot TRAVELTIME \cdot SESSCORE + \varepsilon_{ij} \quad \textbf{(5.6)}$$

where *TRAVELTIME* was the travel time in minutes from the patient's home (zip code) to the hospitals, D_{AGE} was a dummy indicating whether the patient is older or younger than 65, D_{FEMALE} was a dummy for the patient's gender and *SESSCORE* was a socio-economic status (SES) score for the patient's zip code. We estimated a fixed-effects conditional logit model. Given that there were *J* hospitals, the dummy variables in this model would pick up *J* different sets of undefined attributes (e.g., Farrell et al., 2011; Train, 2009). In our data we observed that 99% of the patients will not travel more than 100 minutes for a hip or a knee replacement or cataract surgery. We therefore restricted the choice set of each patient to the hospitals reachable within 100 minutes[245]. For cataract surgery, we only estimated the conditional logit model for the patient's *first* cataract surgery. Out of all patients, 30% received more than one treatment at the same hospital. It is likely that a patient who received more than one cataract treatment at the same hospital was treated for both the left and right eyes. In the estimation of the choice model (and the calculation of the WTP), we excluded such repeat choices by the same patient.

5.5.2 Specification of our WTP regression

For each product, we used the predicted probabilities that followed from the conditional logit estimation to calculate the WTP for the inclusion of each of the hospitals in the network using equation (5.1). From the estimated conditional logit (equation (5.6)), we

calculated the per-patient probability for choosing a certain hospital. Patient type i chooses hospital j with probability:

$$\hat{s}_j(H_j, X_i, \lambda_i) = \frac{exp[\hat{U}(H_j, X_i, \lambda_i)]}{\sum_{g \epsilon G} exp[\hat{U}(H_g, X_i, \lambda_i)]}$$

We use these probabilities and equation (5.1) to calculate the WTP for each hospital:

$$\hat{w}_j = \frac{\sum_{i=1}^{N} ln\left[\frac{1}{1-\hat{s}_j(H_j, X_i, \lambda_i)}\right]}{\sum_{i=1}^{N} \hat{s}_j(H_j, X_i, \lambda_i)}.$$

The calculations were performed in R with the package Merger-Analysis (Halbersma 2013).

The next step was to regress the predicted WTPs on the prices negotiated between hospitals and insurers for hip and knee replacements and cataract surgery. We estimated the following model[246]:

$$PRICE_j = c + \alpha \cdot WTP_j + \beta_1 \cdot INSURER.HHI_j + \beta_2 \cdot SESSCORE_j + \beta_3 \cdot AGE_j + \beta_4 \cdot HOUSEPRICE_j + \beta_5 \cdot HOSPITAL.TYPE_j + \beta_6 \cdot HOSPITAL.SIZE_j + \beta_7 \cdot LIBERALIZED_j + \varepsilon_j \quad \textbf{(5.7)}$$

where *PRICE* was the average pre-merger price (per hospital per product), *WTP* was the WTP following from equation (5.1) and based on the probabilities from the fixed-effects conditional logit model (equation (5.6)) (i.e., $\hat{w}_j$), *INSURER.HHI* is the insurer's Herfindahl-Hirschman Index (*HHI*) for each hospital (based on the insurer's market shares of the total revenue of the hospital, per product). To control for potential differences in hospital costs, we included the average SES-score of the patients (*SESSCORE*) and the average age of the patients (*AGE*) as proxies for hospitals' casemix differences, the average house price of the hospital's zip code (divided by 100.000) as a proxy for location-specific costs (*HOUSEPRICE*), the hospital type (academic or general hospital[247]) (*HOSPITAL.TYPE*), and the hospitals' size, measured in terms of the total number of beds (*HOSPITAL.SIZE*) to account for potential (dis)economies of scale. Further, we control for the per hospital fraction of the liberalized segment (defined by the revenue of the total liberalized segment divided by the total revenue of the hospital) (*LIBERALIZED*). We report the MacKinnon & White (1985) Heteroskedasticity-Consistent standard errors.

246 We examined the robustness of the model by estimating the Huber M-estimator (Huber, 1964) and the least trimmed squares (lts) regression (Rousseeuw & Van Driessen, 1999). Both methods produced similar results. The results are available from the authors upon request.

247 Due to their low number, we did not distinguish Independent Treatment Centres (ITCs – see also footnote 248) or specialty hospitals separately in this analysis. They were treated as general hospitals.

5.5.3 Instrumental variable approach

It is possible that our predicted WTP is endogenous. There are two important sources of endogeneity. First, performance may feed back into structure, causing a simultaneous equation bias (e.g., lower prices may induce patients to go to a cheaper hospital, which in turn increases the (predicted) WTP of the hospital as derived from observed patient choices). Second, there are attributes that influence both price and patients' choice of a hospital (e.g., quality of care). These are picked up by the conditional logit model's fixed effects, causing an omitted variables bias (see also Evans et al., 1993).

The common solution to these problems is to use an instrumental variables (IV) approach. Kessler and McClellan (2000), Cooper et al. (2011) and Gaynor et al. (2013) solve the endogeneity problem by using the predicted patient flows generated from models of patient choice. These only use observable, exogenous characteristics of patients and hospitals (Kessler & McClellan, 2000). In our paper, we estimate a WTP instrument (*TRAVELTIME-WTP*) which is based on the predicted probabilities of a conditional logit model that only includes patients' travel times ($U_{ij} = \beta_1 \cdot TRAVELTIME + \varepsilon_{ij}$). Following Kessler & McClellan (2000) and Gaynor et al. (2013), we explicitly omit hospital-level fixed effects to prevent predicted choice being based on unobserved attributes of prices.

After determining the *TRAVELTIME-WTP*, we carried out a two-stage least square (2SLS) model where the instrument list consisted of *TRAVELTIME-WTP* (instrument for WTP), *INSURER.HHI*, *SESSCORE*, *AGE*, *HOUSEPRICE*, *HOSPITAL.TYPE*, *HOSPITAL.SIZE*, and *LIBERALIZED* (see section 5.6 for details on these variables).

5.6 Data

In this paper, we analyze the price effects of a merger between a general acute care hospital (hospital M1) and a neighboring general acute care hospital that also provides tertiary hospital care (hospital M2). The merger was consummated in the Netherlands in year *t*. We used pre-merger data (*t*-1 data) to establish what price increases the Option Demand method would have predicted if an antitrust authority had used the model in their review after being notified of the merger. We contrast the predictions obtained using the OD method with the actual price effects of the merger. The latter are determined through a difference-in-differences technique (Roos

et al., 2017). In section 5.4 we explained that we focus on three products for which prices are freely negotiable: hip replacements, knee replacements and cataract surgery. In year *t*-1 these product markets jointly represent 47.5 percent of the merged hospital's turnover in the segment for which Dutch health insurers and hospitals were allowed to freely negotiate prices.

We use a nationwide patient-level dataset that contains all inpatient and outpatient visits for all hospital locations and Independent Treatment Centers (ITCs)[248]. For each visit, the patient's zip code, age (year of birth), gender, health insurer, diagnosis and treatment were observed, as well as the price negotiated for each hospital location-insurer-product combination in year *t*-1. The patient-level data that we used came from the insurers' claims administration and hospital registries and was provided by the Dutch Healthcare Authority.

For the choice model (see section 5.5.1), we calculated each patient's travel time (in minutes) to the hospitals using a travel time matrix for year *t*-1. Some hospitals have multiple treatment locations, but the data does not reflect which location the patient actually went to. For hospitals with more than one treatment location, we calculated the patient's travel time (in minutes) to the closest hospital location[249]. Additionally, we obtained socio-economic status (SES) scores from the Netherlands Institute for Social Research (SCP). A higher SES score means a higher socio-economic status in the zip code area.

In the WTP regression (see section 5.5.2), we included the average SES score and the average age. Additionally, we included the average house price for the zip code area of the hospital and the hospital types as proxies for location-specific costs. The data on house prices was obtained from Statistics Netherlands (CBS). We differentiated between academic and general hospitals (taking general hospitals as the reference group). ITCs and specialty hospitals were treated as general hospitals. The insurer's HHI was based on the insurer's market shares per product (of the total revenue of the hospital) and ranged from zero to one. Thus, the insurer's HHI for hospital *j* and product *k* was calculated as:

$$INSURER.HHI_{jk} = \sum_{l=1}^{n} \left(\frac{REV_{jkl}}{\sum_{l=1}^{n} REV_{jkl}} \right)^2,$$

248 ITCs are comparable to the freestanding Ambulatory Surgery Centers (ASCs) that operate in the US and UK healthcare markets.

249 25 hospitals had multiple locations for hip replacements and cataract surgeries. For knee replacements 27 hospitals had multiple locations. As a sensitivity check we also estimated the choice model using the patient's travel time (in minutes) to the main hospital location. This did not affect our WTP estimations. The results are available from the authors upon request.

where REV_{jkl} is the revenue of insurer l (l=1,..,n) in hospital j for product k. We also included the per-hospital fraction of the liberalized segment (*LIBERALIZED*), which was defined by the revenue of the whole liberalized segment divided by the total revenue of a hospital (i.e., the regulated and liberalized segments together).

5.7 Results

5.7.1 Choice model

Table 5.1 presents summary statistics on the main variables that were included in the conditional logit model of patients' choice of hospital for hip and knee replacement and cataract surgery (panels A).

Table 5.1 – Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum	Observations
Hip replacements					
Panel A. Patient characteristics					
Age	69.2	10.5	16	99	*N* = 20846
Age Dummy (>65)	0.66	-	0	1	*N* = 20846
Gender (female)	0.68	-	0	1	*N* = 20846
SES score in the zip code area	-0.002	1.000	-5.437	3.813	*N* = 20846
Travel time (in minutes)	12.60	13.15	0.00	99.96	*N* = 20846
Panel B. Hospital characteristics					
Patients' average age	69.0	2.7	55.1	0.6	*n*=82
Patients' average SES score	-0.023	0.361	-0.909	0.639	*n*=82
Price hip replacement (in €)	9092.00	293.29	8527.00	10408.00	*n*=82
Willingness-To-Pay	1.813	0.885	1.024	7.234	*n*=82
Instrument Willingness-To-Pay (TRAVELTIME-WTP)	1.666	0.676	1.056	5.177	*n*=82
Academic hospital	0.09	-	0	1	*n*=82
ITC	0	-	0	1	*n*=82
Insurers' HHI	0.391	0.134	0.163	0.795	*n*=82
Housing price in the zip code area (€1000)	193.9	32.9	134.0	266.0	*n*=82
Hospital size (number of beds)	512.7	275.0	138.0	1575.0	*n*=82
The hospital's share of the liberalized segment (LIBERALIZED)	0.11	0.04	0.02	0.23	*n*=82
Knee replacements					
Panel A. Patient characteristics					
Age	69.0	9.9	20	97	*N* = 17558
Age Dummy (>65)	0.65	-	0	1	*N* = 17558
Gender (female)	0.69	-	0	1	*N* = 17558
SES score in the zip code area	-0.002	1.001	-5.148	2.772	*N* = 17558
Travel time (in minutes)	13.25	14.15	0	99.71	*N* = 17558

Table 5.1 – Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum	Observations
Panel B. Hospital characteristics					
Patients' average age	69.0	2.0	64.1	74.6	*n*=85
Patients' average SES score	0.009	0.357	-0.869	0.791	*n*=85
Price hip replacement (in €)	11493.00	390.69	9756.00	10689.00	*n*=85
Willingness-To-Pay	1.712	0.795	1.019	6.628	*n*=85
Instrument Willingness-To-Pay (TRAVELTIME-WTP)	1.579	0.589	1.045	4.576	*n*=85
Academic hospital	0.09	-	0	1	*n*=85
ITC	0	-	0	1	*n*=85
Insurers' HHI	0.408	0.127	0.618	0.783	*n*=85
Housing price in the zip code area (€1000)	194.1	32.2	134.0	266.0	*n*=85
Hospital size (number of beds)	509.3	272.3	140.0	1575.0	*n*=85
The hospital's share of the liberalized segment (LIBERALIZED)	0.11	0.03	0.02	0.23	*n*=85
Cataract surgery					
Panel A. Patient characteristics					
Age	73.5	10.4	0.0	110.0	*N* = 103750
Age Dummy (>65)	0.81	-	0	1	*N* = 103750
Gender (female)	0.61	-	0	1	*N* = 103750
SES score in the zip code area	0.000	1.000	-6.171	2.809	*N* = 103750
Travel time (in minutes)	11.30	11.35	0.00	99.99	*N* = 103750
Panel B. Hospital characteristics					
Patients' average age	73.3	2.3	63.5	77.0	*n*=86
Patients' average SES score	-0.031	0.385	-1.148	0.627	*n*=86
Price hip replacement (in €)	1365.00	83.80	1046.00	1547.00	*n*=86
Willingness-To-Pay	1.875	0.846	1.018	5.795	*n*=86
Instrument Willingness-To-Pay (TRAVELTIME-WTP)	1.782	0.805	1.056	5.766	*n*=86
Academic hospital	0.08	-	0	1	*n*=86
Insurers' HHI	0.421	0.128	0.210	0.694	*n*=86
Housing price in the zip code area (€1000)	192.5	33.4	134.0	284.0	*n*=86
Hospital size (number of beds)	488.3	289.35	0.0	1575.0	*n*=86
The hospital's share of the liberalized segment (LIBERALIZED)	0.12	0.06	0.02	0.44	*n*=86

Notes: Summary statistics refer to *t*-1, where *t* is the merger year. *N* = total number of patients that underwent hip or knee replacements or cataract surgeries. The total number of patients that underwent cataract surgery only includes the patient's first cataract surgery. *n* = total number of hospitals in the sample. We calculated the patient's travel time (in minutes) to the closest hospital location.

Table 5.2 presents the results of our estimation. We estimated two models for each product (hip, knee and cataract). Model 2 is the conditional logit model that includes patients' travel time only (see section 5.5.3), while model 1 is the full fixed effects conditional logit model that also includes other covariates (see section 5.5.1). The results of model 2 clearly show that, as expected, patients

dislike travel time. Model 1 also takes patient heterogeneity into account by adding interaction terms. The results show that travel time interacts with age, gender and SES score, indicating that older patients prefer hospitals closer to home than younger patients and that females are less willing to travel further than men, while the higher the SES score, the greater the patients' willingness to travel. All coefficients have the expected sign and correspond with findings from other studies on patient choice in the Netherlands (e.g., Beukers et al., 2014; Varkevisser et al., 2012; 2010). Furthermore, the goodness of fit measures that are also presented in table 5.2 show that our models perform well.

Table 5.2 – Conditional logit model of patient hospital choice for hip and knee replacements and cataract surgery[a]

	Hip replacements		**Knee replacements**		**Cataract surgeries**	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Time	-0.1266***	-0.1488***	-0.1248***	-0.1504***	-0.1343***	-0.1668***
	(0.0018)	(0.0010)	(0.0018)	(0.0011)	(0.0010)	(0.0005)
Time * Age	-0.0590***		-0.0460***		-0.0551***	
	(0.0020)		(0.0019)		(0.0011)	
Time * Female	-0.0031		-0.0025		-0.0088***	
	(0.0020)		(0.0020)		(0.0010)	
Time * SES-score	0.0085***		0.0104***		0.0072***	
	(0.0011)		(0.0011)		(0.0006)	
Observations	20846	20846	17558	17558	103750	103750
McFadden's R^2	0.68	0.64	0.65	0.61	0.72	0.67
Hit-and-miss	0.70	0.69	0.67	0.66	0.70	0.68

Notes: Models estimated by conditional logit model with standard errors in parentheses under coefficients. Model 2 is the conditional logit model that only includes patients' travel time (see section 5.5.3), while model 1 includes a full set of hospital dummies (not reported here) and other covariates (see section 5.5.1). The conditional logit models are estimated on data from *t*-1, where *t* is the merger year. We restricted the patients' choice sets to the hospitals reachable within 100 minutes.

[a] For clarity reasons, we do not report the hospital dummies (fixed effects) here. The results are available from the authors upon request.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

5.7.2 WTP regression

As discussed in section 5.5.2, we used the estimated coefficients from the conditional logit models to calculate the Willingness-To-Pay for the inclusion of each of the hospitals in the network. We then regressed the predicted WTPs on the observed prices. Equation (5.7) is an OLS regression model that we estimated with and without instrumental variables (see sections 5.5.2 and 5.5.3). Table 5.1 presents summary statistics on the main variables that were included in the OLS regressions (panels B).

The results of the estimation can be found in table 5.3. The first model is a simple ordinary least squares model with price regressed on the WTP and the insurers market power vis-á-vis each individual hospital (measured by the HHI); model 2 adds control variables to model 1; and model 3 is a 2SLS approach with control and instrumental variables. As discussed in section 5.5.3, we use *TRAVELTIME-WTP* as an instrument for the WTP. To determine the relevance of the instrument, we tested its correlation with the possibly endogenous regressor WTP by determining the first-stage F-statistic (Stock & Yogo, 2005; Staiger & Stock, 1997). Our first-stage F-statistic was 62.617 (p-value = 0.00) for hip replacement, 39.549 (p-value = 0.00) for knee replacement and 181.51 (p-value = 0.00) for cataract surgery. This indicates that our instrument (*TRAVELTIME-WTP*) is strongly correlated with the WTP. The Wu-Hausman statistic was 0.16 (p-value = 0.68) for hip replacement, 2.39 (p-value = 0.13) for knee replacement and 0.24 (p-value = 0.63) for cataract surgery. This indicates that the variable WTP is not endogenous.

