Healthcare's competition conundrum

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Healthcare's Competition Conundrum

Cooperative inter-organizational strategies
in competitive healthcare markets

Daan Douwe Westra

Colofon

The studies presented in this dissertation were conducted at the Care and Public Health Research Institute (CAPHRI), department of Health Services Research, Maastricht University. Parts of the analyses have been performed at Vektis. CAPHRI participates in the Netherlands School of Primary Care Research (CaRe), acknowledged by the Royal Dutch Academy of Science (KNAW). The research has been funded by the Academic Collaborative Center on Sustainable Care, which is an initiative of Maastricht University Medical Center+ and Maastricht University.

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Healthcare's Competition Conundrum

Cooperative inter-organizational strategies
in competitive healthcare markets

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit Maastricht,
op gezag van de Rector Magnificus, Prof. dr. Rianne M. Letschert,
volgens het besluit van het College van Decanen,
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Daan Douwe Westra

Promotores

Prof. dr. D. Ruwaard

Prof. dr. M. Carree

Co-promoter

Dr. F. Angeli

Beoordelingscommissie

Prof. dr. J.A.M. Maarse (voorzitter)

Prof. dr. A. de Grip

Prof. dr. P.P.T. Jeurissen (Radboud Universiteit / Radboud UMC)

Prof. dr. M.C. Mikkers (Tilburg University)

Dr. A. Paulus

Voor mam, opdat je trots kunt zijn

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CHAPTER 1

General introduction

Improved efficiency, less centralization, and adequate accessibility, those were the primary goals of the Dutch healthcare reform of 2006 (1). These were to be reached through the introduction of competition (i.e. market-mechanisms) by the Health Insurance Act (*Zorverzekeringwet*) in 2006 (2-6). Competition was introduced in the country's healthcare sector as a means to optimize the welfare of its citizens (2, 3, 5, 7). The call for using competition to make the Dutch healthcare sector more efficient can be traced back to the 1980's (2, 4, 5). However, the notion of competition in health care has generated controversy, discontent, and a fierce public debate ever since the 2006 reform (5). Protagonists argue that competition stimulates efficient resource allocation and argue that all its preconditions should be met in order to be truly effective (2, 8). Antagonists argue that competition compromises core values of health care such as solidarity and accessibility and that the logic of competition, which revolves around individual choice, does not apply well to health care (2, 9). To date, the debate is still widely disputed in the Netherlands and reverting back to a non-competitive, public healthcare system emerged as one of the most debated topics during the campaigns for the national elections of 2017.

The polarizing public debate regarding competition in health care has left academics pondering over the question whether the introduction of competition has indeed made the Dutch healthcare sector more efficient. In the decade after the introduction of competition, the expenditure on health care in the Netherlands has increased by 24 billion Euro's, or 1.5% of the Gross Domestic Product (GDP) (10, 11). In the decade prior to the introduction of competition, health expenditure increased by 30 billion Euro's, or 2% of the GDP (10, 11). Some research has furthermore shown that the introduction of competition has lowered costs, particularly for outpatient treatments, and has improved patient experiences in hospitals (12, 13). However, before and after the introduction of competition, the percentage of health spending on hospital care has consistently been roughly 25% of the total health expenditure (10). Other studies find mixed effects or no effects on price and quality indicators, (14, 15). While the Dutch healthcare system is currently ranked among the best in the world (e.g. 16), the life expectancy at birth, a frequently used indicator of a country's health status, has risen equally before and after the introduction of competition in the Netherlands (11). Scientific evidence of the effects of competition in the Dutch healthcare system on its performance in terms of cost and quality of care is thus mixed. There appears to be no clear relation between introducing competition in the healthcare sector and improved or worsened healthcare outcomes.

Competition in health care

Competition in health care means different things to different stakeholders (17-19) and has been referred to in terms ranging from simply ‘competition (in health care)’ to ‘managed competition’ or ‘managed care’. At its core however, competition in the healthcare sector implies *“a purchasing strategy to obtain maximum value for money for employers and consumers. It uses rules for competition, derived from rational microeconomic principles, to reward with more subscribers and revenue those health plans that do the best job of improving quality, cutting costs, and satisfying patients.”* (18). In this definition, value for money refers to the best possible health outcomes for the least amount of money (20). The micro-economic principles of competition to which Enthoven (18) refers carry two important assumptions. The first is that competition between organizations leads to an optimal price for specific services. That is, a price at which supply equals demand (21). The second is that competition forces organizations to innovate in order to create and uphold a competitive advantage over rival organizations (22, 23). Both of these mechanisms are assumed to ultimately benefit consumers or, in the case of health care, patients.

Whether competition leads to optimal value for money in the healthcare sector depends on the way it is structured (24, 25). Patients do not typically purchase healthcare services directly from the providers. Instead, competitive healthcare industries are structured as option-demand markets in which third-party payers (e.g. health insurers) are responsible for matching supply and demand for healthcare services. Competition occurs in three stages in such markets (represented by Figure 1.1) (e.g. 26, 27-31). In the first stage, third-party payers can selectively contract providers based on the price and quality of their services. Contracting high value for money providers enables third-party payers to offer high value for money insurance plans in the second stage where they compete with one another for enrollees (i.e. subscribers) to their insurance plans. In the third stage, enrollees who fall ill seek out a provider of which the services are covered by the insurance plan they have purchased.

The contracting process between third-party payers and healthcare providers (i.e. the first stage of competition) arguably has the greatest influence on consumer welfare and has hence been studied in growing stream of research (31). Gaynor and colleagues (31) have reviewed this body of literature. They indicate that in this first stage the price of specific services can either be negotiable between purchasers and providers or pre-determined by a central authority. Freely negotiable prices between purchasers and providers result in price-competition between providers. Pre-determined prices of specific services result in non-price-competition between providers. In the Netherlands, roughly 8% of all specialized care

services were subject to price-competition upon introduction of the HIA in 2006 and the percentage has been gradually increased to 70% of all specialized care services being subject to price-competition since 2012 (6). In their review, Gaynor, Ho (31) note that theoretically, the quality of services will increase under conditions of non-price-competition whenever the pre-determined price exceeds the marginal costs of providers. They furthermore show that this prediction is generally supported by empirical research. Under conditions of price-competition, the theoretical prediction is that price and quality will either increase or decrease depending on price- and quality-elasticity of demand (31). Empirically, the effect of competition on quality does indeed seem to vary but most empirical studies do indicate that price-competition decreases prices (31).