Table 5.3 – Willingness-to-pay models for hip and knee replacements and cataract surgery

	Model 1	**Model 2**	**Model 3**
Hip replacements			
(intercept)	9238.21***	8075.17***	8027.90***
	(100.09)	(1515.84)	(1519.47)
WTP	76.21**	88.69**	94.40**
	(33.28)	(40.00)	(42.44)
INSURER.HHI	-727.75**	-894.08***	-909.52***
	(294.38)	(324.63)	(335.73)
SESSCORE		-91.61	-95.51
		(101.93)	(104.86)
AGE		16.81	17.30
		(20.00)	(20.11)
HOUSEPRICE		-0.24	-0.18
		(0.98)	(0.98)
HOSPITAL.TYPE		151.25	154.75
		(220.69)	(220.79)
HOSPITAL.SIZE		0.09	0.09
		(0.19)	(0.19)
LIBERALIZED		279.38	256.06
		(2298.29)	(2295.96)
IV	NO	NO	YES: TRAVELTIME-WTP
Observations	82	82	82
R-Squared	0.10	0.13	0.13
Adjusted R-Squared	0.08	0.04	0.04

Table 5.3 – Willingness-to-pay models for hip and knee replacements and cataract surgery

	Model 1	Model 2	Model 3
Knee replacements			
(intercept)	10857.12***	10805.12***	10619.25***
	(170.90)	(1947.40)	(1917.42)
WTP	14.38	3.00	37.90
	(105.15)	(125.09)	(122.47)
INSURER.HHI	-473.89	-5381.80	-613.11
	(433.23)	(450.97)	(447.91)
SESSCORE		21.99	-3.59
		(136.89)	(138.74)
AGE		8.25	9.88
		(26.70)	(26.27)
HOUSEPRICE		-2.12	-1.76
		(1.63)	(1.62)
HOSPITAL.TYPE		153.74	156.39
		(277.65)	(282.73)
HOSPITAL.SIZE		-0.06	-0.06
		(0.21)	(0.21)
LIBERALIZED		-394.23	-605.29
		(2938.10)	(2903.94)
IV	NO	NO	YES: TRAVELTIME-WTP
Observations	85	85	85
R-Squared	0.02	0.06	0.06
Adjusted R-Squared	-0.00	-0.04	-004
Cataract surgery			
(intercept)	1319.70***	803.25	295.27
	(35.50)	(899.40)	(899.51)
WTP	1.26	-2.17	-5.94
	(9.70)	(10.79)	(10.77)
INSURER.HHI	100.78	33.65	47.49
	(71.39)	(89.72)	(89.22)
SESSCORE		-19.57	-17.03
		(32.78)	(33.09)
AGE		10.12	10.30
		(11.09)	(11.09)
HOUSEPRICE		-0.34	-0.36
		(0.36)	(0.36)
HOSPITAL.TYPE		74.51	75.24
		(83.95)	(83.43)
HOSPITAL.SIZE		-0.07	-0.07
		(0.05)	(0.05)
LIBERALIZED		-828.47	-822.98**
		(331.48)	(338.05)
IV	NO	NO	YES: TRAVELTIME-WTP
Observations	86	86	86
R-Squared	0.03	0.41	0.41
Adjusted R-Squared	0.00	0.35	0.35

Notes: Per product we report three models. The first model is a simple OLS model with price regressed on the WTP and the insurers' market power vis-á-vis each individual hospital. Model 2 adds control variables to model 1 and model 3 is a 2SLS model that adds control and instrumental variables. We report the MacKinnon and White (1985) Heteroskedasticity-Consistent standard errors (in parentheses under coefficients). We used data from *t*-1, where *t* is the merger year. Note that the R^2 for cataract surgeries is much higher than the R^2 for hip and knee replacements. This is due to a higher number of ITCs in the market for cataract surgeries.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

The average price for hip replacements is €9,092 (table 5.1). Table 5.3 indicates that a one-unit increase in *WTP* will increase prices for hip replacements by €88.69 (model 2). Following Capps et al. (2003), we show how to interpret the magnitude of this estimate by considering the hospital with the highest *WTP* (i.e., *WTP*: 7.234 –table 5.1) and the hospital with the lowest *WTP* (i.e., *WTP*: 1.024 –table 5.1). Using the results of model 2, the WTP difference of 6.210 translates into a difference in the price of a hip replacement of €550.76.

For knee replacements and cataract surgeries, the WTP is not significantly related to price. Apparently, in our regression model, WTP does not explain the variation in prices for knee replacement and cataract surgeries. This means that in the market for knee replacements and cataract surgeries using the WTP for the WTP-based merger simulation is less meaningful than in the market for hip replacements.

5.8 Using the WTP for antitrust purposes

In this section, we contrast the *ex ante* predicted price effects with the actual *ex post* price effects of a merger between a general acute care hospital (hospital M1) and a neighboring general acute care hospital that also provides some types of tertiary hospital care (hospital M2).

The actual price effects were determined through a difference-in-differences technique (Roos et al., 2017). For a detailed discussion of the method, data and results of the difference-in-differences technique, we refer to Roos et al. (2017). In sum, Roos et al. (2017) use data on hospital-insurer negotiated contract prices in the Netherlands for each of the three hospital products considered, to investigate whether the merger between hospitals M1 and M2 has led to price changes. They first estimate an aggregated difference-in-differences model ($\ln p_{jt} = \alpha + \lambda \cdot POST_t + \delta \cdot POST_t \cdot MERGED_j + \vartheta_j + \varepsilon_{jt}$) and then, to show the effect of aggregating over products, locations and insurers, they remove the aggregations stepwise. The pre-merger price was based on data from the year preceding the merger (t-1) and the post-merger price was based on data from the year after the merger (t+1). Table 5.4 summarizes the estimated merger effects on prices of hip replacement, knee replacement and cataract surgery for hospitals

M1 and M2 in comparison with the average price change pre- and post-merger in a control group. Roos et al. (2017) find evidence of heterogeneous price effects for a merger between neighboring hospitals across hospital products and hospital locations. Their result is robust for different control groups and different model specifications.

Table 5.4 – Merger effect on prices of hip and knee replacements and cataract surgery for hospitals M1 and M2 in comparison to average price changes pre- and post-merger in a control group (retrospective analysis)

	Merger effect on price (DID coefficient)
Panel A. Hospital M1	
Hip replacements	0.090*
	(0.053)
Knee replacements	0.021
	(0.062)
Cataract surgery	0.027
	(0.057)
Panel B. Hospital M2	
Hip replacements	-0.035
	(0.053)
Knee replacements	-0.064
	(0.062)
Cataract surgery	-0.049
	(0.057)

Notes: Time period is *t*-2 and *t*+2, where *t* is the merger. Models estimated by OLS with standard errors in parentheses under coefficients. Null hypothesis: difference-in-differences estimator is equal to zero.
Source: Roos et al. 2017.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

The *ex ante* predictions for merger-induced price increases were calculated using the Option Demand method as described in section 5.4.3. Table 5.5 displays the predicted WTP increases. To see how a merger affects WTP, we looked at the change in the predicted WTPs. In the case of hip replacements, the WTP for hospital M1 increased by 25.7%, and the WTP for hospital M2 increased by 11.7%. Both of these increases were substantial.

Table 5.5 – Hospital specific change in WTP after merger for hip and knee replacements and cataract surgery

	Pre-merger price (mean in €)	Pre-merger WTP	Absolute increase in WTP after merger
Panel A. Hospital M1			
Hip replacements	9135.66	4.668	1.199
Knee replacements	10693.64	4.706	0.994
Cataract surgery	1393.25	3.655	1.530
Panel B. Hospital M2			
Hip replacements	9064.99	2.296	0.268
Knee replacements	10645.73	2.021	0.322
Cataract surgery	1358.92	2.500	0.157

Notes: For the pre-merger WTP, we used data from *t*-1, where *t* is the merger year (WTP estimation using the results from table 5.3, model 2). For the change in WTP after merger, we used data from *t*-1 and *t*+1, where t is the merger year (change in WTP using the results from table 5.3, model 2).

In general, patients are more willing to pay for the inclusion of hospital M1 than hospital M2. This is not surprising because the merger also had a differential impact on the structure of the market in which the hospitals were competing. Hospital M1 is located in an isolated geographical area and hospital M2 was the largest competitor to hospital M1 pre-merger. Hospital M2, in contrast, is subject to notable competitive pressure from (at least) five other hospitals in the three submarkets studied in this paper. Note that table 5.4 suggests that the price increases are higher for hospital M1 than for hospital M2, a finding which is only statistically significant for hip replacements.

Next, the increase in the hospital specific prices due to merger can be determined using equations (5.4) and (5.5). From equations (5.4) and (5.5) it follows that we were able to calculate the predicted increase in prices for hospital *j* as:

$$\frac{\hat{\alpha}(w_j^{post} - w_j^{pre})}{\widehat{PRICE}_j} \qquad \textbf{(5.8)}$$

where $\widehat{PRICE}_j$ is the fitted pre-merger price of hospital *j* and $\hat{\alpha}$ is the estimated coefficient of the WTP that is obtained by equation (5.7). As discussed above, we only estimate the predicted price increases for hip replacements. Table 5.6 compares the results with the *ex post* estimates.

Table 5.6 – Predicted and estimated price increases for hip replacements due to merger

	***Ex ante* predictions (by the Option Demand Method)**			***Ex post* predictions (by the difference-in-differences estimates)**		
	% price increases	95% CI	90% CI	% price increases	95% CI	90% CI
Panel A. Hospital M1						
Hip replacements	1.16	[0.12 –2.21]	[0.29 – 2.04]	9.00	[-1.63 – 19.63]	[0.13 – 17.87]
Panel B. Hospital M2						
Hip replacements	0.26	[0.03 – 0.50]	[0.07 – 0.46]	-3.50	[-14.13 – 7.13]	[-12.37 – 5.37]

Notes: The increases in the hospital specific prices due to merger are determined using equations 5.4 and 5.5. The *ex post* estimates are obtained using a difference-in-differences technique, which is reported in Roos et al. (2017).

We constructed 90% and 95% confidence intervals for the predicted and estimated price increases using the student t distribution of $\hat{\alpha}$ and treatment effect, respectively. Care should be taken in interpreting the results as the *ex post* estimates have large confidence intervals.

The merger simulation showed that the prices for hip replacements in hospitals M1 and M2 were likely to increase significantly, although at a different magnitude. The confidence intervals of the predicted price increases are all nested within the confidence intervals of the actual price increases. Given that the confidence intervals of the *ex post* estimates are quite large, however, we should be cautious in interpreting this result as evidence that the OD method is able to accurately predict price increases after merger. If we were to ignore this for a moment, because Roos et al. (2017) showed that the *ex post* estimation was robust for different control groups and different model specifications, table 5.6 suggest that OD method overestimates the price effects for hospital M2 and underestimates the price effects for hospital M1.

5.9 Conclusion

The aim of this paper is to examine the predictive power of the option demand (OD) method for hospital mergers. Like other merger simulation models (MSMs), the OD method has clear advantages over more traditional market definition approaches because it provides antitrust agencies with direct evidence about the expected effects of the merger and does not require

questionable assumptions to be made on the relevant (geographic) market. Also, studies that contrasted the predictions by the OD method and several traditional measures concluded that the OD model outperforms ad hoc measures in predicting prices (Garmon, 2016; Dranove & Ody, 2016).

Antitrust agencies should aim to use MSMs that are able to explain outcomes in the relevant market reasonable well, for example by demonstrating that the model accurately predicts the effects of mergers in the same industry (Budzinsky & Ruhmer, 2009; Werden et al., 2004). We have contrasted the findings of this prospective method of analysis with the findings of a retrospective study involving a consummated Dutch hospital merger (Roos et al., 2017). Our results indicate that there is a relationship between WTP and prices for hip replacements. We were not able to establish a relationship between WTP and prices for knee replacements and cataract surgeries. We therefore only estimated a reduced-form merger simulation for hip replacements. The comparison between the reduced-form merger simulation and *ex post* estimates suggest that the OD method overestimates the price effects for hospital M2 and underestimates the price effects for hospital M1. Yet, the overestimation is not statistically significant.

Garmon (2016) also finds mixed results for the performance of the reduced-form merger simulation in the US. Hence, we conclude that although the OD method could be a valuable addition to the antitrust agencies' toolkit in signaling potentially anti-competitive merger effects, our findings also indicate that more research is necessary. For example, the explanatory power of our regression models is quite low. This may either indicate that the model needs to be reconsidered to find factors that have higher explanatory power or that the model does not (yet) fit the Dutch healthcare market well enough. With respect to the latter, we concluded in section 5.3.2 that the OD method is applicable to the free-pricing segment of the Dutch hospital industry. However, the industry is in transition and the number of health insurers offering contracts with restricted provider networks has increased over the years. As the OD method depends upon the bargaining relationship between health insurers and hospitals, we expect that the relationship between WTP and price will get stronger as the threat of selective contracting becomes more credible.

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CHAPTER 6

Why Healthcare Providers Merge

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Published in: Health Economics, Policy & Law. 2016. 11(2):121-140. (reprinted with permission)

Abstract

In many OECD countries, healthcare sectors have become increasingly concentrated as a result of mergers. However, detailed empirical insight into why healthcare providers merge is lacking. Also, we know little about the influence of national healthcare policies on mergers. We fill this gap in the literature by conducting a survey study on mergers among 848 Dutch healthcare executives, of which 35% responded (resulting in a study sample of 239 executives). A total of 65% of the respondents was involved in at least one merger between 2005 and 2012. During this period, Dutch healthcare providers faced a number of policy changes, including increasing competition, more pressure from purchasers, growing financial risks, de-institutionalization of long-term care and decentralization of healthcare services to municipalities. Our empirical study shows that healthcare providers predominantly merge to improve the provision of healthcare services and to strengthen their market position. Also efficiency and financial reasons are important drivers of merger activity in healthcare. We find that motives for merger are related to changes in health policies, in particular to the increasing pressure from competitors, insurers and municipalities.

6.1 Introduction

Since the 1980s, healthcare sectors in many OECD countries have become increasingly concentrated as a result of mergers (Garside, 1999; Gaynor & Haas-Wilson, 1999; Bazzoli et al., 2002; Fulop et al., 2002). The Netherlands are no exception to this (Noordegraaf et al., 2005; Fabbricotti, 2007). Both in the Netherlands and internationally, merger activity has fuelled a public and scientific debate about the consequences of mergers and the desirability of further concentration of healthcare sectors (see e.g., Gaynor & Town, 2012: Postma, 2015). Although there is an increasing amount of research on the effects of healthcare mergers (see e.g., Gaynor & Town, 2012), detailed empirical insights in why providers merge and how mergers are influenced by health policy, are lacking. Our study aims to fill this gap in the literature by answering the following research questions: (i) Why do healthcare providers merge? and (ii) How do (changes in) health policy influence motives for merger? The answer to these questions is important as a growing number of European healthcare systems are in the midst of reforms (Saltman et al., 2012), often including measures to increase competition either on the delivery side, on the insurance side or on both (Propper, 2012). In practice, this means that organizations that first operated in a more or less regulated and sheltered environment are now increasingly exposed to competition and financial risks. It is likely that these reforms influence merger activity, but little is known how and to what extent. The Netherlands provides an excellent case for such research as the Dutch healthcare sector is consolidating rapidly while important reforms are implemented.

We answer the research questions by conducting a survey study among Dutch healthcare executives (i.e., end-responsible managers). We focus on providers, so mergers between healthcare insurers, pharmaceutical companies and other organizations that are part of the healthcare sector are not included in the study. The contribution of our study to the literature is threefold. First, it provides empirical evidence on motives for healthcare mergers, which have received little scholarly attention so far. Second, it presents findings on merger motives from different healthcare sectors, while the focus of most studies so far has been limited to hospital mergers. Third, our study contributes to a better understanding of the relation between motives for healthcare mergers and health policies.

This paper proceeds as follows. First, we provide an overview of literature on merger motives. We then describe the most important policy changes in the Dutch healthcare sector that occurred during our study period (2005–2012). Third, we specify the methodology used. After that, we present the findings of our empirical study and we finish with a conclusion and a discussion of the implications of our study.

6.2 Motives for mergers in healthcare

This study is about motives for mergers. A merger differs from an acquisition in the sense that in the former, two or more previously independent organizations consolidate into a single legal entity. In the latter, an organization acquires ownership rights of a second organization. The terms 'merger' and 'acquisition' are often used interchangeably (Angeli & Maarse, 2012). Because the term 'acquisition' is hardly used in Dutch healthcare, we use the term 'merger' in this paper to describe both mergers and acquisitions.

6.2.1 Theoretical perspectives on motives for mergers in healthcare

The current literature on health policy posits multiple theories to account for mergers. The first is improved efficiency by realizing economies of scale, for example, by reallocating resources between different locations in response to excess capacity or other changing conditions (Barro & Cutler, 1997; Spang et al., 2001; Vogt & Town, 2006; Cutler, 2009). Also, by reducing management and administrative overhead, concentrating care in a smaller number of locations, sharing expertise and increasing volume of treatments within locations, mergers may increase efficiency (Dranove & Shanley, 1995; Barro & Cutler, 1997; Robinson, 1998; Harrison et al., 2003; Choi & Brommels, 2009; Hayford, 2012).

The second theory is that mergers represent strategic attempts by organizations to gain market power (Bogue et al., 1995; Barro & Cutler, 1997; Brooks & Jones, 1997; Gaynor & Haas-Wilson, 1999). This explanation posits that a merger leads to a greater market share of a provider, for example, by merging with a competitor, and consequently strengthens its market position. Healthcare providers with greater market power have an enhanced ability to set prices as they are likely to be in a stronger bargaining position vis-à-vis payers and other stakeholders (Bogue et al., 1995; Dranove & Shanley, 1995; Barro & Cutler, 1997; Fulop et al., 2002).

In addition to the two theories discussed above, a third reason for healthcare mergers can be distinguished in the literature, namely pressure from a third party. For example, in a national health system like the National Health Service in the United Kingdom, government may force providers to merge for a variety of reasons, including the reduction of capacity (Harris et al., 2000; Fulop et al., 2002; Gaynor et al., 2013). Although governmental pressure is likely to be less important in competitive healthcare systems, it is possible that other external stakeholders, such as health insurers, influence merger decisions. Also, pressure from internal stakeholders (such as physicians and management) may be considered as a potential reason for merger. Oldenhof et al. (2014) and Witman et al. (2011) show that internal stakeholders are key players in the governance of healthcare providers and therefore likely influence strategic decisions such as mergers.

6.2.2 Empirical studies on motives for mergers in healthcare

Only few studies empirically examine merger motives in healthcare, and these studies mainly focus on hospital mergers. The findings of these studies are mixed. Barro and Cutler (1997) provide empirical evidence for the two main theories on merger motives, based on interviews with executives of all major hospitals in the Boston area of the United States. They find that both the need for a stronger market position and efficiency concerns motivate hospital mergers. In contrast, Brooks and Jones (1997) find in their study on 17 US hospital merger cases no proof of either market power or efficiency considerations in hospital mergers. Furthermore, Harrison (2007) suggests that the primary goal of consolidation is to increase market power rather than decrease inefficiencies. Fulop et al. (2002) study nine mergers between hospital trusts in the United Kingdom and find a variety of motives, including cost savings, safeguarding the quality and amount of services provided, external pressure for concentration of healthcare services, and lobbying from stakeholders (including national government and pressure groups).

In the survey studies of Bogue et al. (1995) and Bazzoli et al. (2002), hospitals rated strengthening the financial position, achieving operating economies, consolidating services, expanding scope of services provided, expanding market share and obtaining access to new technology as the top six most important reasons for merger. A few of these rationales can be regarded as efficiency and market considerations, for example ‘consolidating services’

and 'expanding scope of services provided'. However, Bogue et al. (1995) and Bazzoli et al. (2002) show that distinguishing a 'healthcare services' category is consistent with how healthcare providers motivate mergers. For example, Bazzoli et al. (2002) show that 54% of the healthcare providers reported that expanding market share was among the most important reasons for merger, while 44% of the providers reported that expanding the scope of services provided was among the most important reasons. These reasons are closely related, but providers apparently perceive them differently. Also other studies show that providers motivate mergers with reasons that are related to the provision of healthcare services (Fulop et al., 2002; Hayford, 2012). Finally, Bogue et al. (1995), Robinson (1998), Bazzoli et al. (2002), Harrison et al. (2003) and Choi & Brommels (2009) suggest that 'strengthening the financial position' may be a motive for merger.

In sum, empirical studies on motives for hospital mergers identify efficiency, market power and pressure by stakeholders as important drivers for mergers, but also distinguish a range of other motives, including motives related to the provision of healthcare services and financial considerations. Still, a sector-wide, systematic understanding of why healthcare providers merge is missing. Also, little is known about the relation between merger motives and health policies, although several studies suggest that such a relation is present (Barro & Cutler, 1997; Fulop et al., 2002).

6.3 Policy changes in Dutch healthcare

In order to answer the question how merger motives relate to policy changes, we describe the most important developments in Dutch healthcare policy that took place during our study period (2005–2012). The year 2005 served as a starting point because of major healthcare reforms that were enacted in the Netherlands since that year. Until 2005, Dutch healthcare organizations operated in a strictly regulated environment in which hospital care and long-term care (LTC) were financed by different social insurance schemes. Social health insurance carriers were obliged to contract with any willing provider and faced limited risk for expenditures on hospital care and were at no risk for expenditures on LTC. Also, most healthcare providers received fixed budgets for delivering care. Since 2005, the environment of providers is rapidly changing due to a series of policy measures aimed at strengthening

competition and increasing financial risk for providers. The goals of the market-oriented reform are to stimulate entrepreneurship, increase the system's efficiency and improve its responsiveness to patients' needs, while maintaining equal access (Helderman et al., 2005; Van de Ven & Schut, 2009).

Besides the market-based reforms, healthcare is undergoing a variety of other changes that possibly influence mergers. These include de-institutionalization of LTC and mental care and decentralization of home care to municipalities (Putters et al., 2010; Kroneman et al. 2012; Oldenhof et al., 2014). In the sections that follow, we describe the policy changes that were enacted between 2005 and 2012 in the sectors that we included in our study: hospital care, LTC, and mental healthcare. We focus on the consequences that those developments might have had on mergers. The policy changes are summarized in Table 6.1.

Table 6.1 – Policy changes in Dutch healthcare (2005 – 2012)

Hospital care	Long-term care	Mental healthcare
- Introduction and gradual expansion of provider-insurer negotiations over quantity and prices - Increased competition from new Independent Treatment Centres - Increased financial risks for hospitals	- Introduction of regional budget constraints - Introduction of provider-purchaser negotiations over quantity and prices - Decentralization of household services to municipalities - Ongoing trends of de-institutionalization and downscaling	- Increased financial risks for providers through reduction of budget guarantees - Increased competition from new entrants - Ongoing trend of downscaling

6.3.1 Hospital care

In 2006, the Dutch health insurance system was reformed by the introduction of the Health Insurance Act (Zvw), comprising a mandatory basic health insurance scheme. The aim of the reform was to encourage health insurers to increase the efficiency of healthcare provision by becoming prudent buyers of health services on behalf of their enrollees (Van de Ven & Schut, 2009). Since then, health insurers and hospitals have been provided with incentives and tools to negotiate over the price and quality of hospital care. For example, in 2005, prices for elective hospital care products (e.g., knee, hip and cataract surgeries), jointly accounting for on average 10% of hospital revenue, became freely negotiable. The prices for the remaining products were regulated. After 2005, the share of freely negotiable hospital services increased to 20%

of hospital revenues in 2008, 34% in 2009 and 70% in 2012. Furthermore, health insurers were allowed to selectively contract with hospitals and to reimburse only part of the care provided by non-contracted hospitals. Around 2010, health insurers started using minimum volume standards for a limited number of treatments (such as complex cancer surgery) as an instrument for selective contracting. Only hospitals providing a certain number of treatments are being contracted for these services. The uptake of selective contracting for other treatments has been limited so far.

In addition to growing pressure from health insurers, competition between providers increased. In particular, Independent Treatment Centers (ITCs)[250] were allowed access to the hospital market in 2006, resulting in a rapid growth of the number of ITCs from 149 in 2007 to 288 in 2012 (NZa, 2012a; 2013). These small-scale providers typically focus on non-complex elective procedures, such as varices surgery and cataract surgery, for which health insurers and hospitals are allowed to freely negotiate prices.

Finally, hospitals became exposed to financial risks for capital expenses. Until 2008, hospitals were not at risk for their capital expenses since these were fully reimbursed once the hospital acquired permission by the government to build or renovate hospital facilities. Starting in 2008, however, the compensation of capital expenses will be phased out in 10 years' time.

As a result of these policy changes, hospitals are increasingly exposed to financial risk and under pressure from health insurers and competitors. This became evident in several cases of hospitals that got into serious financial problems over the last years, even leading to the first ever bankruptcy of a general hospital in the Netherlands in 2013. In the past decades, the Dutch hospital sector also consolidated rapidly. As a result of mergers, the number of hospitals decreased from 160 in 1985 to ~100 in 2007 and 80 in 2012 (Blank et al., 2008; RIVM, 2013). In this paper, we aim to study to what degree mergers between 2005 and 2012 were motivated by the changing context. Changes may have increased the need to strengthen market/bargaining power vis-à-vis health insurers and other providers, to meet insurers' requirements of a minimum volume of certain treatments or to strengthen the hospitals' financial position.

250 ITCs are comparable to the freestanding Ambulatory Surgery Centers that operate in the US and UK healthcare markets (see e.g., Carey et al., 2011; Gaynor & Town, 2012).

6.3.2 Long-term care

Similar to hospitals, inpatient and outpatient LTC providers (nursing homes, disability care providers and home care providers) are under increasing competitive and financial pressure, albeit less strongly than in the hospital sector. In the Netherlands, LTC is financed through a separate public LTC insurance scheme (AWBZ). The scheme is carried out by regional insurance carriers or contracting entities. Regional insurance carriers contract with LTC providers within a regional budget constraint, which was set in 2005 by the national government to contain the fast rising LTC expenditures (Schut & Van den Berg, 2010). By the end of 2004, the government repealed the legal requirement for regional insurance carriers to contract with any willing licensed provider of outpatient LTC (e.g., home care providers). As a result, since 2005, regional insurance carriers are allowed to selectively contract with outpatient LTC providers. To accommodate the transition to competition for a share of the regional budget, all regional insurance carriers started with high budget guarantees (on average about 95%) for existing outpatient LTC providers (Varkevisser et al., 2007). These guaranteed budgets were gradually reduced in subsequent years.

Furthermore, the Social Support Act (WMO) was introduced in 2007. Household services – comprising about 30% of total home care expenditures – were carved out of the public LTC insurance scheme and transferred (decentralized) to municipalities. This is in line with decentralization trends in other European countries (Kroneman et al., 2012). Facing budget constraints, most municipalities introduced competitive bidding procedures for household services. As a result, municipalities saved about 12% of the original expenditures on household services (about 1.2 billion euros) and many home care providers faced a substantial drop in revenues or were not contracted at all (Pommer et al., 2009). The reduction of budget guarantees for incumbent providers and the tendering of household services by municipalities attracted many new providers. As a result, the number of home care providers increased by more than 60% between 2007 and 2012 (Actiz, 2012).

Finally, the LTC sector is undergoing trends of de-institutionalization and 'downscaling'. As a result of de-institutionalization, the number of people that live in institutions like nursing homes and facilities for disability care has steadily declined over the past decades. For example, the number of available places in nursing homes dropped by 20% between 1980 and 2010, despite the fact that during this

period the number of people over 80 years of age more than doubled from about 300,000 to about 650,000 (Tweede Kamer, 2013). Furthermore, LTC is downscaling: institutional care is increasingly provided in small-scale homes (Oldenhof et al., 2014). For example, in 2010, 25% of the people with dementia that received institutional care lived in small-scale homes, marking a 178% increase from 2005 (te Boekhorst, 2010). The trends of de-institutionalization and downscaling reflect a changing societal attitude towards LTC. Values like self-determination, social integration and quality of life in regular domestic settings have replaced the traditional model of LTC that was aimed at seclusion, protection and quality of care in large-scale institutions (Oldenhof et al., 2014).

Also LTC providers engaged in mergers. As a result, between 1998 and 2004, the number of standalone nursing homes decreased from 100 to 21, the number of standalone residential homes decreased from 599 to 222 and the number of home care providers decreased from 107 to 55 (Fabbricotti, 2007). In light of the policy changes presented above, mergers may offer a way out for LTC providers: they may help outpatient care providers to enhance their market/bargaining position vis-à-vis regional insurance carriers, municipalities and competitors, and they may offer inpatient care providers opportunities for improving efficiency by reducing overcapacity and investing in small-scale homes.

6.3.3 Mental healthcare

Also mental healthcare providers face increasing pressure from purchasers and competitors. Until 2008, mental healthcare was largely covered by the public LTC insurance scheme (AWBZ). Since then, the majority of mental health services – with a treatment period of less than one year – was transferred from the LTC insurance scheme to the mandatory basic health insurance scheme (Zvw) that was introduced in 2006. Approximately two-thirds of mental care is now financed through the Zvw (Trimbos-instituut, 2011). In contrast to the other providers covered by the Zvw (e.g., hospitals), mental care providers have to negotiate a budget with a representative of all health insurers rather than individual health insurers. Hence, they are still confronted with a single buyer. Although health insurers guaranteed to maintain budgets at the level of the preceding year in 2008, over time they gradually reduced these budget guarantees (Mosca & Heijink, 2013).

Furthermore, new entrants have entered the market for mental care during our study period. New entrants providing mental health services have to negotiate contracts with individual health insurers, including the price per service. While new entrants had a market share in terms of expenditure of only 0.3% in 2008, this increased to 10% in 2012 (NZa, 2012b; Mosca & Heijink, 2013). Nevertheless, the market for mental healthcare is highly concentrated. In 2009, the average regional market share of the largest mental healthcare provider was 62% (NZa, 2010). After a range of mergers between inpatient and outpatient mental care providers in the 1990s, about 85% of mental care in the Netherlands is now provided by 31 regionally organized mental care providers (Trimbos-instituut, 2011).

Finally, the mental healthcare sector is undergoing a trend of downscaling. Although the number of inpatient places for patients with mental disabilities has not decreased during our study period (NZa, 2012b; 2014a), inpatient mental care is increasingly provided in small-scale 'protected homes' instead of large-scale psychiatric hospitals. Protected homes are often located in regular neighborhoods and comprise clustered apartments, often with a shared living room. The number of places in protected homes increased from 4.000 in 1993 to 7.000 in 2004 and 14.000 in 2009, now comprising over 60% of inpatient places (Trimbos-instituut, 2011).

Hence, similar to hospitals and LTC providers, mental care providers face increasing pressure from purchasers and competition with other providers. Furthermore, they are in a transition from inpatient mental care in psychiatric hospitals to protected homes. It is therefore possible that mergers between mental care providers are motivated by an urgency to strengthen their market/bargaining position vis-à-vis health insurers and competitors, and a need to improve efficiency by reducing overcapacity in psychiatric hospitals.

6.4 Methods

To study why healthcare providers merge, we sent a survey to Dutch healthcare executives. The survey contained questions on the background of executives, the characteristics of the providers involved in mergers and merger motives. The survey was sent out electronically in April 2012 (with two reminders in May) to all 740

members of the Dutch Association of Healthcare Executives (NVZD) and another 108 executives whose contact details were obtained from a Dutch consultancy firm (BMC). We focused on healthcare executives because they are key players in merger processes and have unique inside information on why mergers are initiated. To limit the risk of social desirability bias (respondents may wish to provide a preferred image and answer questions accordingly), the survey was processed anonymously.

In the Netherlands, there is no public information on the total number of healthcare executives. Based on undisclosed documents of the NVZD, we estimated that we have sent the survey to about 70% of Dutch healthcare executives. In the same documents, the NVZD analyzed the representativeness of their membership list. They concluded that their sample is fairly representative for all healthcare executives. They only seemed to slightly overrepresent executives of large healthcare organizations within some healthcare sectors.

We attempt to extend the reach of the survey by also using the contact details that we received from BMC. BMC provides consultancy services to (small and large) healthcare organizations. By that, we were able to survey a unique population. The healthcare executives in our study worked throughout the field of healthcare in private not-for-profit organizations that provide (a combination of) mental care, disability care, nursing home care, hospital care and other forms of care (including home care and primary care).

The final sample consisted of 239 respondents, of which 155 (64.9%) had been involved in at least one merger case between January 2005 and April 2012.[251] To limit the risk of recall bias, we asked the executives that participated in more than one merger (i.e., 42.6% of all executives that participated in mergers) to focus on the most recent merger case. The executives that participated in the survey are mostly male (n = 163; 73.1%). The mean age of our respondents is 55.6 years (SD: 5.44; minimum: 32; maximum: 70). The executives' length of career varies strongly in the sample. On average, respondents have 13 years of experience in end-responsible positions in healthcare, but the standard deviation is 8.89 and there are also respondents that have less than one year or over 40 years of experience.[252] Our findings on the executives' age and gender are similar to those in a previous survey study among Dutch healthcare executives (Van der Scheer et al., 2007).

251 The survey was sent to 848 executives of which 831 received the email and 296 filled out the survey (response rate 35%). In 17 cases, the e-mail was returned as undeliverable. After excluding respondents who did not work in organizations providing healthcare services at time of the merger and who did not provide full information, the remaining study sample consisted of 239 respondents.

252 These proportions are based on 223 respondents because 16 respondents did not fill out the questions on age, gender and experience.

Table 6.2 displays information on the executives' healthcare organizations that were involved in a merger during the study period.

Table 6.2 – Background characteristics of the executives' organizations that were involved in a merger (N=155)[a]

	Respondents' organisations		Partnering organisations	
	No.	%	No.	%
Panel A. Turnover before merger				
Less than EUR 15 million	25	16	46	30
EUR 15 – 50 million	45	29	43	28
EUR 50 – 100 million	44	28	38	25
EUR 100 -125 million	14	9	13	8
EUR 125 – 150 million	5	3	4	3
More than EUR 150 million	22	14	11	7
Panel B. Healthcare sector before merger				
Nursing homes	29	19	23	15
Mental care	23	15	20	13
Hospitals	21	14	19	12
Disability care	12	8	8	5
Other[b]	24	15	29	19
Healthcare conglomerates[c]	44	28	56	36

[a] Notice that the unit of observation is the executive and not the organization. Since several executives may have been involved in the same merger, the number and type of organizations does not refer to unique organizations
[b] Healthcare sector 'other' includes organizations providing youth care, home care and rehabilitation care. The number of providers in these healthcare sectors was too small to perform meaningful analysis on the sectors separately
[c] Healthcare conglomerates are organizations that provide different types of care (e.g., both mental care and disability care)

Almost three quarters of executives were involved in mergers between providers with a turnover of less than EUR 100 million (most of which less than EUR 50 million). Furthermore, executives were primarily involved in mergers between healthcare organizations that provide (partly) the same type of care (n = 141, 81%). Over half of the executives took part in single-sector mergers (i.e., mergers that do not involve healthcare conglomerates; n = 77). Finally, only 9% (n = 14) of the executives were involved in mergers between two or more healthcare providers that are not active in the same healthcare sector(s). Hence, we find that most mergers between Dutch healthcare providers between 2005 and 2012 were aimed at integration: mergers involving organizations in the same or an adjacent stage of service delivery (Angeli & Maarse, 2012). Only a limited number of mergers is aimed at diversification (mergers between organizations in other markets; Angeli & Maarse, 2012).