Figure 1.1: Schematic representation of competitive healthcare industries based on Gaynor and Town (29)

Cooperation in health care

The model of competition in health care is based on the micro-economic principles of the so-called neoclassical theory of the firm (18, 32). This model assumes that organizations in a market act independently and that interactions between them are governed by price-

mechanisms and executed at arms-length (32, 33). Under this model, cooperation between organizations is often dubbed collusion, and perceived as a deliberate attempt to frustrate the market and create an unfair advantage by forming cartels (32). Put more simply, cooperation between competing organizations is considered ‘sleeping with the enemy’ (34). More recently however, the perception that organizations are fully atomistic actors which solely compete with one another to maximize their profits is increasingly perceived as inadequate (35). Instead, researchers have widely acknowledged that organizations are embedded in networks of various cooperative relations with other firms (e.g. 35, 36-39). Cooperative relations between organizations can take many forms ranging from joint ventures to trade associations and the reasons for organizations to collaborate can be as diverse as reducing costs, sharing risks, improving efficiency, creating a new market, and learning (37, 40-42). In general terms however, organizations cooperate in order to achieve goals they cannot achieve on their own (43).

In his seminal work, Arrow (44) has described several characteristics on which the health care market deviates from the competitive neoclassical model in other industries. The widespread prevalence of inter-organizational cooperation in the healthcare industry is not one of the characteristics described in Arrow’s work however. Yet, in health care, inter-organizational cooperation has had a longstanding tradition and can arguably be considered more common than in other industries. Due to its specialized and fragmented nature health care is in fact commonly delivered by networks of multiple organizations connected through various forms of cooperative relations ranging from patient transfers to shared human resources and interlocking directorates (e.g. 43, 45, 46-51). Like in other industries, cooperation between healthcare organizations is driven by motives rooted in theories such as resource dependency theory, institutional theory, and strategic choice theory (52).

Despite the widespread occurrence of cooperation between healthcare organizations, pro-competitive reforms are based on a model of competition which considers cooperation collusive. In line with this thought, competition in health care has predominantly been studied using approaches which build on the neoclassical model of competition and disregard the strategies of- and cooperative ties between- healthcare organizations (31). Overlooking this intermediary (inter-)organizational level of analysis forms one of the explanations of the mixed evidence regarding the effect of competition in health care, in the Netherlands as well as internationally. Consequently, competition, its mechanisms, and especially the tensions between (price-)competition and cooperation are not fully understood in the healthcare industry. As long as this is the case, the debate on whether or not competition is effective as a means to make healthcare more efficient will remain a polarizing matter. A closer examination of the behavior of competing healthcare organizations will foster a better

understanding of how competition in the healthcare industry works in practice. On the one hand it can reveal which strategies are adopted by healthcare providers in competitive markets and whether these strategies have changed as a result of pro-competitive reforms. On the other hand it can reveal the influence of specific strategies on costs and quality of care. A closer examination of the behavior and strategies of competing healthcare organizations will thus shed more light on the question whether competition is indeed a useful tool to improve the efficiency of the healthcare sector.

Aim of the dissertation

Most of the empirical research regarding competition in health care has disregarded the role of cooperation and inter-organizational relations between competing healthcare organizations. Some noteworthy exceptions from the Italian healthcare system have shown that competing healthcare organizations are more likely to collaborate (53-56). However, the Italian healthcare system does not rely on price-competition. A wide range of studies from the U.S. healthcare system, in which price-competition does exist, have studied the existence of cooperative inter-organizational relations between healthcare organizations. These have for example created various typologies of healthcare networks or studied their effects (e.g. 51, 57, 58). However, for the most part they have not paid specific attention to the influence of (the introduction of) competition on these relations and the interplay between competition and cooperation in the healthcare industry.

Tentative evidence from the Netherlands suggests that the introduction of price-competition has limited the tendency of healthcare organizations to cooperate (59). Although it can thus be expected that (the introduction of) competition alters the cooperative behavior of healthcare providers, robust, longitudinal, and industry-wide empirical evidence of this mechanism is lacking. Therefore, the aim of this dissertation is to study cooperative inter-organizational relations between healthcare organizations in a price-competitive healthcare market. More specifically, the dissertation aims to answer four distinct research questions:

1. How can the interplay between pro-competitive policy reforms, inter-organizational relations, and health outcomes be conceptualized?
2. How are cooperative inter-organizational networks between providers in a price-competitive healthcare market structured at different points in time, based on: a.) shared board members, b.) Shared medical professionals, and c.) shared patients?

3. Do observed network structures deviate from formalized network structures?
4. How does (price-)competition influence the formation of cooperative inter-organizational relations between healthcare providers?

A variety of methods are used to investigate these research questions. These include theoretical, qualitative, and quantitative research approaches as well as exploratory, descriptive, and explanatory work. These are furthermore conducted at different levels of analysis including the individual, organizational, and network levels.

Outline of the dissertation

The dissertation is structured in four main parts. **Chapter 2** constitutes Part I and answers the first research question. It introduces a novel conceptual framework from which several testable propositions are derived. As such, it forms the theoretical and conceptual foundation of the dissertation. More specifically, Chapter 2 describes the intermediary role which inter-organizational relations play in pro-competitive healthcare reforms. It furthermore discusses shared board members, shared professionals, and shared patients as examples of such relations. The remaining chapters constitute the empirical operationalization of this theoretical foundation.

Part II of this dissertation is comprised of Chapter 3, Chapter 4, and Chapter 5. These aim to answer the second and third research question of the dissertation and study the structure and evolution of cooperative inter-organizational networks of shared board members, shared professionals, and shared patients respectively. **Chapter 3** presents a descriptive quantitative study in which social network analysis is used to investigate the structure of networks of interlocking directorates (i.e. shared board members) between healthcare providers in the Netherlands and to assess whether these networks have changed over time. **Chapter 4** constitutes an exploratory mixed-method (i.e. quantitative and qualitative) study of sharing professionals (i.e. medical specialists), a novel operationalization of inter-organizational cooperation between healthcare organizations. The phenomenon of sharing medical specialists is quantitatively explored through social network analysis. Furthermore, the motives underpinning the formation of inter-organizational relations in the form of shared specialists are qualitatively studied using semi-structured interviews. **Chapter 5** uses social network analysis to quantitatively study networks of shared patients in the Dutch specialized care market. Additionally, it tests the differences between pre-determined patient transfer networks in oncology and those observed in practice in order to answer the third research question.

Chapter 6 and Chapter 7 focus on the influence of (price-)competition on the formation of cooperative inter-organizational relations, which is the fourth research question. Together, these chapters form Part III of the dissertation. **Chapter 6** quantitatively investigates cooperation and competition (i.e. cooperation with competitors) through shared specialists. It studies the personal and organizational determinants of sharing specialists between specialized care providers in the Netherlands using logistic multilevel regression models. **Chapter 7** quantitatively investigates the effect of price-competition on the evolution of cooperative inter-organizational networks through shared medical specialists, using longitudinal social network analysis.

Lastly, Part IV of the dissertation is formed by **Chapter 8** which contains the general discussion. It presents the theoretical and methodological reflections on the work described in the preceding chapters as well as its implications for policy and practice and suggestions for future research.

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PART I

Theoretical aspects of inter-organizational relations

CHAPTER 2

Understanding competition between healthcare providers: Introducing an intermediary inter-organizational perspective

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Abstract

Pro-competitive policy reforms have been introduced in several countries, attempting to contain increasing healthcare costs. Yet, research proves ambiguous when it comes to the effect of competition in healthcare, with a number of studies highlighting unintended and unwanted effects. We argue that current empirical work overlooks the role of inter-organizational relations as well as the interplay between policy at macro level, inter-organizational networks at meso level, and outcomes at micro level. To bridge this gap and stimulate a more detailed understanding of the effect of competition in health care, this article introduces a cross-level conceptual framework which emphasizes the intermediary role of cooperative inter-organizational relations at meso level. We discuss how patient transfers, specialist affiliations, and interlocking directorates constitute three forms of inter-organizational relations in health care which can be used within this framework. The paper concludes by deriving several propositions from the framework which can guide future research.

Introduction

Rising healthcare expenditures (1), demographic challenges, and technological advancements compel nations to find appropriate ways to organise their healthcare systems (2). Policymakers face the challenge to control health expenditures at the macro level while incentivising efficiency at the micro level (3). Between the 1970s and the 1990s regulated systems were the most common way for Western countries to organize their healthcare sector (4, 5). Although they were able to control macro-level health expenditures, these systems were burdened by imbalanced supply and demand and a lack of efficiency stimuli (2, 5). Several countries consequently introduced legislation spurring competition within their healthcare system in an attempt to stimulate efficient healthcare delivery and resource allocation (2, 5-9). Yet, competition in health care is controversial topic and its potential adverse effects have left some policymakers hesitant to introduce pro-competitive reforms (6).

In health care markets competition is often referred to as ‘managed competition’ which is defined as a set of ‘rules for competition’ between care providers designed to obtain maximum value for money (10). Value is the best possible health outcomes achieved per dollar spent, which is what ultimately matters for patients and society (11). Competition can furthermore occur between third-party purchasers such as insurers who compete for enrollees or between healthcare providers (i.e. organizations) who compete to be (selectively) contracted by purchasers (12, 13). In this chapter we refer to the latter. Supporters of competition argue that it stimulates providers to seek a competitive advantage over each other, which boosts efficiency and ultimately benefits patients (12, 14, 15). However, antagonists argue that the characteristics of health care render competition in the sector ineffective (16).

Empirical studies regarding the impact of competition on health outcomes have produced positive as well as negative results in price-competitive as well as non-price competitive systems (i.e. systems where prices are regulated or pre-determined) (17, 18). In price-competitive systems like the United States or the Netherlands purchasers selectively contract services from providers based on freely negotiable treatment prices (13, 19). The theoretical prediction that this drives down treatment price is supported by several empirical findings (e.g. 20, 21, 22). But findings regarding the effect of price competition on various indicators of quality of care are mixed. Some studies find that it increases quality (e.g. 23, 24-26) while others display opposing or no significant effects (e.g. 27, 28). In non-price-competitive systems on the other hand, quality is the primary differentiating factor for providers, which can result in a so-called ‘Medical Arms Race’ (MAR) (29). The theoretical prediction that this

increases overall health expenditures (13, 30) is supported by several empirical findings (e.g. 31, 32, 33), while findings concerning the effect of non-price competition on indicators of quality of care are also mixed (24, 34-41).

Most of these empirical studies have been rooted in the traditional neoclassical perception of competition. It assumes that outcomes are a result of an industry's structural characteristics which influence rivalry and organizational behaviour (42, 43). The Structure-Conduct-Performance (SCP) paradigm, in which market structure (e.g. concentration) is associated with outcomes, has hence served as the primary empirical approach. However, the approach is typically applied in a cross-sectional way to analyse markets in an equilibrium, whereas healthcare reform is an inherently dynamic and ongoing process (44, 45) that makes markets unstable and changing. It has furthermore been criticized for overlooking organizational behaviour in empirical testing (46, 47) and inter-organizational cooperation has been explicitly described as difficult to capture within the traditional competitive paradigm (48). The dynamic nature and failure to account for inter-organizational behaviour could very well explain the mixed findings of empirical research. As a result, our understanding of the effectiveness of competition in healthcare settings remains limited and a conclusive answer to the question whether policymakers should or should not introduce pro-competitive reforms to improve value for patients is lacking.

In order to foster a more detailed understanding of competition in healthcare markets, some researchers have suggested that the institutional context (i.e. macro level), behavioural features of healthcare providers (i.e. meso level), and health outcomes (i.e. micro levels) should be considered simultaneously when analysing healthcare reforms (49, 50). Scant academic attention has however been paid to the complex interplay between the policy (macro), inter-organizational (meso), and outcome (micro) levels. This study aims to advance the understanding of the interplay between these levels. It does so by formalizing a conceptual framework that can support future research regarding the role and evolution of cooperative inter-organizational relations between healthcare organizations as intermediary between policy reforms and health outcomes.

Theoretical approach

We have conducted a narrative review of academic literature regarding 1) the relation between macro level reforms and meso level healthcare markets, 2) the meso level healthcare market and health outcomes, 3) the role of cooperative inter-organizational relations between healthcare providers in determining health outcomes, 4) how inter-

organizational relations form networks of healthcare providers, and 5) the types of inter-organizational relations which exist in health care. We have synthesized the findings from these bodies of literature by formalizing a cross-level conceptual framework (see Figure 2.1). The framework highlights the interplay between macro level policy reforms, meso level healthcare markets, and micro level outcomes. At the meso level, the role of inter-organizational relations between healthcare organizations is emphasized. The framework seeks to facilitate research regarding the effect of pro-competitive policy reforms on patient level outcomes within the healthcare domain. In order to guide such future research, several testable propositions have been derived from this framework.

Figure 2.1: Cross-level conceptual framework

Results from the literature review

The need for an inter-organizational network perspective to health care

Despite the fact that the neoclassical rules of competition have been well-established, many scholars have also recognized the fact that cooperative inter-organizational relations between independent autonomous organizations are essential to an organization's goal attainment (51). This notion has for example been formalized in concepts such as the relational view

(RV), which proposes that dyads of organizations create additional value through sharing knowledge and utilizing complementary resources (e.g. 52, 53), ‘coopetition’, which refers to the simultaneous cooperation and competition between organizations (e.g. 54, 55), and strategic networks, defined as purposeful long-term relations between separate organizations to pursue a competitive advantage (e.g. 48).

Although it was not specified as a differential factor by Arrow (16) in his influential work on the differences between the healthcare industry and other industries, much of the initial work regarding cooperative inter-organizational relations has stemmed from non-profit and specifically the healthcare industry (e.g. 51, 56). The non-profit nature of the industries in which inter-organizational relations were commonly discussed initially led strategy scholars to pay little attention to the concept (48). However, inter-organizational relations have long been established as a relevant mechanism for and determinant of efficient and effective healthcare delivery (57, 58). This crucial role of inter-organizational relations within the healthcare domain primarily stems from healthcare’s fragmented nature and (increasing) sub-specialization (59, 60). In fact, scholars have widely recognized that health care is a service which is delivered by several cooperating providers (58, 61, 62), implying that even for a single disease, a patient is typically treated by more than one organization. In 1984 for example, Provan (63) wrote that *‘most hospitals form collaborative agreements with other healthcare organizations’*. Fostering and sustaining successful inter-organizational collaboration between healthcare providers has subsequently been, and continues to be, a focal point of research within the industry (e.g. 61, 64).