6.4.1 Questions about merger motives

We asked the respondents: 'What was (were) the most important motive(s) to engage in a merger?' Respondents were able to tick one or more of the answer categories that followed from the literature: (i) efficiency; (ii) market/bargaining position; (iii) pressure from internal and/or external stakeholders; (iv) healthcare provision; and (v) financial reasons. The five main categories were subdivided into 23 motives. The motives were based on the reasons for merger that Bogue et al. (1995), Bazzoli et al. (2002) and others found and supplemented with merger motives that were identified in a discourse analysis of newspapers texts about organizational scale in Dutch healthcare (Postma, 2015). For each category of motives, we also provided an open answer category (which we named 'other'). The five categories and the list of motives can be found in Table 6.5.

6.5 Results

6.5.1 Merger motives

In Table 6.3, we present what categories of motives healthcare executives rate as the most important one(s) for engaging in a merger.

Table 6.3 – Main categories of merger motives (multiple-response question)

	Healthcare executives	
	No.	%
Main categories of motives for merger		
Healthcare provision	107	69
Market/bargaining position	97	63
Efficiency	71	46
Financial reasons	43	28
Pressure from internal and/or external stakeholders	19	12

Of the five categories of merger motives, healthcare executives most often mention the category related to healthcare provision (n = 107; 69%). This indicates that executives regard merger as an instrument to change the organization and delivery of healthcare services. By realizing a broader/more specialized range of services or by providing services to new groups of clients or in other geographical areas, they seem to aim at attracting new patients and/or offer more or better services to their existing patients.

Almost equally frequently mentioned is the category of motives related to strengthening the market or bargaining position. The fact that this category was mentioned by more than 60% of all executives supports the expectation that policy changes aimed at increasing competition are important drivers for mergers in the Netherlands. Furthermore, although efficiency and financial reasons are less frequently mentioned, these considerations were still important in almost 50% and 30% of executives' decisions to merge. This is consistent with policy changes aimed at improving efficiency of healthcare provision and increasing financial risk for providers. Remarkably, pressure from internal or external stakeholders did not play an important role in executives' merger decisions. Less than 10% of the executives indicated this reason. This suggests that healthcare executives have a large degree of autonomy in merger decisions.

The majority of healthcare executives (72%) mentioned more than one category of merger motives. Table 6.4 distinguishes between executives who mentioned a single category (panel A) and those who reported multiple categories (panel B).

Table 6.4 – Single (Panel A) or multiple (Panel B) categories of motive (s) for merger

	Healthcare executives	
	No.	%
Panel A. Single categories of motives for merger	43	100
Healthcare provision	19	44
Market/bargaining position	17	40
Efficiency	2	5
Financial reasons	2	5
Pressure from internal and/or external stakeholders	3	7
Panel B. Multiple categories of motives for merger	112	100
Healthcare provision and market/bargaining position	24	21
Healthcare provision, market/bargaining position and efficiency	18	16
Healthcare provision and efficiency	11	10
Market/bargaining position and efficiency	9	8
Healthcare provision and financial reasons	8	7
Healthcare provision, financial reasons and efficiency	7	6
Healthcare provision, market/bargaining position, financial reasons and efficiency	7	6
Other combinations of motives to merge	28	25

Among those who mentioned a single category, the vast majority (84%) mentioned healthcare provision or bargaining position as drivers to merge. For those who mentioned multiple motives, the same two categories were the most important. In total, healthcare

executives reported 22 combinations of categories, of which 20 include the category 'healthcare provision', the category 'market/ bargaining position' or both.

6.5.2 Merger motives across sectors

Within each of the categories of merger motives, a number of more specific motives were distinguished. Table 6.5 reports the relative importance of these motives within the five main categories.
We first focus on the importance of merger motives across sectors (panel A). Within the category 'efficiency', the three motives – more efficient use of capacity, more efficient deployment of personnel and a reduction of overhead – are almost equally important. However, although the number of observations is low, more efficient use of production capacity seems to be more important for mergers involving nursing homes and healthcare conglomerates (93% and 96% of the executives, respectively) than in hospitals (50% of executives). This is in line with the observed trends of de-institutionalization and downscaling and the resulting pressure on inpatient LTC providers to reduce overcapacity.

Within the category 'market/bargaining position', almost all executives mention improving the market/bargaining position vis-à-vis health insurers. This is not surprising since the financing of providers depends on a contract (hospitals, mental health and home care providers) or a budget (nursing homes and disability care providers) to be negotiated with either competing health insurers or regional insurance carriers. Also, the rapid consolidation of the health insurance market (the four largest insurers currently have a combined market share of ~90% (NZa, 2014b)), might have urged providers to develop countervailing power by merging.

For LTC providers, strengthening their market/bargaining position vis-à-vis municipalities is also found to be important. This is in line with the growing importance of municipalities as purchaser of home care.

Furthermore, almost all executives mention fortifying or maintaining a strong position versus competitors, thereby illustrating the increasingly competitive environment in which healthcare providers operate. Despite the increasing role of the market, however, executives still seem to perceive the government as an important player: about two-thirds of the executives within

Table 6.5 – Merger motives per category per healthcare sector (Panel A) and per period (panel B)[a]

	Panel A. Healthcare executives per sector (before merger) (n=155)						**Panel B. Healthcare executives per period (n=155)**	
	Mental care (n=23)	Disability care (n=12)	Nursing homes (n=29)	Hospitals (n=21)	Healthcare conglomerates (n=44)	Other (n=24)[2]	2005 – 2008 (n=64)	2009 – 2012 (n=91)
	53% (n=12)	17% (n=2)	45% (n=13)	38% (n=8)	48% (n=21)	63% (n=15)	42% (n=27)	49% (n=44)
1. Efficiency (%)								
More efficient use of real estate and/or (bed)capacity	84	50	93	50	96	47	85	71
More efficient deployment of personnel	92	50	70	50	96	67	81	75
Reduction of overhead	100	100	93	88	96	100	96	96
Other	17	50	8	13	43	40	19	34
	66% (n=15)	50% (n=6)	76% (n=22)	43% (n=9)	69% (n=30)	63% (n=15)	61% (n=39)	64% (n=58)
2. Market/bargaining position (%)								
Improving or maintaining bargaining position vis-à-vis health insurance companies	93	84	96	89	84	94	95	87
Improving or maintaining bargaining position vis-à-vis suppliers	67	50	59	78	64	80	72	62
Improving or maintaining bargaining position vis-à-vis municipalities	60	67	73	23	77	60	59	69
Improving or maintaining position vis-à-vis other healthcare organisations	80	100	82	89	94	94	95	85
Improving or maintaining political influence	80	84	50	45	77	74	69	68
If the organisation would not merge, it would be vulnerable to a takeover by a third party	34	50	32	12	27	27	33	26
Other	0	17	11	12	14	14	5	18
	5% (n=1)	9% (n=1)	14% (n=4)	19% (n=4)	9% (n=4)	21% (n=5)	7% (n=5)	5% (n=14)
3. Pressure from stakeholders (%)								
Pressure from government	0	0	25	0	89	80	60	43

Table 6.5 – Merger motives per category per healthcare sector (Panel A) and per period (panel B)[a]

	Panel A. Healthcare executives per sector (before merger) (n=155)						Panel B. Healthcare executives per period (n=155)	
	Mental care (n=23)	Disability care (n=12)	Nursing homes (n=29)	Hospitals (n=21)	Healthcare conglomerates (n=44)	Other (n=24)[2]	2005 – 2008 (n=64)	2009 – 2012 (n=91)
Pressure from health insurers	0	0	50	75	89	40	60	50
Pressure from physicians	0	0	0	75	81	0	40	15
Pressure from management	0	100	25	50	70	40	80	43
Pressure from supervisory board	0	100	25	75	59	40	80	43
Other	100	100	25	0	68	0	40	15
	74% (n=17)	100% (n=12)	56% (n=16)	86% (n=18)	69% (n=30)	59% (n=14)	72% (n=46)	67% (n=61)
4. Health care provision (%)								
Consolidating healthcare services	89	84	82	89	90	79	85	80
Realizing a broader/more specialized range of healthcare services	100	100	63	84	100	86	89	82
Providing healthcare services to new groups of patients	65	59	69	50	64	79	67	56
Providing healthcare services in other geographical areas	18	50	38	12	30	50	20*	36*
Reducing waiting lists	30	9	25	34	40	22	35	23
Increasing possibilities for small-scale care	53	42	50	28	64	50	63	41
Being able to meet volume criteria	71	50	69	78	37	72	43*	62*
Other	24	59	38	17	30	22	33	26
	18% (n=4)	17% (n=2)	31% (n=9)	34% (n=7)	32% (n=14)	30% (n=7)	22% (n=14)	32% (n=29)
5. Financial reasons (%)								
Strengthening or consolidating solvency	50	100	100	100	86	100	86	94
Improving access to external capital	50	50	56	86	58	43	64	56
Other	0	0	23	15	58	43	29	35

[a] These were all multiple-response questions. On the multiple-response sets, we performed chi-square tests of independence and pairwise comparison within each of the five categories of proportions with Bonferroni-adjusted *p*-values for multiple comparisons. Null hypothesis: no significant difference between time periods or healthcare sectors ($\alpha = 0.05$ and 0.10)

* Significant difference between time period

this category reports that improving or maintaining political influence was a motive to merge.

Within the category 'healthcare provision', mergers are particularly motivated by consolidation and specialization of healthcare services. Expanding services to new patient groups and new areas is also frequently mentioned, though more often in case of mergers between LTC providers than in case of hospital mergers. Increasing possibilities for small-scale care is a motive in almost half of the LTC and mental care mergers. This is consistent with the trend of downscaling.

Within the category 'financial reasons', clearly the most important motive for merger is strengthening or consolidating solvency. This motive is dominant across all types of healthcare providers. This likely reflects the increasing financial pressure that was discussed earlier, which urges providers to find partners with a better solvency rate to achieve more financial stability. For the partner with the better solvency rate, the merger might be valuable for other reasons, for example because of the portfolio of the other organization, despite its worse financial situation. Acquiring or safeguarding access to external capital is also important, perhaps because of the stricter requirements of banks – in response to the increasing financial risk of providers – as primary source of external capital.

6.5.3 Changing merger motives

We now turn to the changes in merger motives over time and the relation with policy developments. Since the number of observations is too low to investigate changes per year and per healthcare sector, we split our study period in two equal time periods – 2005–2008 and 2009–2012 – and aggregated merger motives of the executives of the various healthcare sectors. The results are shown in panel B of Table 6.5. Using a χ^2 test we find no significant dependence between merger period and main categories of merger motives. Nevertheless, it is interesting to note that especially 'financial reasons' and 'efficiency' seem to be mentioned more frequently in the second period (albeit not significantly), pointing to the increasing financial pressure on healthcare providers. A reason for the absence of differences in the main categories between the two time periods could be an anticipation effect: providers foresee changes in health policies and decide to merge before the actual changes are effectuated.

Within categories we find that executives that were involved in mergers in the second period (2009–2012) significantly more often report 'providing healthcare services in other geographical areas' and 'being able to meet volume criteria' as a motivation to merge (p-value < 0.05) than in the first period (2005–2008). The first change possibly points to the ambition of healthcare providers to expand their market share in reaction to incentives for competition. The second change is consistent with the growing importance of volume criteria in selective contracting by health insurers. Although selective contracting of healthcare services is limited, the threat of the use of volume criteria for selective contracting may have had influenced mergers already. When we split the study period in 2005–2007 and 2008–2012, we find that in the second period significantly more executives indicate 'improving or maintaining market/bargaining position vis-à-vis municipalities' as an important motive for merger (p-value < 0.05). This is consistent with the decentralization of household services from public LTC-insurance towards municipalities in 2007.

6.6 Conclusion and discussion

This study is the first to systematically analyze motives for merger over a period of time and across different healthcare sectors, using a rich and unique dataset from a survey among Dutch healthcare executives. We analyzed why healthcare providers merge and how these merger motives relate to (sector-specific) policy changes.

Our study shows that healthcare mergers are motivated by a variety of reasons. We find that the dominant motives for merger were improving healthcare provision and strengthening market/bargaining power. Also efficiency and financial reasons are important drivers of merger activity in healthcare. Our study thereby confirms findings from earlier studies that emphasize the importance of market power and, to a lesser extent, efficiency and financial considerations as motive for healthcare mergers (e.g., Bogue et al., 1995; Barro & Cutler, 1997; Gaynor & Haas-Wilson, 1999; Bazzoli et al., 2002). Pressure from external or internal stakeholders is rarely a reason for Dutch healthcare providers to merge. This result does not support earlier studies that indicate that pressure from third parties is an important motive for merger (e.g., Fulop et al., 2002; Gaynor et al., 2013).

The importance of motives related to the provision of healthcare also confirms findings from earlier studies (Bogue et al., 1995; Bazzoli et al., 2002). In most studies on healthcare mergers, however, motives regarding the provision of healthcare are not identified as a separate category. Although it might be argued that these motives are related to market power and/or efficiency considerations, the fact that the majority of healthcare executives indicate these reasons as relevant, strengthens the idea that executives perceive this category as different from market power and efficiency. We therefore argue for incorporating reasons regarding healthcare provision as a separate category in theories on healthcare mergers.

With regard to policy changes, we find that between 2005 and 2012 healthcare providers increasingly merge because of motives related to their market position ('providing healthcare services in other geographical areas'), selective contracting of hospital care by health insurers ('being able to meet volume criteria') and decentralization of LTC ('improvement or maintenance of market/bargaining position vis-à-vis municipalities') as the pressure from competitors, health insurers and municipalities is increasing. We also find that providers tend to merge with providers from the same healthcare sector (integration), which likely creates more opportunities for specialization and strengthening their market position. These findings indicate that changes in health policy have an impact on merger motives, but further research is required to understand how this relation exactly works.

This study contributes to the literature by empirically showing what motives for merger executives in Dutch healthcare have and how these relate to health policies. However, although we tried to minimize the risk of social desirability bias by processing the survey anonymously, we cannot rule out the possibility that in some cases the answers of executives to our survey questions are *ex post* justifications to hide other types of motives. These could for example be 'mimicking', i.e., uncritically copying business practices (such as merger) from the private sector (Bigelow & Arndt, 2000; Kitchener, 2002; Comtois et al., 2004) or the personal ambition of management or executives (Angwin, 2007). We recommend future studies, for example ethnographic research, to investigate in detail whether these other types of motives play a role and to study to what degree the goals of mergers are achieved in practice.

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CHAPTER 7

Getting Cold Feet? Why Healthcare Mergers are Abandoned

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Published in: Health Care Management Review. 2016. 41(2): 155-164.

Abstract

Despite the frequent occurrence and sizeable consequences of merger abandonment in other sectors, there is no thorough understanding of merger abandonment in health care. The purpose of this study is to improve the understanding of determinants of health care merger abandonment. On the basis of the literature on merger abandonment, we formulated a framework on potential determinants of health care merger abandonment. We then constructed a survey that was sent to 70% of all executives of Dutch health care organizations (response rate = 35%, n = 291). We provide descriptive overviews of open, multiple-response, and multiple-choice questions on merger abandonment and use chi-square tests and Fisher's exact tests to test whether abandoned and completed merger processes differ. About 62% of the respondents were involved in at least one merger process during the period of 2005-2012. Thirty-eight percent of these respondents reported that their last merger case ended prematurely (n = 53). The most frequently mentioned determinants of merger abandonment are changing insights on the desirability and feasibility during merger processes, incompatibilities between executives, and insufficient support for the merger from internal stakeholders. We did not find significant relationships between merger abandonment and executives' previous merger experience, degree of organizational diversification, health care sector, size differences, or other organizational differences. Our findings partially confirm results from previous studies, especially with regard to the importance of changing insights and incompatibilities between the involved executives in merger abandonment. We also find that pressure from internal stakeholders, particularly nonexecutive directors, and distrust, fear, and animosity play an important role in merger abandonment. To minimize the organizational and societal costs of abandoned mergers, we advise executives who engage in mergers to construct backup plans with alternative strategies in case the merger is abandoned and to conduct a thorough analysis of pros and cons before the merger.

7.1 Introduction

In many countries, increased merger activity in health care has fuelled a political and scientific debate about the consequences of mergers and the desirability of further concentration of health care markets (Gaynor & Town, 2012). Much less attention is paid to cases where organizations intend to merge but eventually decide to abandon the merger, although studies estimate that between 11% and 28% of all merger cases across industries are abandoned (Pickering, 1978; Madura & Ngo, 2012). From a societal viewpoint, merger abandonment may have positive or negative consequences (Akhigbe et al., 2000; Song & Walkling, 2000; Wong & O'Sullivan, 2001; Pett et al., 2003; Neuhauser et al., 2011; Liu, 2012). On the one hand, merger abandonment may, for example, prevent potentially harmful mergers that are likely to be inefficient or aimed at gaining anticompetitive advantage. On the other hand, the resources from internal and external stakeholders that are devoted to merger preparation are largely lost when a deal is off. Although it is difficult to quantify the consequences of merger abandonment, abandoning a merger can be costly and undesirable, especially if the merger would have been successful when consummated.

Despite the frequent occurrence and sizeable consequences of merger abandonment in other sectors, there is no thorough understanding of merger abandonment in health care. To fill this gap, we issued a survey among Dutch health care executives (i.e., end-responsible managers) to examine the determinants of health care merger abandonment. Our study provides valuable insights into potential deal breakers of health care merger transactions, so that organizations are better able to decide whether to engage in a merger and improve the process once they are involved in a merger.

7.2 Theory

The goal of our study is to improve the understanding of the determinants of health care merger abandonment. In this section, we provide an overview of the available literature on merger abandonment for several industries. We limit our overview to findings or determinants that are relevant to health care. On the basis of this literature, we develop 11 expectations about the

determinants of merger abandonments in health care. We use the expectations as a framework for our survey.