While the non-profit environment of many healthcare industries is what has arguably enabled cooperative inter-organizational relations to flourish, pro-competitive reforms have greatly altered the context of the healthcare industry in several Western countries. In any industry a firm’s performance cannot be fully understood without considering the inter-organizational relations in which it is embedded (65). We argue that overlooking inter-organizational relations in health care, an industry in which they are widespread, generates an incomplete understanding of the effects of pro-competitive reforms. In order to better understand whether pro-competitive reforms positively affect health outcomes, research should thus consider (changes in) such inter-organizational relations between healthcare organizations. The consideration should furthermore transcend the dyadic level (i.e. as a relation between organization A and organization B) because that disregards the embeddedness of such relations in a larger social context (66). The collection of inter-organizational relations between a group of organizations together comprise a ‘whole’ network (52, 58) and should instead be considered as such.

The term 'network' is widely used and difficult to pin down. Examples in health care include terminology such as network organization, integrated delivery network, hub and spokes network, or multi-hospital network (48, 61, 62, 67-70). At the meso level, we view a network as a collection of dyadic cooperative inter-organizational ties. They are neither arms-length transactions between separated organizations nor fully integrated organizations (63, 71). Instead, they consist of a collection of legally independent organizations (i.e. nodes) connected by (multiple) cooperative inter-organizational ties (72). Considering inter-organizational relations in their network context furthermore allows for the investigation of their intermediary role between the macro and micro level. As Borgatti and Halgin (73) put it; considering the network perspective allows for the identification of processes that determine why networks have the structures they do (e.g. the interplay between the macro and meso level) and how specific network structure lead to certain outcomes (e.g. the interplay between the meso and micro level).

Inter-organizational ties in health care

Cooperative inter-organizational relations come in a variety of forms (57, 74). In order to influence outcomes they should however transcend mere formal agreements to collaborate and constitute actual collaborative tasks and behaviour (64, 75). In other words, they should involve flows of assets, information, or status from one organization to another (76). Although several of such ties are conceivable, we review here three which are used in existing literature. These are: patient transfers, professionals' affiliations, and interlocking directorates. Together these describe a cross-section of a typical healthcare organization at the patient level, the professional's level and the board level. They can furthermore be studied in a horizontal (i.e. between providers in a similar domain) as well as a vertical (i.e. between providers in different domains) sense. However, by no means do these ties constitute an exhaustive list. Future research could identify other generalizable, healthcare-specific, inter-organizational relations able to perform the mediating role at the meso level.

Patient transfers

Patient transfers between healthcare providers have been used in pioneering papers in the field of inter-organizational networks within health care (e.g. 57, 77-82). They represent a form of collaboration that is inherent to the fragmented nature of the healthcare industry in which multiple organizations treat a patient. Patient transfers have been described as a cooperative inter-organizational relation due to the fact that transferring a patient from one organization to another establishes a relation in which information and knowledge is passed from one to the other (77). As Lomi, Mascia (81) describe it: *"Patient sharing requires that partner hospitals commit resources to joint infrastructural investments to support relational coordination, a reliable signal of collaboration between sending and receiving hospitals."*

(81). Or as Gittel and Weiss (59) put it; *“To discharge patients properly requires some kind of relationships with downstream providers who will care for the patients post-discharge, both to assure that slots will be available on short notice, and to assure that once gone, patients will be in good hands.”* (59).

Professionals’ affiliations

The second type of cooperative inter-organizational relation we propose to accompany our framework is that of professionals’ affiliations. Empirical research has focused on cooperation between healthcare professionals such as medical specialists (83) but has predominantly done so within organizational boundaries. We instead propose an inter-organizational approach to this matter. In line with Dyer and Singh (52), Gittel and Weiss (59), and Westra, Angeli (84) we propose that interfirm knowledge sharing routines can consist of healthcare professionals who cross organizational boundaries. Such interaction between organizations, operationalized for example through sharing healthcare professionals, can foster inter-organizational learning (59, 85).

Interlocking directorates

The third form of inter-organizational cooperation within the healthcare domain we propose to consider at the meso level is that of interlocking directorates. Interlocking directorates refers to the practice of ‘sharing’ board members between organizations. It has been described as a strong predictor of strategic decisions by organizations which in turn influence an organization’s profitability and serve as a vehicle to reduce external uncertainty stemming from competition for example (68, 86). Interlocking directorates are perceived as vehicles of communication and coordination between organizations which can influence an organization’s financial sustainability and facilitate health outcomes such as the accessibility of care.

The macro, meso, micro interplay

Pro-competitive reforms are an instrument used by policy makers to optimize the outcomes for patients, rather than a goal in itself (87, 88). Two distinct mechanisms underpin this effect. The first is that the behaviour of healthcare organizations drives the creation of value for patients. Rooted in the traditional neoclassical competitive logic, the assumed mechanism, in the case of pro-competitive healthcare reforms, is that competition maximises value for patients (10, 11). In other words, that competitive behaviour of healthcare organizations will leave patients better off than non-competition between providers. The second underlying mechanism is that the institutional context at the policy (i.e. macro) level influences the behaviour of healthcare organizations (i.e. at the meso level) (7, 89) and that organizations display different behaviour in response to different policy alternatives (90). With pro-

competitive healthcare reforms the assumption is that the changes in the institutional context will lead healthcare providers to actually compete with one another (44).

These mechanisms highlights that pro-competitive reforms generate positive outcomes for patients, or fail to do so, through the intermediary role of the behaviour of healthcare providers. The interplay between three distinct levels of analysis thus becomes apparent. The first of these is the policy (i.e. macro) level. It is the institutional context which dictates the rules of the game and which can be directly altered by policy reforms. The healthcare market is the second (i.e. the meso) level. Here healthcare providers can display specific behaviour, of which competing with other providers is one example. The outcome level is the third and final of these levels. It is the level at which value for patients is assessed based on dimensions such as the price, quality, and accessibility of specific services.

Both of these mechanisms have been subject to empirical research within health care. However, following the SCP approach, the intermediary meso level has been operationalized by structural market features. We will not reiterate the mixed findings of empirical studies regarding the effect of competition on price and quality outcomes (i.e. the first mechanism) described in the introduction of this chapter, we do however point out that the second mechanism has also attracted academic attention. Both in and outside the US, there has been a trend towards consolidation of healthcare markets and integration between providers subsequent to pro-competitive reforms (67, 88, 91, 92). Gaynor and Haas-Wilson (92) for example question whether the ‘unmistakable trend of consolidation’ in healthcare markets represents an efficient response to external uncertainty or attempts to gain anticompetitive advantages. While their work underlines the mechanism that pro-competitive reforms influence the healthcare market, it also highlights the reverse interplay between the meso and macro level. In related work, Gaynor and Vogt (93) and Loozen (94) have for example discussed the rationale behind, issues with, and required adaptations of anti-trust enforcement in health care.

Formalisation of the framework

In the preceding sections we have introduced a conceptual framework based on a review of academic literature regarding the interplay between macro level policy reforms, meso level healthcare markets, and micro level outcomes and the role of inter-organizational relations between healthcare organizations in healthcare markets. The framework aims to guide future research regarding pro-competitive policy reforms on patient level outcomes within the healthcare domain. This section presents several testable propositions based on this framework. The propositions focus on the interplay between the macro and meso levels,

market structure and inter-organizational relations within the meso level, the meso and the micro levels, the micro and meso levels, and the micro and macro levels.

Policy and inter-organizational relations: macro and meso

While several studies have been conducted regarding the evolution of market structure following pro-competitive policy reforms in the healthcare sector of several countries, there is scant research investigating the relation between macro level policy and the structure and evolution of cooperative inter-organizational networks. This is particularly true for research utilizing the three types of inter-organizational ties we have proposed. Yet, as our framework proposes, if the influence of pro-competitive healthcare reforms is to be fully understood, this relation should be studied in more depth.

While research has shown that inter-organizational relations such as patient transfers are common in Bismarck-type healthcare systems (e.g. 78) as well as in Beveridge-type systems (e.g. 81), the effect of reforming one type of system towards the other has yet to be studied in detail. In essence, examining this interaction tests the influence of the institutional context on the structure and evolution of inter-organizational networks in healthcare. For example, the hierarchical nature of a Beveridge-type National Health System could result in hierarchically imposed patient transfers towards a specific centre of excellence. Provan (63) has shown that hospitals which are part of a larger system (i.e. a consortium) possess less strategic decision making autonomy. A similar rationale would hold for hospitals in an NHS system. Increasing organizational autonomy by reforming the system towards a more competitive, Bismarck-type, system could hence alter the structure of these networks.

The same logic holds for other types of inter-organizational ties. In the case of shared professionals or board members the influence of the institutional context could be even more explicit. In some countries it is illegal for professionals to be affiliated to multiple organizations (84) and the Dutch governance-code for example limits the amount positions which can be held by board members. However, two studies in the Dutch context do indicate an increase in inter-organizational cooperation based on specialists' affiliations (i.e. shared medical specialists) as well interlocking directorates following the introduction of price competition in the Dutch healthcare market (84, 95). We formalize the interaction between the institutional context at the macro level and inter-organizational networks at the meso level in the following proposition:

Proposition 1a – Pro-competitive policy reforms affect the structure of inter-organizational networks of healthcare providers.

A reverse interaction between inter-organizational networks at the meso level and policy at the macro level can be described twofold. First, based on the ongoing nature of healthcare reforms (44, 45). The ongoing nature of reforms suggests that policymakers can introduce additional reforms based on the response organizations have displayed to previous (pro-competitive) reforms. Second, in line with the reasoning of consolidating healthcare markets, several authors have argued that some forms of inter-organizational cooperation potentially impede effective competition (12, 84, 96), highlighting the potential need for stricter enforcement or adaptations of existing antitrust regulations. We hence formalize the following proposition regarding the meso to macro level interaction.

Proposition 1b – The structure of inter-organizational networks of healthcare providers affects policy reform.

Inter-organizational relations and market structure: at the meso level

Throughout this chapter we have stressed the value of inter-organizational relations at the meso level. However, our framework does not propose a singular focus on inter-organizational networks. Instead, inter-organizational networks constitute an addition to structural market features at the meso level. Following the SCP-logic, market structure can influence inter-organizational behaviour of providers. Likewise, inter-organizational relations can in turn influence the structure and functioning of markets. The former has received little academic attention when it comes to the influence of inter-organizational behaviour of healthcare organizations. Studies by Mascia, Di Vincenzo (80), Lomi and Pallotti (79), and Mascia, Pallotti (97), all of which utilize patient transfers, form notable exceptions. These studies find that overlap in geographic and product markets (i.e. structural features of the market) influences cooperation between providers, based on which we formalize the following proposition:

Proposition 2a – The structure of healthcare markets affects the structure of inter-organizational networks of healthcare providers.

The latter notion has discussed theoretically by Fottler, Schermerhorn (57) when they describe a process to which they refer as ‘incrementalism of inter-organizational relations’. The authors indicate that healthcare organizations typically commence inter-organizational cooperation by using cooperative ties which require less resource commitment and bear lower risks, explicitly mentioning patient transfers as an example. As the organizations reap the rewards of their cooperative inter-organizational relation, they move towards more committed and higher risk type of relations. Complete or joint ownership, hence integration which alters market structure, is the most committed type of relation described by the authors. Although healthcare executives have an important role when it comes to matters of

integration (98), this process of incrementalism has, to the best of our knowledge not been tested empirically, particularly based on the three types of inter-organizational relations we have proposed. Hence, we formalize the following proposition:

Proposition 2b – The structure of inter-organizational networks of healthcare providers affects the structure of healthcare markets.

Inter-organizational relations and outcomes: meso and micro

Perhaps the most discussed and hypothesized aspect of inter-organizational relations in healthcare is their relation to improved patient-level outcomes such as increased accessibility, higher quality, and lower costs of health services. In their seminal work, Provan and Milward (99) show for example that networks with specific network structures are more effective than others. A finding reiterated by Mascia, Angeli (82) in their analysis of patient transfer networks in Italy.

What constitutes an effective network structure can however vary between the different inter-organizational ties we have proposed. As can the underlying mechanisms of how these ties influence patient level outcomes. When it comes to patient transfers for example, researchers have suggested that referring patients to high volume hospitals has the potential to prevent avoidable deaths (100) by leveraging complementary resources (78). In case the networks facilitate the flow of patients towards providers who possess the correct resources and volumes to treat patients (78, 81, 82, 101) service duplication can furthermore be avoided (82, 100). Researchers have shown that patient transfer networks are associated with reduced readmission rates for patients (81) but have also found sub-optimal patient transfer network configurations (101, 102).

When it comes to shared human resources the relation to patient level outcomes is slightly more indirect. That is, through sharing such resources, organizations create channels to transfer knowledge, routines, and best-practices, thus creating learning opportunities and harnessing the potential to increase quality of care for patients. Non-healthcare research has indeed found that partner organizations capable of effectively transferring knowledge generally outperform those who are not (52). While two Dutch studies indicate that inter-organizational learning and improving quality of care for patients are important drivers for medical professionals to be shared (84, 103), other studies have indicated that medical specialists are unable to duplicate their performance from one organization to the next (104, 105).