7.2.1 External pressure

In competitive markets, antitrust laws are found to play an important role in the abandonment of mergers (Wong & O'Sullivan, 2001). Antitrust policy may prevent anticompetitive mergers in two ways: (i) by direct prohibition if an antitrust authority finds that the proposed consolidation will lead to anticompetitive behaviour in the relevant market and (ii) by anticipatory action of the organizations that have the intention to merge. Anticipatory action means that organizations modify their behaviour and plans without direct intervention of the agencies to remain within the bounds of the antitrust law. In the context of this article, this means that organizations abandon a merger because they anticipate that the antitrust agency will block the merger. Both Baarsma et al. (2012) and Gordon and Squires (2008) found that about 10% of the intended mergers are abandoned because of (anticipated) objections to the consolidation by antitrust authorities. For competitive health care markets that are subject to antitrust laws, we therefore expect the following:

1. Enforcement by antitrust agencies plays a role in the abandonment of health care merger cases, either by prohibition of the merger by antitrust agencies or by anticipatory action of merging organizations.

In addition, pressure from external stakeholders other than antitrust agencies, for example, media and other health care organizations, is found to influence the likelihood of merger completion (Pickering, 1983; Lamberg et al., 2008; Dikova et al., 2010; Muehlfeld et al., 2011; McCann, 2013). The studies in this field indicate that external uncertainty and unpredictability caused by stakeholders in the environment of the organizations increases the probability of merger abandonment. Furthermore, Aguilera et al. (2007) and Muehlfeld et al. (2007) found that merger cases that gather close societal attention are more likely to be abandoned than other cases. Because health care is a sector with high public interest, often attracting a lot of attention, we expect the following:

2. Pressure from external stakeholders other than antitrust agencies is a reason for the abandonment of health care merger cases.

7.2.2 Resistance by internal stakeholders

Several studies indicate that a positive attitude of executives toward a merger is the most important factor for completion (Walkling, 1985; Branch & Yang, 2003; Muehlfeld et al., 2007; Meyer & Altenborg, 2008; McCann, 2013). Holl and Kyriaziz (1997) found that the probability that a merger case leads to a merger is lowered substantially when executives of one of the involved parties do not want to cooperate. Executives may resist a merger when they foresee a loss in compensation, prestige, job satisfaction, and security after post-merger displacement (Aguilera et al., 2007). In addition, personality clashes, a lack of trust between executives, inability to work toward common goals, a managerial preference for remaining independent, and doubts on the (intended) effects of the proposed merger can lead to merger abandonment (Pickering, 1983; Sudarsanam, 1991; Brennan et al., 2010). Therefore, we expect the following:

3. Resistance by executives is a determinant for the abandonment of health care merger cases.

According to Wong and O'Sullivan (2001), little is known about the role of nonexecutive directors in the abandonment of mergers. Henry (2004) found that the corporate governance structure (e.g., board composition and the number of nonexecutive directors) has no correlation with merger abandonment. This is not to say that nonexecutive directors are unimportant in merger decisions. Irrespective of whether an organization features a one-tier or two-tier executive board, nonexecutive directors have an obligation to (dis)approve major organizational decisions like mergers. If nonexecutive directors reject the merger, the deal is off. Works councils and client advisory councils usually have a legal right to advice the boards of executives in important strategic decisions, which means that they have a say in merger decisions as well. Finally, stakeholders like middle management and professionals are often found to be important players in the governance of health care organizations (Witman et al., 2011; Oldenhof et al., 2014). Therefore, we expect the following:

4. Nonexecutive directors, works councils, client advisory councils, middle management, and professionals play a role in the abandonment of health care merger cases.

7.2.3 Organization/sector characteristics

A range of studies show that organization or sector characteristics play a role in the abandonment of mergers.

First, Pickering (1983) and Ingham and Wong (1994) found that problems in financial performance or other performance problems of one of the organizations that are discovered during a merger process could lead to merger abandonment. Therefore, we expect the following:

5. The discovery of performance problems of one of the organizations during health care merger cases is a reason for abandonment.

Second, several studies showed that, if organizations have prior experience with mergers, the likelihood of merger abandonment decreases. However, there is little evidence on how merger experience exactly influences abandonment or completion (Dikova et al., 2010; Muehlfeld et al., 2011). It is likely that the impact of an organization's merger experience (partly) depends on the merger experience of its executives, being the key decision makers. We therefore expect the following:

6. In comparison with executives who complete merger processes, executives who abandon mergers have less merger experience.

Third, Aguilera et al. (2007) and Aguilera and Dencker (2010) found that the more diversified merging organizations are (i.e., the broader the range of different products or services they provide), the lower the probability that they abandon the merger. They argue that diversified organizations develop organizational capabilities and routines to facilitate the integration of new activities, which is helpful in merger cases. Therefore, we expect the following:

7. Executives involved in abandoned mergers more often work in less diversified organizations than executives involved in completed mergers.

Fourth, D'Aveni and Kesner (1993), Aguilera and Dencker (2010), and Madura and Ngo (2012) found that mergers between organizations from different sectors have a lower propensity to be abandoned than mergers between organizations from the same sector. These authors argue that, although the involved organizations have a common understanding of the sector, merger cases in the same sector are abandoned more often because competition in the past may have led to informal collisions and personal disputes between management of both organizations.

Cross-sector mergers that involve distinct markets do not have to deal with these issues and are therefore likely to experience fewer conflicts during merger process, resulting in a higher probability of merger completion. Therefore, we expect the following:

8. In comparison with executives involved in completed mergers, executives involved in abandoned mergers are more likely to operate in the same health care sector as their merger partner.

Fifth, several studies indicate that organizational size is an important factor in merger abandonment. Holl and Pickering (1988), Akhigbe et al. (2000), Branch and Yang (2003), Maheswaran and Pinder (2005), and Aguilera et al. (2007) found that mergers between organizations with comparable sizes are less likely to be completed than mergers between organizations with a different size. Perhaps because small organizations do not try to resist the wishes of the larger organizations, especially if it is a hostile takeover, whereas equally sized organizations collide over merger conditions. Furthermore, Pickering (1978) found that merger abandonment is more likely if both organizations are large. Therefore, we expect the following:

9. Size differences between organizations involving executives who complete merger processes are larger than size differences between organizations involving executives who abandon mergers.

10. Executives are more likely to experience merger abandonment if the health care organizations that are involved in the merger are both large.

7.2.4 Case studies on health care merger abandonment

Scientific research on merger abandonment in health care is limited and consists of case studies of abandoned hospital mergers in the United States and Canada only. The determinants of merger abandonment that are found in these case studies in health care are consistent with our expectations based on the general literature. Appelbaum and Morrison (2000), for example, showed that, also in health care, antitrust policy prevents anticompetitive mergers (Expectation 1). Furthermore, Neufeld et al. (1993) found that a wide variety of variables played a role in the abandonment of the merger that they studied, including the absence of a strong, systematic analysis of potential costs and benefits and insight in the financial viability of the merger (Expectation 5). They also found that the hospitals lacked a carefully defined stakeholder management strategy (Expectations 2-4).

However, in the case studies, we also identified a reason for abandonment that had not been reported in research in other sectors. Several case studies have shown that ideological and religious differences can be important determinants of the abandonment of health care mergers, especially in mergers between religiously affiliated and secular hospitals (Appelbaum & Morrison, 2000; Gelb & Shogan, 2007; Palley & Kohler, 2008). We therefore formulate one additional expectation:

11. Ideological/religious differences are determinants for merger abandonment in health care.

7.3 Data and Method

The case studies provide insight in why specific health care mergers have been abandoned, but a more general, sector wide insight in the phenomenon is lacking. We fill this gap in the literature by investigating the determinants of health care merger abandonment in the Netherlands between 2005 and 2012. We constructed a survey that was sent to 70% of all Dutch health care executives.

7.3.1 Study period

The year 2005 served as a starting point because of major health care reforms that were enacted in the Netherlands since that year. New regulations in the Netherlands between 2005 and

2012 include the Health Insurance Act (Zvw) and the Healthcare Market Regulation Act (WMG). The first introduced a new health insurance scheme that strengthened competition between health insurance companies; the second was created to expand the room for competition among health care providers. As a consequence, Dutch health care organizations that operated in a heavily regulated environment until 2006 are now increasingly exposed to competition and financial risks.

7.3.2 The survey

To our knowledge, there are no validated surveys on merger abandonment. We therefore designed a survey that specifically focused on this topic. The survey was constructed using the expectations and piloted by former health care executives and colleagues. The survey contained open, multiple-choice, and multiple-response questions on the background of executives, the characteristics of the organizations involved in a merger, and reasons for merger abandonment.

To date, most research on merger abandonment uses the organization as the unit of analysis. These studies mostly use publicly available information, which is arguably incomplete. First, there is no registry of (abandoned) mergers, so abandoned mergers that are not publicly announced are not included in these studies. Second, even if it is publically known that the merger was abandoned, the reasons are often not made public. We therefore concluded that we had to survey as many executives as possible to get a complete picture of merger abandonment. We focus on executives as they are key players in merger processes.

An e-mail with a link to the online survey was sent out in April 2012 to all 740 members of the Dutch Association of Healthcare Executives and another 108 executives whose contact details were received from a Dutch consultancy firm (BMC). On the basis of undisclosed documents of the Dutch Association of Healthcare Executives, we estimated that we have sent the survey to about 70% of Dutch health care executives. Hence, we sent the survey to most health care executives nationally, which provided us with a comprehensive and unique data set. We excluded 17 persons from the sample as they never received the e-mail (i.e., error message: ‘e-mail undeliverable’). In total, 291 respondents of 831 contacts have filled out the survey (response rate = 35%). We excluded the respondents who did not work in health care organizations at the

time of the merger or on who we had no full information, so the study sample eventually included 223 respondents. Of these, 62% (n = 139) had been involved in at least one merger case between January 2005 and April 2012. We asked the executives who participated in more than one merger (i.e., 38% of all executives who participated in mergers) to focus on the most recent merger case. Of the executives who had been involved in merger cases, 62% (n = 86) indicated that their last merger case was completed, whereas 38% (n = 53) indicated that their last merger case was abandoned. Hence, more than one third of the respondents reported that the last merger in which they participated was abandoned.

7.3.3 Measurement

According to the definition used in this study, a merger case starts when parties decide that they want to merge and ends either in a legal consolidation of the organizations (completed merger) or in a decision to terminate the process (abandoned merger). We analyze (i) the answers that the executives provided to an open question ('What was/were the main reason(s) for merger abandonment?') and (ii) the answers to two multiple-response questions that specifically focused on the role of stakeholders in abandoned mergers ('Which external/internal stakeholders have influenced the merger abandonment?'). To analyze the answers to the open question on reasons for merger abandonment, we used the main concepts from our theoretical framework in combination with open coding. We also compare the answers of 53 executives who were involved in abandoned mergers with the answers of 86 executives who were involved in completed mergers. For the comparisons, we used chi-square tests of independence and the Fisher's exact test with small sample sizes. Table 7.1 summarizes the distribution of the executives' characteristics.

As a sensitivity check, we used different operationalizations. For example, we used different definitions of small/large organizations, and we used the overall experience of the health care executive as a proxy for the organization's merger experience instead of the respondent's experience with mergers. In addition, in testing Expectations 9 and 10, we assumed a merger between two health care organizations, although in practice, health care mergers between more than two health care organizations also occur (23% of the executives who we surveyed was involved in mergers with more than two partners). Because we collected information on the

Table 7.1 – Measurement and operationalization of key variables in expectations 6 to 10

No.	Variable	Operationalization	Answer categories	Executives that were involved in completed mergers (n=86)		Executives that were involved in abandoned mergers (n=53)	
				No.	%	No.	%
6	Organization's merger experience	Executive's merger experience	No experience (1st merger case)	50	58	36	68
			Experience (> 1 merger cases)	36	42	17	32
7	Organizational diversification	Number of healthcare sectors in which the healthcare organization is active as reported by the executive	No organizational diversification (single sector before merger)	49	57	32	60
			Organizational diversification (multiple sectors before merger)	37	43	21	40
8	Sectoral differences between the merging organizations	Merger between organizations that are (partly) active within the same healthcare sector or not as reported by the executive	Merger (partly) within the same sector	80	93	47	89
			Merger across sectors	6	7	6	11
9	Size differences between the merging organizations	Size of the merging organizations in terms of yearly turnover (small organization < € 50 mln., large organization > € 50 mln.) as reported by the executive	Small difference (a merger between 2 small or 2 large organizations)	63	73	44	83
			Large difference (a merger between a small and a large organization)	23	27	9	17
10	Combined size of the merging organizations	Size of the merging organization based on the combined yearly turnover (small organization < € 50 mln., large organization > € 50 mln.) as reported by the executive	Small merger (a merger between 2 small organizations)	36	42	21	40
			Medium merger (a merger between a small and a large organization)	23	27	9	17
			Large merger (a merger between 2 large organizations)	27	31	23	43

largest merger partner, we only have information on two organizations (the executive's organization and the largest partner's organization). As a sensitivity check, we also tested Expectations 9 and 10 limiting the data set to the respondents who indicated that their merger only included two organizations. The sensitivity checks did not lead to different results. The results of the sensitivity checks are available upon request by the authors.

7.4 Findings

7.4.1 Respondents

The executives who are included in our study work throughout the field of health care in private not-for-profit organizations that provide (a combination of) mental care, disability care, nursing home care, hospital care, and other forms of care (including home care and primary care). They are mostly men (n = 163, 73%). The mean age of the respondents is 55.6 years (SD = 5.44 years). The executives' length of career varies strongly in the sample (mean = 13 years, SD = 8.89 years). Our findings on the executives' age and gender are similar to those in a previous study among Dutch health care executives (Van der Scheer, 2007).

7.4.2 Reasons for merger abandonment

Most respondents gave several reasons for merger abandonment. In table 7.2, the most important reasons that were given in response to the open question are categorized. Table 7.3 summarizes the main findings of the two multiple response questions that focused on the influence of internal and external stakeholders.

In the following, we analyze to what degree our expectations that we formulated in the theoretical framework are correct. Hereto, we use the answers that the respondents gave to the open and two multiple-response questions (tables 7.2 and 7.3).

7.4.3 External pressure

Overall, executives report that internal stakeholders are much more influential in health care merger abandonment than external stakeholders. The most frequently mentioned external stakeholder is the antitrust authority. According to table 7.2, seven respondents indicated that antitrust law and/or direct involvement of the antitrust authority were the main reasons for merger

abandonment (13%). It furthermore follows from table 7.3 that the same executives plus one other mentioned the antitrust authority as an influential actor in the abandonment of mergers (15%). Of these, five respondents indicated that they modified their merger plans because they anticipated that the antitrust authority would otherwise intervene (anticipatory action). The remaining three respondents indicated that the antitrust authority had actively blocked the merger. These findings mean that we find support for the first expectation that follows from the literature: according to over 10% of the respondents, antitrust law plays a role in merger abandonment.

Table 7.2 – 'What was/were the main reason(s) for merger abandonment?' (Open question)[a]

	Health care executives	
	No.	%
Reason for merger abandonment		
Changing insights on the desirability/feasibility of the merger	17	32
Executives' stance towards the merger, relationship between executives and changes therein	16	30
Pressure from nonexecutive board	8	15
Pressure from internal stakeholders (middle management and healthcare professionals)	8	15
Distrust, lack of synergy, fear, animosity	7	13
Pressure from the antitrust authority/antitrust law	7	13
Ideological/religious reasons	6	11
Pressure from other healthcare organizations	4	8
Chose an alternative for merger (e.g., a joint venture)	2	4

[a] Notice that respondents were able to give more than one answer

Other external stakeholders had a negligible influence on merger abandonment. Most executives (64%, n = 34) indicated that no external stakeholders influenced the decision to abandon the merger (table 7.3). Furthermore, only four respondents claimed that pressure from external stakeholders (other than the antitrust authority) was a main reason for merger abandonment (table 7.2). We therefore find limited support for our second expectation: most respondents indicate that pressure from external stakeholders did not influence Dutch health care merger abandonment.

7.4.4 Resistance by internal stakeholders

From the literature, it followed that resistance by executives is one of the most important determinants for health care abandonment (Expectation 3). We find support for this expectation. The second most frequently mentioned reason for merger abandonment is the

Table 7.3 – 'Which internal/external stakeholders have influenced the merger abandonment?" (multiple-response questions)[a]

	Health care executives	
	No.	%
Panel A. Internal stakeholders		
Nonexecutive board	35	66
Middle management	16	30
Works Council	14	26
No internal stakeholders	13	25
Client Advisory Council	9	17
Healthcare professionals	8	15
Other	1	2
Panel B. External stakeholders		
No external stakeholders	34	64
Antitrust authority	8	15
Another healthcare organization (besides the merger partner(s))	6	11
Media	1	2
Government	1	2
Politicians	1	2
Other:		
Consultants	2	4
Patient and Consumer Federation	1	2
Banks	0	0
Health insurance companies	0	0

[a] Notice that respondents were able to tick more than one category.

executives' stance toward the merger, the relationship between the executives, and changes therein (30%, n = 16). These personal issues were mostly caused by difficulties in the collaboration between executives or by changes in the composition of boards. For example, one executive stated: 'Despite all rationalizations, the root cause of the abandonment was the lack of positive energy among the executives involved' and two executives mentioned 'frictions between executives' and '[a lack of] cooperation between the members of the executive board' as the most important reasons for abandonment. In addition, seven respondents indicated that feelings of distrust, a lack of synergy, fear, and animosity between key players (likely executives) were among the main reasons for merger abandonment. Answers include 'On paper it worked out well, but after a number of incidents during the merger process, we lost trust in each other' and 'conflicts of interest'.