Interlocking directorates can influence patient level outcomes in an even more indirect fashion. To the best of our knowledge, research regarding interlocking directorates has not been widely adopted within health care. Outside the healthcare though, researchers have suggested that interlocking directorates influence a firm's strategies, profitability, and integration (68, 86). Board members are hence perceived as vehicles of knowledge transfer between organizations. Their major distinction from shared professionals however is that they do not necessarily possess knowledge of the primary process within a healthcare organization but instead harness the potential to transfer knowledge related to strategic and financial processes. Despite these differences in underlying mechanisms, we formulate the following proposition regarding the influence of inter-organizational networks at the meso level on outcomes at the micro level:

Proposition 3a – The structure of inter-organizational networks of healthcare providers affects outcomes.

In line with the previous interactions we argue that the interaction between inter-organizational networks and outcomes is also bi-directional. The inverted relation is congruent with the formalization of the classical economic notion that providers will seek a competitive advantage over one another. That is, if organization A and B (at the meso level) observe that their outcomes are suboptimal, they will respond by structuring their cooperative relations in such a manner that it will improve their performance (i.e. outcomes). Research has for example reported that providers share medical specialists in order to respond to quality and volume requirements of the market (84). Hence, we formulate the following proposition regarding this interaction;

Proposition 3b – Outcomes affect the structure of inter-organizational networks of healthcare providers.

Outcomes and policy: micro and macro

Lastly, we have argued that policy reforms at the macro level are implemented with the aim to improve outcomes at the micro level. They are thus fundamentally driven by discontent with existing micro level outcomes produced by a healthcare system. Current pro-competitive reforms are for example primarily aimed at slowing down increasing healthcare expenditures (2), one of such micro level outcomes. While we have argued in this chapter that the effect of macro level policy reform and micro level outcomes is mediated by the structure of- and inter-organizational relations within- the healthcare market, we formalize a more direct reverse interaction between patient-level outcomes and policy in our framework, which leads to the following proposition:

Proposition 4 – Outcomes affect policy reforms

Conclusion

Although pro-competitive reforms have been introduced in the healthcare sector of several Western countries, the academic literature lacks a consensus on whether such reforms reach their goal of maximizing patients' value for money. We have argued that this is due to two main factors. First, existing research regarding competition in healthcare has not addressed the inherently dynamic interplay between policy at the macro level, the healthcare market at the meso level, and outcomes at the micro level. Second, the healthcare market, at the meso level, has predominantly been operationalized based on its structural features, neglecting cooperative inter-organizational relations which are relevant to understand any industry but healthcare in particular. In this chapter we hence formalized a conceptual framework which addresses these two shortcomings and we have identified three types of inter-organizational relations relevant to the healthcare sector, namely patient transfers, professionals' affiliations, and interlocking directorates.

From the framework we have furthermore derived several propositions able to guide future research regarding pro-competitive reforms in health care. Specifically, these propositions have been aimed at the interplay between macro level policy and inter-organizational relations at the meso level, market structure and inter-organizational relations within the meso level, inter-organizational relations at the meso and outcomes at the micro level and vice-versa, and outcomes at the micro level and policy at the macro level. Specifically, future empirical research could investigate the directionality of these propositions because by analysing networks of cooperative inter-organizational relations in healthcare markets, researchers and policymakers are able to better understand why certain policies do or do not meet their intended effects of benefits for patients.

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PART II

Occurence of inter-organizational relations

CHAPTER 3

Exploring interlocking directorates in health care

Based on:

Westra, D., Angeli, F., Carree, M., en Ruwaard, D. Bestuurlijke dubbelrollen: natuurlijke bestuursstructuur of doorn in het oog van de governance code? In: H. den Uijl en T. van Zonneveld, Zorg voor toezicht: de maatschappelijke betekenis van governance in de zorg, pp. 224-232. Amsterdam: Mediawerf, 2015.

Abstract

Interlocking directorates occur when a board member of an organization also holds an affiliation to another organization. They were long considered the primary indication of cooperation between organizations and have hence been studied in a range of industries and through various theoretical perspectives. However, despite the strong reliance on inter-organizational cooperation, empirical research regarding interlocking directorates is scarce in the healthcare industry. In this paper, we study the occurrence of direct interlocking directorates in health care, their geographical dispersion, their occurrence between organizations in the same market segment, and their changes over time. Furthermore, we studied the ties between market entrants and incumbent organizations. We use social network analysis based on publically available data extracted from the annual report of all Dutch healthcare organizations in 2007 and 2012. Board interlocks appear to be increasingly common over time, suggesting that they constitute a way to manage environmental uncertainty. Furthermore, they typically occur amongst geographically proximate organizations in similar market segments. Lastly, roughly half of all market entrants are tied to incumbent organizations. Traditional concerns regarding anti-competitive effects of board interlocks could hence resurface. More in-depth and multi-level research regarding interlocking directorates in health care can enhance our understanding of these forms of inter-organizational cooperation in the sector, as it has done in various other industries.

Introduction

During the past few decades, many countries have enacted various reforms in their healthcare sector (1). Healthcare organizations hence operate in turbulent times. In the Netherlands for example, numerous healthcare reforms were introduced in the past years (2). Examples include the introduction and adaptation of the health insurance act (3, 4), near-continuous reform of the mental healthcare sector (5), introduction of integrated financing schemes (6), and decentralization of the responsibility for various types of care to municipalities (7). As a result, the hospital sector has undergone a wave of consolidation (8, 9), municipalities are selectively contracting or delivering healthcare services (5), and various new models of (integrated) healthcare delivery have been developed (e.g. 10). Ultimately, an organization's board is responsible for adequately navigating their organization through such uncertain surroundings (11). Boards are typically comprised of inside and outside members (12). The former refers to board members who are primarily affiliated to the organization, such as the CEO, while the latter refers to board members who are primarily affiliated to other organizations (12).

Rooted in resource dependence theory, one way for organizations and their boards to cope with the uncertainties of the external environment is by forming board interlocks, otherwise known as interlocking directorates (13-17). An interlocking directorate exists when the board member of a particular organization is also affiliated with another organization (e.g. 12), forming a link between two organizations. Amongst others, such links enable organizations to cooperate with regulatory bodies, customers, and suppliers, as a result of which external constraints are reduced (e.g. 17, 18). That is, interlocking directorates constitute vehicles to incorporate external parties in an organization's decision making structure in order to reduce external uncertainties, a phenomenon known as cooptation (17). Direct interlocks occur when organizations are directly linked with one another through a shared board member, whereas indirect interlocks imply that two organizations are both represented in the board of a third organization (14).

In the 1970s and 1980s, research regarding interlocking directorates flourished in top-tier management journals (e.g. 18, 19, 20, 21). They were considered the main indication of inter-organizational relations between organizations and reliable data regarding their existence was generally available (12). Interlocking directorates hence constitute arguably the most widely studied form of inter-organizational relations and besides cooptation, various motives and effects of board interlocks have been proposed (22). For example, board interlocks were initially considered collusive strategies intended to limit the amount of competition between organizations and increase conformity amongst competitors (12,

16, 22, 23). Although the evidence regarding the anti-competitive effect of board interlocks is mixed (cf. 12), the formation of board interlocks between competing organizations has been prohibited by U.S. antitrust legislation since 1914 (23). Alternatively, interlocking directorates have been described as mechanisms for personal career development (e.g. 21, 24), organizational legitimacy (e.g. 25), and social cohesion (e.g. 26). On a personal level, holding a great number of board positions is furthermore associated with several practical problems in terms of board members' availability and flexibility (e.g. 27).

Most of the empirical work regarding board interlocks has been conducted in for-profit industries. Although interlocking directorates have been recognized as relevant forms of inter-organizational relations in the healthcare sector (e.g. 28, 29), empirical research regarding these ties has been limited in this industry. This omission is noteworthy for several reasons. Firstly, inter-organizational networks are considered widely common in the healthcare sector and have been the focal point of a range of studies (e.g. 30, 31-33). Empirically however, inter-organizational relations in health care are typically operationalized in ways other than interlocking directorates, for example through patient transfers between organizations (e.g. 34, 35, 36) rather than at the board level through interlocking directorates. Secondly, the occurrence of interlocking directorates seems highly plausible in health care given its unpredictable nature following various reforms (1) and the increased likelihood of interlocking directorates in unpredictable and uncertain surroundings (13-17). Yet, it is unclear whether this is indeed the case. Thirdly, (price-)competition has become a prominent mechanism in the healthcare system of several countries (37), causing the debate surrounding interlocks as vehicles of collusion to resurface.

In this study, we explore direct board interlocks between healthcare organizations. More specifically, the aim of our paper is threefold. Firstly, we seek to unravel the occurrence of direct interlocking directorates in the healthcare industry. That is, we examine how common direct interlocking directorates are and whether they occur between geographical proximate organizations and organizations active in the same segment of the healthcare industry. To the best of our knowledge, scientific evidence regarding direct board interlocks between healthcare organizations is scant. Heemskerk, Hendriks (38) do analyze interlocking directorates in health care but their work focuses on indirect interlocks, which are formed when board members of two organizations both sit on the board of a third organization, rather than direct interlocks, which are formed by outside directors who's primary affiliation is with another organization. Secondly, we aim to test whether the occurrence of direct board interlocks between healthcare organizations has changed over time. We do this in a market which, for a considerable part, has grown increasingly price-competitive (3, 39), shedding light on how healthcare organizations react to uncertainties resulting from

increased competition. Lastly, because market entrants are commonly considered a source of competition to incumbent firms (40) and market entry has been described as a crucial aspect of effective competition in health care (41), we specifically investigate the interlocks between market entrants and incumbent firms. The results of our exploration will shed more light on the phenomenon of interlocking directorates in health care and reveal avenues for future empirical research regarding this matter.

Methods

Setting

Our exploration of direct interlocking directorates in health care was conducted in the Netherlands and based on data from the years 2007 and 2012. The Netherlands spent approximately 75 and 92 billion Euro on health care in these years, amounting to 9.3 and 10.9 percent of the country's GDP, respectively (42, 43). These expenses were financed by three arrangements; the Health Insurance Act (HIA) which financed curative healthcare services, the Exceptional Medical Expenses Act (EMEA) which funded long term healthcare services, and the Social Support Act (SSA) through which social support services were paid (44). The curative healthcare services financed by the HIA account for more than half of the total health and wellbeing expenditure (42) and the majority of the expenses under the HIA are attributable to specialized care services (45). The introduction of the HIA in 2006 furthermore introduced (price-)competition in the curative part of the country's healthcare sector (3, 4). This mechanism is largely based on traditional models of competition which dictate that organizations are assumed to act fully independent of one another (e.g. 40, 46). Whether healthcare organizations indeed operate independently largely depends on the way they are governed (38) and the Dutch healthcare governance code has thus prohibited the formation of direct board interlocks between competitors by stipulating; "Being an outside board member of a competitor is hereby prohibited" (47 Original in Dutch, translated by the authors).

Data and sample

Our study was based on the annual reports of Dutch healthcare organizations. By June 1st of each year, Dutch healthcare organizations should submit their annual report, including full financial statements, of the preceding calendar year (48). These annual reports are made publically available through a dedicated website by the Dutch ministry of Health, Welfare, and Sport. Information reported in the annual reports of Dutch healthcare organizations includes general characteristics such as the type of organization, the number of employees, and number of locations, full financial statements, the composition of the inside and outside

board (respectively ‘Raad van Bestuur’ and ‘Raad van Toezicht’ in Dutch), and performance indicators such as the number of patients treated or the number of quality certifications obtained by the organization. The data contained in the annual reports of the healthcare organizations is furthermore compiled in a freely downloadable data file made available through the same website. Information is presented at the concern level (i.e. the level of the consolidated annual reports. The downloadable data files containing the information reported in the annual reports of 2007 and 2012 were used as the primary data sources in this study. Our analysis was based on all organizations in the dataset, which span the domains of specialized care, mental health care, nursing care, care for the disabled, maternity care, forensic care, youth care, and social care.

Analysis

Using the SAS for Microsoft Windows software package, each organization’s board members (i.e. the members of the inside and outside board) were extracted from the data file. Based on their names, each board member (i) was linked to an organization (j), which was identified through its chamber of commerce number. Organizations with missing chamber of commerce numbers were disregarded. Each organization has a certain degree of freedom in reporting the names of their board member. A person ‘dr. James Jones’ could for example be reported as such or as James Jones, J. Jones, or dr J. Jones. Therefore, all title prefixes (e.g. prof. or dr.) and suffixes (e.g. RA or MBA) were stripped from the names of the board members. Board members’ names were subsequently reformatted to contain a person’s first initial and family name only. Next, all punctuation marks (including spaces) were excluded. Lastly, based on the gender of each board member reported in the annual report, a gender prefix was added to each board member’s name in order to decrease the likelihood of unjustly considering two names as the same person.

The complete list of board members and their affiliation to an organization’s chamber of commerce number formed a so-called two-mode or bipartite edgelist (49). Both of these bipartite edgelists (i.e. one for 2007 and one for 2012) were transformed to undirected unimodal matrices of interlocking directorates between healthcare organizations using the Statnet package in R. That is, two organizations (j1 and j2) were connected through an interlocking directorate when a person (i) served as a board member on both organizations. This could be as an outside board member in both organizations, a member of the inside board in both organizations, or as a member of the inside board in one and outside board in the other organization. Next, both unimodal matrices of interlocking directorates between healthcare organizations were visually represented using the Visone software package (50). Organizations were shaped according to their type (i.e. specialized care provider or other type of provider) and colored according to their geographical location in the country (i.e.

located in a Northern-, Southern, Eastern-, or Western- provinces). Next, we calculated the density (i.e. number of interlocks formed relative to all possible interlocks), average degree centrality (i.e. the number of ties each organization has), and transitivity (i.e. number of ties between organization A and C in case organization A is connected to organization B and organization B is connected to organization C) of each network (51). Lastly, we conducted a paired-samples t-test based on the interlocks of all organizations which submitted an annual report in 2007 as well as in 2012 to detect any changes in the occurrence of interlocking directorates over time.