We also expected that the nonexecutive board, works councils, client advisory councils, middle management, and professionals play a role in the abandonment of health care mergers. We find support for this expectation. Nonexecutive directors (66%, n = 35) are by far the most mentioned internal stakeholders in merger

abandonment (table 7.3), and according to table 7.2, pressure from nonexecutive directors is the third most important reason for merger abandonment (15%, n = 8). Deviating opinions on strategic choices (e.g. 'insufficient support to the merger as the nonexecutive directors preferred another merger partner') forces executives to abandon a merger. In addition, the interaction between executives and nonexecutive directors matters: 'there was no chemistry between the designated chairman of the nonexecutive board and the designated chairman of the executive board'. Works councils (26%, n = 14) and client advisory councils (17%, n = 9) are important actors (table 7.3), but these seem to be less important than nonexecutive directors in the abandonment of health care mergers. None of the respondents indicated that pressure from either the works council or client advisory council was decisive in abandoning the merger (table 7.2).

In addition, middle management is found to influence the decision to abandon the merger. Although attitudes and behavior of middle management are rarely mentioned as a main reason for merger abandonment in response to the open question, it follows from table 7.3 that 30% of the executives (n = 16) ticked the middle management option in the multiple-response question on internal stakeholders. Hence, our findings indicate that middle management often influences the decision to abandon the merger. According to table 7.3, however, pressure from health care professionals seems to be less important (15%, n = 8).

7.4.5 Organization/sector characteristics

It follows from table 7.2 that changing insights into the desirability and feasibility of the merger during the merger process are the most frequently cited reasons for abandonment (32%, n = 17). One executive, for example, stated that there was a 'lack of agreement on the organizational structure and positions'. Another executive mentioned that the merging organizations were not able to 'come to terms on the organization of medical care'. If we look more specifically at the issues over which disagreements arose, we find that financial issues are mentioned most often (n = 6 or 35% of those who indicated disagreement as the main reason for abandonment – not in table 7.2). For example, two executives stated that 'insufficient value and the bad financial position of the merger partner' and 'sudden financial deficits at one of the merger partners' resulted in abandonment of the merger. These findings provide support for the fifth expectation that was found in the literature.

To find out whether organizational differences like predicted by the literature (Expectations 6-10) matter, we compared the answers by executives involved in completed health care mergers with answers by those involved in abandoned ones. We find that none of the expectations that follow from the literature are supported by our survey data as the *p*-values of all relationships exceed .10. Our analysis shows that the association between the executive's merger experience and merger abandonment is not significant ($\chi^2(1) = 1.331$, *p*-value > .10).We therefore find no support for the sixth expectation. Likewise, we find no support for Expectation 7 as diversification is not found to be related to executives' involvement in merger abandonment ($\chi^2(1) = 0.156$, *p*-value > .10). In addition, the relationships that were predicted under Expectations 8, 9, and 10 are not found to be significantly related (Fisher's exact test, *p*-value > .10; $\chi^2(1) = 1.764$, *p*-value > .10) and ($\chi^2(2) = 2.711$, *p*-value > .10, respectively). Hence, organizational differences do not seem to play a role in explaining why mergers are abandoned or not. A caveat, however, is that this finding may be influenced by the fact that different executives may have been involved in the same merger. Finally, in table 7.2, we find no strong support for the expectation that ideological/religious differences play a role in merger abandonment as only six executives (11%) indicated that religious reasons were among the most decisive reasons for abandonment.

7.5 Discussion

On the basis of a survey among most Dutch health care executives, this study is the first to present nationwide evidence on merger abandonment in health care. Our findings partially confirm results from previous studies, especially with regard to the importance of changing insights on the desirability and feasibility of the merger in merger abandonment. In addition, we find that many health care executives are getting cold feet because of incompatibilities with the other executive(s). Unlike previous studies, we do not find that pressure from external stakeholders, other than antitrust agencies, is a major determinant of merger abandonment. We do find that pressure from internal stakeholders, particularly nonexecutive directors, and notions like distrust, fear, and animosity play an important role in merger abandonment. These elements have hardly received attention in studies on abandoned mergers so far.

We were not able to find support for the expectations on organizational characteristics that we found in the literature. This may mean that these relationships are not (or no longer) valid in health care; that there is not enough variance between health care organizations in our sample; or that, despite the fact that we sent the survey to most Dutch health care executives, the number of observations on merger abandonments is rather small.

Our study also shows that a large portion of health care executives has to deal with abandoning a merger: 38% of the respondents reported that they have been involved in at least one abandoned merger between January 2005 and April 2012. This percentage exceeds the number of abandoned mergers that has been found in other sectors (i.e., 11%-28%). This does not necessarily imply, however, that merger abandonment occurs more frequently in health care, because studies from other sectors are likely to underreport the actual number of abandonments as they predominantly use data from publicly announced mergers. We, instead, directly asked executives whether they were involved in abandoned mergers. However, the disadvantage of this approach is that we may have counted some mergers multiple times, because different executives may have been involved in the same merger. This may also explain the rather large number of abandoned mergers that we find.

Despite the differences between the Dutch health care system and other health care systems, our findings likely bear external validity to other countries and health care systems. Changing insights and executives' attitudes, which are the most important determinants of merger abandonment found in our study, are likely to be relevant in any system. The same holds for the pressure from internal stakeholders. However, the exact influence of each stakeholder will depend on the institutional context. It would be interesting to replicate our survey to other countries and to find out whether those and other institutional differences matter in health care merger abandonment.

7.6 Practice implications

Our study shows that merger abandonment is not a rare phenomenon. We derive three recommendations for executives from our study. Our first recommendation is that executives who engage in a merger should construct backup plans with alternative strategies in case a merger is abandoned. This helps the executive to stay in control of the organization's strategy and avoids unnecessary negative effects of merger abandonment on the organization.

As changing insights on the desirability and feasibility of the merger during the merger process seem to be the most important reasons for abandonment, we also recommend that executives conduct a thorough analysis of pros and cons before engaging in a merger and monitor the progress of the merger closely. This will not prevent all unpleasant surprises during merger processes, but at least, some of the changing insights can be spotted earlier on, preferably before the decision to merge is made.

Third, we emphasize the importance of relations between executives, nonexecutives, and other stakeholders. Both strategic (e.g., different goals) and interpersonal (e.g., bad personal relations) considerations seem to play a role in merger abandonment. Dealing with nonexecutive directors and other stakeholders requires a delicate balancing act of executives. On the one hand, they have to keep the formal and legal relationships between actors in mind, which sometimes call for distance and discretion, whereas, on the other hand, they have to invest in strong informal ties with stakeholders to prevent feelings of distrust, a lack of synergy, fear, and animosity. As such, a merger is a process that calls upon the social competences of executives. Executives should be prepared for that.

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CHAPTER 8

Conclusion and Discussion

8.1 Introduction

Over the last forty years, the same questions have continued to dominate the policy debate on the structure of the Dutch healthcare system: why do hospitals merge? And which distribution of hospital services across the country leads to the highest efficiency, accessibility and quality of care? Important changes in the healthcare system have also led to the emergence of new questions. This is because today, compared to forty years ago, a larger role for competition is envisioned in the sector, and ongoing consolidation among healthcare providers is leading to new threats. The gradual introduction of competition into the Dutch healthcare system has also led people to ask how far competition in healthcare should be taken, how mergers impact competition, and what the effects of competition are.

In this thesis, we have sought to contribute to a better understanding of the effects of competition and mergers in the Dutch healthcare sector. The findings presented may help the government and its regulatory agencies to improve the functioning of markets in healthcare.

8.2 Main findings

In many OECD countries, healthcare sectors have become increasingly concentrated as a result of mergers. The Netherlands is no exception. Because ongoing hospital consolidation is at odds with the objectives of increased competition into the Dutch hospital market, merger activity over the past decade has fueled a debate regarding the consequences of mergers and the desirability of further concentration. However, in Chapter 2 of this thesis, we showed that consolidation of the Dutch hospital market predates the introduction of competition by a long way. We set out to answer the following question:

8.2.1 How do institutional changes relate to hospital mergers?

Chapter 2 described developments in the Dutch hospital market structure over the past 40 years and discussed the implications of those developments for current healthcare policy.

The chapter shows that although the organization and financing of the Dutch hospital market has changed tremendously over the past 40 years, market concentration has increased consistently and continuously over the same period, notwithstanding wider developments in the policy context. Increasing market concentration has been caused by a high number of mergers, some closures and very few new providers entering the market. Chapter 2 shows that the introduction of competition seems to have accelerated consolidation, but that this has occurred in an already highly concentrated market.

The problem with increasing market concentration is that changing the market structure is much more difficult than modifying the way in which healthcare is organized and financed. Because mergers leave the remaining hospitals with greater market power and few new competitors enter the market, the effect of consolidation on the market structure is (semi-)permanent. In the near future, markets may become even more concentrated, since there is no reason to believe that hospital merger activity will cease. Neither is it likely that new hospital organizations will enter the market in the foreseeable future.

In the remainder of the thesis, we discussed our research into the effects of these changes, starting with the question:

8.2.2 What is the effect of hospital competition on quality of care?

Like many health systems around the world, the Dutch healthcare system increasingly encourages competition between providers. For a number of years now, Dutch insurers have been competing for customers, while healthcare providers compete for contracts with insurers. Specifically, since 2005, insurers and hospitals have been able to negotiate freely on prices when contracting for the provision of certain procedures. In Chapter 3, we studied the impact of price liberalization on quality of care.

Empirical evidence on the theoretically ambiguous effect of price liberalization on healthcare quality is scarce, but studies suggest that the relationship is negative when information on quality is poor. In our research, a difference-in-differences analysis across more and less concentrated markets identified the effect of increased price competition. Previous studies had examined the impact on quality for acute admissions, where the scope for

competition is limited. We, by contrast, examined the impact on quality of non-acute hip replacements, where competition can play a much larger role.

Given that information on the quality of hospital care was absent when free price negotiation was introduced into the Dutch healthcare market, there was a risk of a negative impact on quality. However, we found no evidence of this. On the contrary, in the first year following price liberalization, we found that in regions with low market concentration, readmissions actually fell (i.e., quality increased) compared to highly concentrated regions. This effect, however, was not sustained. Thus despite the absence of quality information, the introduction of price competition does not seem to have harmed the quality of elective hospital care. In the next chapter, we turned our attention to price effects:

8.2.3 What are the price effects of a hospital merger?

To research the effect of market concentration on prices, we carried out a case study involving a hospital merger in the Netherlands. The study aimed to provide a better understanding of the price effects of consolidation. Because merged hospitals often continue to operate at different locations, provide multiple products and negotiate prices with a range of payers, an interesting question is whether these differences matter. If it turns out that they do matter, this may have important implications for *ex ante* merger scrutiny by antitrust authorities.

In Chapter 4, we expanded existing bargaining models to allow for heterogeneous price effects and used a difference-in-differences model, whereby price changes at the merging hospitals' locations are compared to price changes at comparison hospitals. Using the hospital-insurer bargaining model, we showed that the price effects of a hospital merger can vary and that the differences between locations, products and insurers may influence the result of hospital-insurer price setting in different ways. We then used a unique national dataset of hospital-insurer negotiated contract prices for each hospital product in the Netherlands to investigate whether the price effects of a merger between a general acute care hospital and a neighboring general acute care hospital that also provides tertiary hospital care varied between different hospital locations, different products and different insurers. We found evidence of heterogeneous price effects across health insurers, hospital products and hospital locations. We also found that where

this merger affected prices, this effect was positive. The research question in Chapter 5 was then whether we are able to predict these merger price effects prospectively:

8.2.4 What is the predictive power of an *ex ante* merger simulation model?

In competitive markets, the aim of preventive merger control is to prevent anticompetitive consolidation. To determine whether a merger between firms will result in anticompetitive price increases, antitrust authorities need to carry out a prospective review of the effects of that merger. However, the approaches that are commonly used for prospective merger reviews are problematic. The most promising alternatives to these highly criticized traditional approaches are Merger Simulation Models (MSMs). Since MSMs have only been validated to a limited extent, chapter 5 addresses the question of whether we are able to predict the effects of mergers using these models.

To this end, we used the same merger case as in chapter four, but we took our analysis one step further and compared the results predicted by a merger simulation model to the actual changes that were reported in chapter four. More specifically, we evaluated the predictive power of the Option Demand (OD) method. This is a merger simulation model that has been developed specifically for hospital markets in which insurers compete for customers and providers compete for contracts with insurers. We explicitly took account of the multiproduct nature of hospitals by examining the price effects of the hospital merger for various hospital products. We also allowed for potential differences in bargaining outcomes between neighboring locations by predicting the merger effects for each location. We concluded that the OD merger simulation model could be a useful and powerful addition to the toolkit of antitrust agencies, but that further refinements are needed in order to better reflect the peculiarities of the Dutch healthcare market.

Chapters 2 to 5 focused on the effects of the introduction of competition and the effects of concentration in the Dutch healthcare market. We examined both price and quality effects. A further key question is whether price and quality considerations were important reasons for healthcare executives to pursue mergers. In the Netherlands, providers that deliver inpatient care must be non-profit organizations, implying that they may not distribute any profits they make to owners or shareholders.

As such, profit maximization may not be the main driver for mergers between Dutch healthcare providers. This leads us to the following question, which was addressed in Chapter 6:

8.2.5 Why do healthcare providers merge?

In this chapter, we not only studied the motivation for healthcare mergers but we also looked at whether the motivation for mergers related to (changes in) healthcare policies. We conducted a survey study among 848 Dutch healthcare executives, 35% of whom responded. The majority of our respondents (65 percent) had been involved in at least one merger between 2005 and 2012. During this period, Dutch healthcare providers faced a number of policy changes, including increasing competition, more pressure from purchasers, growing financial risks, the de-institutionalization of long-term care and the decentralization of healthcare services to municipalities.

Our study showed that during this period, healthcare executives had a range of motivations to seek to merge with other providers. We found that the dominant motives for merger activity were improving healthcare provision and strengthening market/bargaining power. With regard to policy changes, we found that as the pressure from competitors, health insurers and municipalities increased, healthcare providers were increasingly inclined to merge for motives relating to their market position or in order to improve their provision of healthcare services. These findings indicate that changes in health policy have impacted on merger motives.

Finally, in chapter 7 we turned to the question of why healthcare mergers are abandoned. So far, we have only focused on why healthcare organizations merge and the effect of concentration on quality and prices. However, it is also interesting to consider those merger plans that have been less successful:

8.2.6 Why are healthcare mergers abandoned?

To improve our understanding of the reasons why healthcare mergers may be abandoned, we used the same survey that was used in chapter 6. We found that thirty-eight percent of the mergers that our respondents were involved in were mergers that had been prematurely terminated – in other words, merger plans in the healthcare sector are frequently abandoned.

Our study indicated that the most frequent determinants of abandoned mergers in healthcare were changing insights into desirability and feasibility during the merger process, incompatibilities between executives, and insufficient support for the merger from internal stakeholders. Our findings partially confirm the results of previous studies, especially with regard to the important role of changing insights into the desirability and feasibility of the merger. Unlike previous studies, we did not find that pressure from external stakeholders was a major factor in the abandonment of mergers. However, we did find that pressure from internal stakeholders, particularly nonexecutive directors, and factors such as mistrust, fear, and animosity played an important role in the abandonment of mergers. These elements have scarcely been addressed in previous studies on abandoned mergers.

8.3 Implications

What can we learn in policy terms from the findings summarized above, and which questions need to be explored in future research? We would argue that the policy debate on healthcare in the Netherlands, which has tended to focus on the merits of introducing more competition into the hospital sector, has largely overlooked the underlying structural changes in the market, which have greatly enlarged the market power of hospitals. Since there is no reason to believe that hospital merger activity will decline in the near future and few new competitors enter the market, the effect of consolidation on market structure is (semi-)permanent. Consequently, if the government decides to introduce more competitive forces in the healthcare sector, it needs to take account of the structure of the market. Policymakers should recognize that competition can only be an effective way of increasing efficiency, quality and accessibility when sufficient provider alternatives are available to consumers and/or insurers. There is a risk that this necessary, but not sufficient, precondition would not be met in a highly concentrated market. Thus, when committing the government to regulated competition, policymakers should also bear in mind the prevailing market structure and find effective ways to prevent the abuse of market power where necessary. If they fail to do so, increased competition will not have the intended effects.

The first policy implication of this is that stricter competition enforcement by the competition authority is required. Guidelines for improving the enforcement of competition could be drawn up based on a retrospective analysis of concentration. The research presented in Chapters 4 and 5 of this thesis, for example, shows that future prospective merger analysis could benefit from (i) an increased focus on the delineation of product markets, (ii) taking potential differences between hospital locations into account, (iii) a better understanding of the dynamics of negotiations between insurers and healthcare providers and (iv) changes to general Merger Simulation Models so that these better reflect the unique attributes of the Dutch healthcare system. Research on other merger cases is advisable in order to identify which areas merit further development. Furthermore, the analyses presented in Chapters 6 and 7 show that Dutch healthcare organizations sometimes merge for strategic reasons and seem to have a high degree of autonomy when deciding whether or not to merge. It is therefore important that there is an acknowledgement that even in a non-profit sector like healthcare, organizations may be strategically motivated and that the strict and uniform application of antitrust laws is therefore appropriate in relation to concentration in the healthcare sector.

However, it is also important to realize that stricter enforcement of competition alone will not be sufficient if the market has already become overly concentrated. Some have argued that by being overly permissive of mergers in the past, the competition authority has not only allowed complexities to develop in hospital competition, but also restricted the scope for hospital competition in the future (Varkevisser & Schut, 2017). The effective enforcement of competition thus not only entails *ex ante* merger control, but also the effective use of the policy instruments that allow authorities to effectively prevent the abuse of specific dominant positions as well as to "re-design" markets that have already become highly concentrated. In other words, even where mergers have resulted in markets that are dominated by a few hospitals, competition authorities could still seek to limit anticompetitive practices using the 'significant market power' instrument. The market entry of new competitors could also help restore competitive pressure. New entrants are critical to the proper functioning of any market, but healthcare regulations are often unnecessarily inhibitive in this respect. These legal barriers need to be eliminated wherever possible. In addition, competitive pressure in markets not only

needs to come from traditional organizational forms like new hospitals or independent treatment centers, but could also come from emerging technologies and new organizational forms. Gaynor et al. (2017), for example, conclude that the adoption of new practices such as e-health could lead to the entry of new competitors and should not be stifled by regulations; a similar conclusion is drawn by Janssen (2016) in the context of Dutch healthcare.

Another important precondition for proper competition is the availability of information on quality (e.g., Van de Ven et al. 2013). In recent years, despite the efforts made in this regard, the availability of adequate and reliable quality information for patients and insurers in the Netherlands has remained inadequate (e.g., Rekenkamer, 2013; NZa, 2017). The lack of adequate information may have significant implications for the introduction of competitive forces and the consequences of this. Because information on quality of hospital care was absent when free negotiation on pricing was introduced into the Dutch hospital market, there was a significant risk of negative impact on quality. This effect was found in other countries where similar policies have been introduced (Propper et al. 2008; 2004; Volpp et al. 2003). In Chapter 3, however, we found no evidence of a negative impact of price liberalization on quality of care provided to hip replacement patients in the Dutch hospital sector. Since this finding may not hold for other time periods and for other procedures, policymakers cannot ignore the possibility that price competition may jeopardize quality if there is an absence of adequate information on quality. Further research is needed and a real effort needs to be made to increase the quality information that is available.

Overall, given the current level of concentration and the fact that the available research suggests that mergers typically have limited benefits for society or the organizations involved, and in some cases they may have no benefit at all, further consolidation in the healthcare sector may well be harmful. Hence, in areas where the concentration of activities is likely to be beneficial, more cooperation rather than outright mergers may be preferable. Whether this is indeed the case remains a matter for future research.

This thesis shows that, given the often irreversible nature and potentially adverse consequences of consolidation in healthcare markets, policy measures that enhance or facilitate consolidation should not be taken lightly and should be carefully investigated before they are implemented.

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Abbreviations table

Abbreviation	Short for... (Dutch)	Short for... (English)
ACM	Autoriteit Consument & Markt	Authority for Consumers & Markets
AWBZ	Algemene Wet Bijzondere Ziektekosten	Exceptional Medical Expenses Act
BS	Centraal Bureau voor de Statistiek	Statistics Netherlands
CBZ	College Bouw Ziekenhuisvoorzieningen	Netherlands Board for Health Facilities
CDS	Artikel van Capps, Dranove & Satterthwaite (2003)	Paper by Capps, Dranove & Satterthwaite (2003)
COTG	Centraal Orgaan Tarieven Gezondheidszorg	National Health Tariffs Authority
DID	Verschillen-in-verschillen	Difference-in-differences
DOJ	Ministerie van Justitie (Verenigde Staten)	Department of Justice (United States)
DOT	Diagnose Behandel Combinaties Op weg naar Transparantie	Diagnosis Treatment Combination On its Way to Transparency
DRG		Diagnosis-Related Groups
DTC	Diagnose Behandel Combinatie	Diagnosis Treatment Combination
EC	Europese Commissie	European Commission
EVI	Exploitatie Verlagende Investeringen	Operating Costs Reducing Investments
EXPH		European Commission's Expert Panel on Effective Ways of Investing in Health
FTC	Mededingingsautoriteit (Verenigde Staten)	Federal Trade Commission (United States)
GDP	Bruto Binnenlands Product	Gross Domestic Product
GNT	Artikel van Gowrisankaran, Nevo & Town (2015)	Paper by Gowrisankaran, Nevo & Town (2015)
GT	Artikel van Gaynor & Town (2012)	Paper by Gaynor & Town (2012)
HHI		Herfindahl-Hirschman Index
HMO		Health Maintenance Organization
IIA		Independence of Irrelevant alternatives
i.i.d.		Independently and Identically Distributed
ITC	Zelfstandig Behandel Centrum (ZBC)	Independent Treatment Center
LOCI		LOgit Competition Index
LTC	Langdurige zorg	Long-term care
MCO		Managed Care Organization
MinVM	Ministerie van Volksgezondheid en Milieuhygiëne (sinds 1971-1982)	Ministry of Health (1971-1982)
MinVWS	Ministerie van Volksgezondheid, Welzijn en Sport (sinds 1994)	Ministry of Health (since 1994)
MinWVC	Ministerie van Welzijn, Volksgezondheid en Cultuur (1982-1994)	Ministry of Health (1982-1994)
MSM	Fusie simulatie model	Merger Simulation Model
NHS		National Health Service
NMa	Nederlandse Mededingingsautoriteit	Dutch Competition authority
NVZ/IPO	Nederlandse Vereniging van Ziekenhuizen/Interprovinciaal overleg	Dutch Hospital Association/Interprovincial consultation
NVZD	Vereniging van Bestuurders in de Zorg	Dutch Association of Healthcare Executives
NZa	Nederlandse Zorgautoriteit	Dutch Healthcare authority
NZi	Nationaal Zorginstituut	Dutch National Hospital institute
OD		Option Demand
OECD	Organisatie voor Economische Samenwerking en Ontwikkeling (OESO)	Organisation for Economic Co-operation and Development
OLS		Ordinary Least Squares
RIVM	Rijksinstituut voor Volksgezondheid en Milieu	National Institute for Public Health and the Environment
RVZ	Raad voor Volksgezondheid en Zorg (nu: Raad voor Volksgezondheid en Samenleving – RVS)	Council for Health and Healthcare (now: Council for Health and Society)
SCP (chapter 1)	Structuur-Gedrag-Prestatie	Structure-Conduct-Performance
SCP (other chapters)	Sociaal en Cultureel Planbureau	Netherlands Institute for Social Research
SD	Standaard deviatie	Standard deviation
SE	Standaard fout	Standard Error

Abbreviation	Short for... (Dutch)	Short for... (English)
SES	Sociaal-economische status	Socio-economic status
SMP	Aanmerkelijk Marktmacht	Significant Market Power
TK	Tweede Kamer der Staten-Generaal	House of Representatives
UK	Verenigd Koninkrijk	United Kingdom
US	Verenigde Staten van Amerika	United States of America
WMG	Wet Marktordening Gezondheidszorg	Healthcare Market Regulation Act
WMO	Wet Maatschappelijke Ondersteuning	Social Support Act
WTG	Wet Tarieven Gezondheidszorg	Health Care Prices Act
WTP	Bereidheid tot betalen	Willingness-to-Pay
WWII	Tweede Wereld Oorlog	World War II
WZV	Wet Ziekenhuisvoorzieningen	Hospital Facilities Act
Zvw/HIA	Zorgverzekeringswet	Health Insurance Act
2SLS		Two-stage Least Squares

Summary

The aim of this thesis is to contribute to a better understanding of the effects of competition and mergers in the Dutch healthcare sector. We focused our analysis on the Dutch hospital industry. The reason for this is twofold. First, hospital care accounts for the majority of overall healthcare spending. Second, competition was introduced in the Dutch hospital industry following a long period of strict regulation, while the sector simultaneously experienced increasing levels of consolidation. The combination of these factors creates an excellent opportunity to study the effect and rationale of competition and consolidation in the healthcare sector.

Chapter 1 of this thesis introduces the research on the rationales and effects of mergers and competition in the Dutch healthcare sector. It explains why health economists do not simply open an economics textbook, read what the sections on oligopolies or bilateral bargaining have to say about the rationales and effects of mergers and competition and leave it at that. The chapter also provides a brief overview of the empirical research done so far. Furthermore, we outline the research topics and question that will be addressed in the remainder of the thesis.

Chapter 2 outlines the history of Dutch hospital mergers. In this chapter, we show that the Dutch hospital market has experienced several waves of mergers. These waves are the main reason for the high level of concentration in the Dutch hospital industry. The few studies that have investigated the effects of concentration suggest that high market concentration may not be beneficial for society or the organizations involved. The introduction of competition into the sector has meant that market concentration has become a source of concern. This is because competition can only be an effective way of increasing efficiency, quality and accessibility if sufficient alternatives are available to consumers and/or insurers. This necessary, though not sufficient precondition risks not being met in a highly concentrated market, which is the case for most hospital markets in the Netherlands. Government policy has focused on how to best organize and finance healthcare. At the same time, the underlying and structural changes that have led to the levels of concentration in today's hospital market have largely been neglected.

In **Chapter 3**, we present our study into the effect of hospital competition on quality of care. In this study, we looked at the effect of the introduction of price competition in the Dutch hospital

market and considered whether its impact on the quality of care differs between highly concentrated hospital markets and less concentrated hospital markets. Previous research on the competition-quality relationship measured quality in market sectors where the scope for competition is limited – acute admissions. By contrast, we examined readmission for the elective procedure 'non-acute hip replacements' for which the scope for competition – and hence its potential effect – is larger. The most important finding of our study is that, despite the lack of information on quality when free price negotiations were introduced, competitive pressure does not appear to have damaged quality.

In **Chapter 4**, we turn our attention to price effects. Most studies on hospital concentration find that mergers lead to higher prices. These studies mostly take the merged hospital as the unit of observation, while the observed price is the weighted average across hospital products and across payers. Therefore, little is known about whether and why price effects vary between hospital locations, products and payers. In this chapter, we introduce a case study of a Dutch hospital merger. We expanded existing bargaining models to allow for potentially heterogeneous price effects of mergers. Furthermore, a difference-in-differences model was estimated in which price changes at the merging hospitals are compared to price changes at comparison hospitals. The most important finding is that where the merger under study affected prices, the effect is positive and that price effects may differ across locations, products and payers. We explained why these findings have important implications for *ex ante* merger scrutiny by antitrust authorities.

Chapter 5 addressed the question whether we are able to predict merger price effects prospectively. Merger simulation models are promising alternatives to highly debated traditional approaches, but they have only been validated to a limited extent. In this chapter, we investigated the same merger case as in chapter 4. We compared the predicted results of the Option Demand method – a merger simulation model developed specifically for the (US) hospital market – to the actual changes that were reported in chapter 4 to evaluate whether the current models perform sufficiently well to be used in antitrust cases. We concluded that the Option Demand method could be a valuable addition to the antitrust agencies' toolkit, but needs further refinements in order to better reflect the peculiarities of the Dutch healthcare market.

In **Chapter 6**, we study merger motivations of healthcare providers. Although mergers occur frequently in the Dutch healthcare sector, empirical insight into why healthcare providers merge is lacking. Neither do we know enough about the influence of healthcare policy on mergers. To identify the reasons for mergers and their relation to (changes in) healthcare policies, we conducted a survey on the motivation for mergers that was sent to the majority of Dutch healthcare executives. Thirty-five percent of the 848 executives in our sample responded to the survey. The majority of respondents had been involved in at least one merger between 2005 and 2012. The study indicated that the main reasons for merger mentioned by executives were to improve the provision of healthcare services and to strengthen the market position of the providers. We furthermore found that motives for merging are related to changes in health policies, in particular to the increasing pressure from competitors, insurers and municipalities.

In **Chapter 7**, we turn to the question why healthcare mergers are abandoned. The reason for examining this is the lack of thorough understanding of the abandonment of healthcare mergers despite the frequent occurrence and sizeable consequences of merger abandonment in other sectors. In this chapter, we use the same survey that was used in Chapter 6. Thirty-eight percent of our respondents reported that the last merger case that they were involved in, ended prematurely. The most frequently mentioned causes of merger abandonment were changing insights regarding desirability and feasibility during the merger processes, incompatibities between executives and insufficient support for the merger among internal stakeholders. These findings partially confirmed results from previous studies.

In **Chapter 8**, the main findings of this thesis are presented and discussed.

Samenvatting

Deze dissertatie beoogt bij te dragen aan een beter begrip van de effecten van concurrentie en fusies in de Nederlandse gezondheidszorg. Onze analyse richt zich voornamelijk op de Nederlandse ziekenhuiszorg. De ziekenhuiszorg heeft een belangrijk aandeel in de algemene zorguitgaven. Ook werd in de sector na een lange periode van strikte regulering, concurrentie geïntroduceerd terwijl er op hetzelfde moment veelvuldig gefuseerd werd. Dat maakt dat deze sector een interessant beginpunt voor onderzoek naar concurrentie en fusies in de Nederlandse gezondheidszorg is.

In **Hoofdstuk 1** wordt het onderzoek naar de motieven en effecten van fusies en concurrentie in de gezondheidszorg ingeleid. Er wordt uiteengezet waarom gezondheidseconomen niet zomaar naar algemene economische theorieën kunnen refereren als zij op zoek zijn naar meer informatie over fusies en concurrentie in de zorg. Ook wordt een kort overzicht gegeven van het empirische onderzoek dat tot op heden uitgevoerd is. Daarnaast introduceren we de onderwerpen en onderzoeksvragen die in de rest van de dissertatie aan bod komen.

In **Hoofdstuk 2** wordt de geschiedenis van Nederlandse ziekenhuisfusies beschreven en op hoofdlijnen geanalyseerd. De Nederlandse ziekenhuissector heeft meerdere fusiegolven ondergaan. Deze fusiegolven vormen de belangrijkste reden voor de huidige hoge marktconcentratie. De weinige studies naar het effect van concentratie suggereren dat fusies zeker niet altijd positief uitpakken voor de samenleving of de betrokken organisaties. Met de introductie van meer marktwerking in de gezondheidszorg zijn de zorgen omtrent concentratie alleen maar toegenomen. Dat komt omdat marktwerking alleen maar kan leiden tot efficiëntere, betere en toegankelijkere zorg als voldoende alternatieven beschikbaar zijn voor patiënten en verzekeraars. In een sterk geconcentreerde markt zoals de Nederlandse ziekenhuissector wordt er mogelijk aan deze noodzakelijke, maar overigens niet voldoende voorwaarde, niet voldaan. Overheidsbeleid heeft zich lange tijd voornamelijk gericht op de organisatie en financiering van de gezondheidszorg, maar er lijkt onvoldoende aandacht geweest te zijn voor de onderliggende en structurele veranderingen die tegelijkertijd als gevolg van de toenemende marktconcentratie plaats hebben gevonden.

In **Hoofdstuk 3** presenteren we onze studie naar het effect van de introductie van prijsconcurrentie in de Nederlandse ziekenhuiszorg. We hebben bekeken of de invloed van de

introductie van prijsconcurrentie op kwaliteit varieerde tussen regio's waar veel concurrentie mogelijk is en regio's waar weinig concurrentie mogelijk is. Eerder onderzoek naar de relatie concurrentie-kwaliteit heeft betrekking op 'acute opnamen', waarvoor de ruimte voor concurrentie beperkt is. Wij onderzochten daarentegen 'heropnamen bij niet-acute heupvervangingen', een electieve procedure waarvoor de ruimte voor – en dus het mogelijke effect van – concurrentie aanzienlijk groter is. Er was ten tijde van de introductie van prijsconcurrentie in Nederland zeer weinig kwaliteitsinformatie aanwezig. In dat geval bestaat het risico dat prijsconcurrentie ten koste gaat van de kwaliteit van zorg. De belangrijkste bevinding van onze studie is dat, ondanks de destijds zeer beperkt aanwezige kwaliteitsinformatie, de introductie van prijsconcurrentie in de daarop volgende jaren geen negatief effect heeft gehad op de kwaliteit van zorg.

In **Hoofdstuk 4** onderzoeken we de prijseffecten van een Nederlandse ziekenhuisfusie. De meeste studies vinden dat ziekenhuisfusies leiden tot substantieel hogere prijzen. In deze studies is echter gekeken naar het gefuseerde ziekenhuis als geheel, waarbij het prijseffect voor alle producten en voor alle verzekeraars tezamen berekend werd. Er is daardoor niet bekend of en waarom prijseffecten variëren tussen ziekenhuislocaties, producten en verzekeraars. Voor onze casestudie gebruikten we bestaande onderhandelingsmodellen om heterogene prijseffecten van fusies te modelleren. Daarnaast voerden we een verschillen-in-verschillen analyse uit waarbij we de prijsveranderingen in de fusieziekenhuizen vergeleken met de prijsveranderingen die in vergelijkbare niet-gefuseerde ziekenhuizen waren opgetreden. De belangrijkste bevinding is dat waar de onderzochte fusie effect had op prijzen zij leidde tot hogere prijzen en dat prijseffecten kunnen verschillen tussen locaties, producten en verzekeraars. We leggen uit waarom deze bevindingen belangrijk zijn voor prospectief fusietoezicht door mededingingsautoriteiten.

In **Hoofdstuk 5** staat de vraag centraal of het mogelijk is om de prijseffecten van een ziekenhuisfusie te voorspellen. Fusie-simulatiemodellen zijn veelbelovende alternatieven voor niet goed functionerende traditionele methoden, maar hun effectiviteit is zelden geëvalueerd. In dit hoofdstuk onderzoeken we dezelfde fusiecasus als in Hoofdstuk 4. We vergelijken de voorspelde prijs-effecten die volgen uit de Option Demand methode – een specifiek voor de (Amerikaanse) zorgmarkt ontwikkeld fusiesimulatiemodel – met de werkelijke effecten die volgen uit de analyse van Hoofdstuk 4.

Dit om te onderzoeken of het fusiesimulatiemodel dusdanig goed genoeg voorspelt dat het door mededingingsautoriteiten gebruikt kan worden bij hun beoordeling van een voorgenomen ziekenhuisfusie. We concluderen dat de Option Demand methode een waardevolle toevoeging aan de gereedschapskist van een mededingingsautoriteit kan zijn, maar nog wel verbetering behoeft.

In **Hoofdstuk 6** onderzoeken we fusiemotieven van zorgaanbieders. Hoewel er veel fusies plaatsvinden in de Nederlandse gezondheidszorg, bestaat er een tekort aan kennis over de reden waarom zorgorganisaties fuseren en wat de invloed van gezondheidszorgbeleid op de motieven voor fusies is. Om de redenen voor fusies en hun relatie tot (veranderingen in) gezondheidszorgbeleid te achterhalen, maakten we gebruik van een survey die is verzonden aan het grootste deel van de Nederlandse zorgbestuurders. Vijfendertig procent van de 848 uitgenodigde zorgbestuurders vulde de enquête in. De meerderheid van de respondenten was betrokken bij een fusietraject tussen 2005 en 2012. Eén van de bevindingen van de studie was dat aanbieders voornamelijk fuseren om het zorgaanbod te verbeteren of om hun marktpositie te versterken. Verder vonden we dat fusiemotieven gerelateerd zijn aan veranderingen in gezondheidszorgbeleid, en voornamelijk aan de toenemende druk van concurrenten, verzekeraars en gemeenten.

In **Hoofdstuk 7** richten we ons op de vraag waarom eenmaal gestarte fusies, niet altijd afgerond worden. Hoewel het voortijdig afbreken van fusies in andere sectoren veelvuldig blijkt voor te komen en volgens de daarnaar uitgevoerde onderzoeken erg kostbaar kan zijn, is naar afgeketste fusietrajecten in de zorg nog nauwelijks onderzoek gedaan. Het doel van dit onderzoek was dan ook te achterhalen of het afketsen van fusies in de zorg vaak voorkomt en wat de redenen voor fusieafbreking kunnen zijn. We maakten hierbij gebruik van de eerder in Hoofdstuk 6 genoemde enquête. Achtendertig procent van onze respondenten rapporteerde dat de laatste fusiezaak waarbij zij betrokken waren, voortijdig was afgeketst. Veranderende inzichten met betrekking tot de wenselijkheid en haalbaarheid van het fusieproces als ook bestuurders met onverenigbare wensen en gebrekkige interne ondersteuning voor het fusieproces, waren de belangrijkste redenen voor het voortijdig afbreken van fusieprocessen. Deze resultaten komen gedeeltelijk overeen met resultaten uit eerdere onderzoeken.

In **Hoofdstuk 8** worden de belangrijkste resultaten van het proefschrift beschreven en bediscussieerd.

Acknowledgements

I would like to thank a number of people for their help and support while I carried out this research and wrote about my findings.

First of all, my supervisors, Professor F.T. Schut and Professor M. Varkevisser; Erik and Marco. Erik, during my studies in Health Sciences, you were able to persuade me to embark on a PhD project. I am very grateful for that. The appreciation, guidance and support that you have provided during this process made me understand that this was something that I could achieve. I have learned so much from you. Marco, you trusted me to work on a kind of follow-up to your own thesis, and at the same time you gave me the freedom to interpret this project in my own way. Thank you for that trust. It is wonderful that you are now my official supervisor too. You have both spent so many hours reading and commenting on my work. Time and again, you challenged me to set the bar a little higher. You have given me opportunities, encouraged me and talked me back down to earth those times when I got carried away and came up with a yet another great new research idea. The way in which you approach your work has helped me to make progress. Your enthusiasm concerning this project was a great motivator for me, and thanks in large part to your support and enthusiasm, I see a future for myself in science. I cannot thank you enough. I am looking forwards to that future.

The members of the doctoral committee. Thank you for the time and effort you have put into scrutinizing my thesis, and I am delighted that you will be acting as my opponents during my defence ceremony.

The co-authors of the third chapter, Professor O. O'Donnell and Professor E. van Doorslaer; Owen and Eddy. I am grateful for your time, confidence and valuable advice. The paper took a while to complete, and you were not always sure if progress was still being made, but you kept the faith and allowed me the time that I needed. Thanks too for all the valuable feedback that you provided me with on a regular basis. You have taught me a great deal. My other co-authors; Ramsis Croes, Victoria Shestalova and Jeroen Postma. Jeroen, I take great pride in the multidisciplinary angle that we have given to our research project. That was not always an easy approach, so it is wonderful that it has worked out, and that it has already led to two published papers. Ramsis, I have so much admiration for the way you combine a full-time job with the work that we do together. Finishing the papers involved considerable work, and amending them following the review commentary involved yet more work, but all that hard work is evident in the final product. I am very proud

of it, so thank you for your diligence and perseverance. Victoria, you joined us at a later stage, but your contribution was nonetheless vital. Thank you for your willingness to step in and get involved on such an uncertain but challenging project.

Professor W.P.M.M. van de Ven; Wynand. In my second year at university, you asked me if I might consider doing research in the future. That idea appealed to me and I am very grateful for the confidence that you placed in me. I always felt a valued member of your department and, more recently we share an office together. Thank you for your enthousiasm and interest in my research.

My (former) colleagues from Erasmus School of Health Policy & Management (ESHPM). Thank you for your support, conviviality and motivation. I have truly enjoyed working within your organization. During my studies and my doctoral research, I received academic training at the ESHPM. I consider myself very fortunate in this regard. I would especially like to mention six of my (former) colleagues. My former roommates at the office: Frank, thank you for all the good times we had in 'our' office, and thanks to Edith and Trea too; our time as roommates at the office was short-lived, but I was very happy to have you around. Rudy, thank you for your hospitality in Boston. I look forward to working together. Barbara, thanks for being there at all the crucial points in my studies and PhD research. I'm very grateful for all our chats. Hanna, it was lovely to be able to share my experiences at De Regenboog hospice with you, and so much more. Thanks too to my fellow organizers at lolaHESG 2017: Frederick, Kim, Lytske, Mariska and Wouter. I really enjoyed working on this project together. We made a great team. Timo and Daniëlle, you also deserve a special mention for your enthusiastic support in finding the perfect locations, among so many other things.

My former colleagues at the Dutch Healthcare Authority. I look back with great fondness on the time that I was able to spend with you. I learned an enormous amount and we had fun too. I would like to thank Misja and Annemiek in particular. You have helped initiate and develop our work together, and I am very grateful for that. It was a hugely valuable experience for me, which taught me so much, not only about the healthcare sector, ZBOs and projects, but also about what it can be like working outside the university. I would also like to mention Ben, Ingrid and Gertjan. Ben, suddenly you found yourself sharing an office with someone who was working on a PhD in health *economics*. That must have been a big change, but we got through it just fine. I had a wonderful time and always felt very welcome. Thank you

for that. Gertjan, what started as a joint internship will hopefully culminate in a great publication. I look forward to working together. Ingrid, this year we are supervising another student. I am so glad that we have been able to work together so productively for so long.

The Council for Public Health and Healthcare. I still have fond memories of my internship at the Council for Public Health and Healthcare. Bert Kreemers guided and supported me in a way that was absolutely inimitable. He enthusiastically encouraged me to aim for a future in science, and I am still very grateful for that.

My (former) colleagues at De Regenboog Hospice: Karin, Len, Renske, the professionals and the volunteers. The work that you do is so unique and valuable. I hope to stay a part of your team for a long time to come and I would like to say thank you for the support and warmth that you give not only to the residents, but also to the other team members, me included.

My paranymphs; my brother, Ewout, and my best friend since day one of our studies, Sandra. Thank you for being with me here, on 14 June 2018. This is the conclusion of a very special period, and I am delighted that you are here to support me.

My family and friends. Many people have joined me on my journey, from starting out at university to this moment, attaining a PhD. The road was not always easy. Some people decided to take a different route, while others joined me along the way. To all of you, thank you for all the support you have given me over the past few years. I would like to mention a number of people in particular: Karen, Nathalie and Joanna, who have been invaluable friends ever since I started my studies. I am so lucky to have had your friendship. I would also like to thank my parents: I am so glad that you are always there for me. The last years have been no walk in the park. It is so wonderful to be able to celebrate another highlight: this job has been completed, thanks in part to your support and encouragement. I am grateful to you for everything. Ewout and Maureen: we will also celebrate your own highlight this year; I am so looking forward to your wedding day. I cannot thank you enough.

And finally. My grandma, who gave me her name and who meant so much to me: thank you.

Anne-Fleur Roos
Rotterdam, April 2018

Portfolio

Education

Erasmus University Rotterdam, Rotterdam, the Netherlands 2018
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PhD in Health Economics

- Title: Mergers and Competition in the Dutch Healthcare Sector
- Supervisors: Prof. dr. F.T. Schut and Prof dr. M. Varkevisser
- Visiting scholar at Department of Health Care Policy, Harvard Medical School in November 2013
- Coursework: Academic writing for PhD-students; Refwork; Ready in 4 years; Basisdidactiek; Introduction to Econometrics; Applied Health Econometrics; Survival analysis; Stata; Empirical Policy Evaluation in Health; Industrial Organization; Analysing Patient-level Data; Spatial Health Econometrics

Erasmus University Rotterdam, Rotterdam, the Netherlands 2009
Institute of Health Policy & Management
Master of Science in Health Economics, Policy & Law, GPA: 8.5/10 (with distinction)

Erasmus University Rotterdam, Rotterdam, the Netherlands 2008
Institute of Health Policy & Management
Bachelor of Science in Health Sciences, GPA: 8.7/10 (with distinction)

Erasmus University Rotterdam, Rotterdam, the Netherlands 2007
Erasmus Honours Program

Publications

- **Roos. A.F.** & J.P. Postma. 2016. 'Getting Cold Feet? Why Healthcare Mergers are Abandoned'. *Health Care Management Review.* 41(2):155-164.
- Postma. J.P. & **A.F. Roos.** 2016. 'Why Healthcare Providers Merge'. *Health Economics, Policy & Law.* 11(2):121-140.
- **Roos. A.F.** & F.T. Schut. 2012. 'Spillover Effects of Supplementary on Basic Health Insurance: Evidence from the Netherlands'. *European Journal of Health Economics.* 13:51-62. (based on MSc. thesis)

Professional publications

Postma. J.P. & **A.F. Roos.** 2015. 'Why healthcare organisations merge' [In Dutch]. *Bestuurskunde*. 25(3):63-77.

Roos. A.F. & R.R. Croes. 2015. 'Heterogeneous Price effects in Hospital Mergers' [In Dutch]. *Economische Statistische Berichten.* 100(4715):454-457.

Roos. A.F. & J.P. Postma. 2014. 'Getting Cold Feet? Why Healthcare Mergers are Abandoned' [In Dutch]. *Zorgvisie*. 44(11).

Postma. J.P. & **A.F. Roos.** 2013. 'Why Healthcare Mergers are Abandoned' [In Dutch]. *Boardroom Zorg.* 7/8(12):2-5.

Roos. A.F. & M. Varkevisser. 2011 'The Competition Act: The Devil is in the Details' [In Dutch]. *Zorgvisie: Special Trends & Strategie.* 41(12):56-58.

Roos. A.F. & F.T. Schut. 2009. 'Evaluation Supplementary Insurance and Collective Insurance 2009; research commissioned by the Federation of Patients and Consumer Organizations in the Netherlands (NPCF)' [In Dutch]. Rotterdam: Erasmus University Rotterdam.

Roos. A.F. & F.T. Schut. 2008. 'Spillover Effects of Supplementary Health Insurance on Basic Health Insurance' [In Dutch]. *Economisch Statistische Berichten.* 93(4548):710-713.

Roos. A.F. & F.T. Schut. 2008. 'Evaluation Supplementary Insurance and Collective Insurance 2008; research commissioned by the Federation of Patients and Consumer Organizations in the Netherlands (NPCF)' [In Dutch]. Rotterdam: Erasmus University Rotterdam.

Roos. A.F. & H.P.M. Kreemers. 2008. 'Financial pressure in the hospital market: theory and practice' [In Dutch]. The Hague: Council for Public Health and Healthcare.

Selection of media coverage of my research: daily national newspapers Trouw; NRC and De Volkskrant; daily regional newspapers Brabants Dagblad and Parool; Erasmus Magazine; NOS national news; newsletter Zorgverzekeraars Nederland; Newsletter Consumentenbond; Economische Statistische Berichten. Also, my work has been cited in Parliament proceedings and letters from the Minister of Health to the Parliament

Professional activities

Dutch Healthcare Authority, Utrecht, the Netherlands 2014 – 2015
Bureau of Economic and Medical Affairs
External Collaborator and project manager for the projects *Retrospective Analyses of Hospital Mergers; Concentration of Healthcare Markets; Price Trends in the Hospital Industry; Trends in Healthcare Expenditures and Healthcare Use of Patients with Chest Pain* and *The Impact of Co-Payments on Mental Healthcare Demand*

Dutch Healthcare Authority, Utrecht, the Netherlands 2012
Bureau for Economic and Medical Affairs
External Collaborator for the project *Retrospective Analyses of Hospital Mergers*

Council for Public Health and Healthcare, the Hague, the Netherlands 2008
Intern for the project *Financial pressure in the hospital market: theory and practice* (background study for the report *Managing Healthcare Spending*)

Erasmus University Rotterdam, Rotterdam, the Netherlands 2008-2009
Institute of Health Policy & Management
Research assistant for the projects *Evaluation Supplementary Insurance and Collective Insurance 2008* and *Evaluation Supplementary Insurance and Collective Insurance 2009*, which were both commissioned by the Federation of Patients and Consumer Organizations in the Netherlands (NPCF).

Supervising and teaching experience

Erasmus University Rotterdam, Rotterdam, the Netherlands 2016-
Erasmus School of Health Policy & Management
Principal lecturer (coordinator)
Competition in Health Care Markets (MSc Health Economics, Policy and Law; MSc Health Economics)

Erasmus University Rotterdam, Rotterdam, the Netherlands 2012-
Erasmus School of Health Policy & Management
Lecturer
Economics & Financing of Healthcare Systems (MSc Health Economics, Policy and Law; MSc Health Economics)

Erasmus University Rotterdam, Rotterdam, the Netherlands 2011-
Erasmus School of Health Policy & Management
Internship supervisor, supervisor and co-evaluator
Thesis (BSc Health Policy and Management; MSc Health Economics, Policy and Law; MSc Health Economics)

Training program hospital pharmacists, Utrecht, the Netherlands 2011-2012
Lecturer

Erasmus University Rotterdam, Rotterdam, the Netherlands 2007-2013
Erasmus School of Health Policy & Management
the Netherlands
Lecturer and teaching assistant
Statistics (BSc Health Policy and Management)

Awards, scholarships and fellowships

York University, York, UK
Centre for Health Economics
Royal Economic Society scholarship for the Spatial Health Econometrics Workshop, 2017

Institute for Research and Information in Health Economics (IRDES), Paris, France
Scholarship for the 3rd IRDES Workshop on Applied Health Economics and Policy Evaluation, 2017

University of Manchester, Manchester, UK
Centre for Health Economics
Scholarship for the Manchester International Workshop on Health Economics, 2013

University of Duisberg-Essen, Essen, Germany
Competent in Competition and Health (CINCH)
Scholarship for the CINCH Academy: Essen Summer School in Health Economics, 2013

Erasmus University Rotterdam, Rotterdam, the Netherlands
Institute of Health Policy & Management
Grant for Innovative and Interdisciplinary Dissertation Research, 2009

Erasmus University Rotterdam, Rotterdam, the Netherlands
Erasmus Honours Program 2007
- 25 top students of Erasmus University Rotterdam participated in this program

Invited conference and seminar presentations

2018: Australasian Workshop on Econometrics and Health Economics, Melbourne; 6th Health Econometrics Workshop, Bergamo (scheduled)

2017: Erasmus University Rotterdam, Rotterdam; 9th lowlands Health Economists' Study Group, Rotterdam; 2nd International Invitational Conference Competition Policy in Hospital Markets, Rotterdam; 3rd IRDES Workshop on Applied Health Economics and Policy Evaluation, Paris; 2017 international Health Economics Association Biennial World Congress, Boston; 2nd Spatial Health Economics Workshop, York

2016: Ministry of Health, the Hague

2015: Authority for Consumers & Markets, the Hague; Erasmus University Rotterdam, Rotterdam; Dutch Healthcare Authority, Utrecht; Netherlands Bureau for Economic Policy Analysis, the Hague; Dutch Hospital Association, Utrecht

2014: International Health Economics Association 10th World Congress, Dublin; International Invitational Conference on Competition and Antitrust in Hospital Markets, Bayreuth; Annual Meeting of the Dutch Economic Association, Amsterdam

2013: Essen Summer School in Health Economics, Essen; Erasmus University Rotterdam, Rotterdam

2012: Dutch Healthcare Authority, Utrecht

2010: American Society of Health Economists conference, Ithaca

Miscellaneous

Professional services: referee work for *Health Services Research* and *Health Economics*. Local organising committee 9th Lowlands Health Economists' Study Group (2017). Member of the 'MSc. Health Economics, Policy and Law & MSc. Health Economics' board at the Erasmus School of Health Policy and Management (2016-).

Teaching certification: University Teaching Qualification track (2017-2018)

Consulting: member advisory committee Ministry of Health (Price Transparency in Healthcare) (2016)

Volunteering: volunteer palliative terminal care (certified) at hospice De Regenboog, Rotterdam

Colophon

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Cover and basic design by
Studio Hoope

Printed by
Opmeer paper pixels projects, the Hague

Invitation

to the public defense
of the PhD thesis
Mergers and Competition in the Dutch Healthcare Sector
by Anne-Fleur Roos

on Thursday 14 June 2018
at precisely 1:30 p.m.
in the Senaatszaal
(Erasmus Building)
at Erasmus University
Rotterdam,
Campus Woudestein,
Burgemeester Oudlaan 50
in Rotterdam.

Following the defense a
reception will be held in the
Erasmus Gallery (Erasmus
Building).

Paranymphs
Ewout Roos
Sandra van Roermund

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