In order to examine the relation between market entrants and incumbent firms, we used two approaches, both of which were based on the boards of independent treatment centers which had entered the market between 2007 and 2012. Independent treatment centers are small organizations which offer curative healthcare services under the HIA and employ at least 2 medical specialists, most commonly in medical specialties such as dermatology, ophthalmology, or orthopedics (52). Independent treatment centers mainly offer treatments covered by the HIA, which distinguishes them from private clinics (52). Each independent treatment center which submitted an annual report in 2012 but had not done so in 2007 was considered to have entered the market between 2007 and 2012 and was included in this analysis. Similar to the analysis in the entire market, the first approach consisted of mapping the board interlocks between market entrants and incumbent hospitals in 2012. Because independent treatment centers can constitute spin-offs of incumbent hospitals formed in conjunction with medical specialists (53, 54), we analyzed the so-called additional affiliations (i.e. ‘nevenfuncties’ in Dutch) of the board members of market entrants to study whether these board members held positions as active medical specialists in incumbent hospitals. Board members are obliged to report such additional affiliations in the annual report and they have been used to study indirect board interlocks (38).

Results

Table 3.1 presents the results of the quantitative analysis in 2007 and 2012. It displays that a total of 824 healthcare organizations were included in the dataset of 2007. The annual reports of these organizations reported 5,534 unique board members, averaging 6.72 board members per organization. Roughly three in every four board members was male and approximately 7.61% of all board members (i.e. 421 board members) held a position on the inside and/or outside board of multiple healthcare organizations in the 2007 dataset. Of these board members who held multiple affiliations, 79% was male. On average, board members held 1.10 board positions in 2007. However, the 421 board members who held

a position on the board of multiple organizations held on average 2.26 positions. The maximum number of positions held by a board member in 2007 was seven. Of the 824 organizations, 410 are involved in one or more direct board interlocks (i.e. 49.75%) and 141 are organizations which provide specialized care services (i.e. 17.11%). See Table 3.1 for an overview.

Table 3.1: Descriptive statistics of board interlocks at the individual, organizational, and network level

	2007	2012
Board member level		
Total number of board members	5,534	7,122
% male board members	74.97%	71.32%
Total number of affiliations	6,063	7,892
Average number of affiliations per board member	1.10	1.11
Interlocking board members	421	612
% male interlocking board members	79.05%	76.14%
Number of affiliations of interlocking board members	950	1,381
Average number of affiliations per interlocking board member	2.26	2.26
Maximum number of affiliations	7	6
Organizational level		
Number of organizations	824	1,276
Average board size (number of members)	6.72	5.58
Organizations with 1 or more board interlock(s)	410	595
Average interlocks of organizations present both years	0.96	1.34*
Specialized care organizations	141	299
Independent Treatment Centers (ITCs)	56	205
ITCs which have entered the market	-	170
ITCs which have exited the market	-	21
Average board size (# of members) of entrants	-	4.53
Entrants with board interlocks to incumbent firms	-	21
Entrants with alternative interlocks ^a to incumbent firms	-	58
Network level		
Network density	0.00133	0.00087
Transitivity	0.44959	0.34212
Average degree	1.09466	1.10502

^a Board member is also an active medical specialist in incumbent organization

* p-value < 0.001

In 2012, our second observation year, the dataset included 1,276 healthcare organizations. Approximately a quarter of these organizations (i.e. 23.43% or 299 organizations) are specialized care organizations. The annual reports of these organizations reported 7,122 unique board members, averaging 5.58 board members per organization. In 2012, 71.32% of all board members are male and 8.59% (i.e. 612 board members) held a position on the inside and/or outside board of more than one organization. Of these board members

who held multiple positions, 76.14% were male. The board members held an average of 1.11 positions in 2012. Board members who held multiple positions held an average of 2.26 positions and the maximum number of positions held by a board member in 2012 was six. Of the 1,276 organizations in the 2012 dataset, 595 organizations (i.e. 46.63%) were connected to at least one other healthcare organization through a board interlock.

Figure 3.1 displays the network of board interlocks in 2007 and Figure 3.2 displays the network of board interlocks in 2012. In each of the networks, nodes represent an organization and a tie between the nodes indicates an interlocking directorate between the two organizations. That is, it indicates that there is at least one board member who sits on the inside and/or outside board of both organizations. The width of the tie between organizations is proportionate to the number of board members shared between the connected organizations. The thicker the tie, the more board members are shared between both organizations. Nodes are shaped according to the type of organization. Organizations in the specialized care sector are represented by squares, whereas organizations in other sectors of the healthcare industry are indicated by circles. The color of each node corresponds to the part of the country it is located in. Organizations located in the three Northern provinces of the Netherlands; Groningen, Drenthe, and Friesland are colored green. Organizations located in the three Western provinces of the country; Noord-Holland, Zuid-Holland, and Utrecht are colored grey. Organizations located in the three Eastern provinces of the Netherlands; Gelderland, Flevoland, and Overijssel are colored blue. Lastly, organizations located in the three Southern provinces of the Netherlands, Limburg, Noord-Brabant, and Zeeland are colored red.

Figure 3.1: Network of interlocking directorates between Dutch healthcare organizations in 2007.

Figure 3.2: Network of interlocking directorates between Dutch healthcare organizations in 2012.

Visual inspection of the graphical representation of the board interlock networks in Figure 3.1 and Figure 3.2 yields three main observations. Firstly, interlocking directorates appear most common between organizations located in similar geographical regions. This is indicated for example by the cluster of red nodes in the upper-right of both networks (i.e. Figure 3.1 and Figure 3.2), the many interlocks between grey nodes in the largest component of the 2007 network, and the number of same color dyads at the bottom of both networks. Secondly, organizations appear to be connected primarily to other organizations in similar sectors (i.e. specialized or non-specialized care). The clique (i.e. fully-connected structure) of non-specialized care organizations located at the bottom of both networks are examples of this notion. Thirdly, there appears to be a growing trend in the number of interlocking directorates between Dutch healthcare organizations. This is predominantly indicated by the increased size of the largest network component (i.e. the top-left component of both networks). The increased occurrence of board interlocks is furthermore supported by quantitative analysis. Although Table 3.1 indicates that the board interlock network of 2012 is less dense than that of 2007, a greater percentage of board members hold multiple board positions in 2012 than in 2007. The results of the paired-sample t-test, presented in Table 3.1, indicate that the 583 organizations which submitted an annual report in 2007 and 2012 held an average of 0.96 board interlocks in 2007 versus 1.34 in 2012. The increase in the average number of interlocking directorates between 2007 and 2012 is significant at the 0.001 confidence level (i.e. $p\text{-value} < 0.001$).

Table 3.1 indicates that market entrance by independent treatment centers largely explains the increase in specialized care organizations between 2007 and 2012. The analysis of the ties between market entrants and incumbent firms reveals that 170 independent treatment centers entered the market between 2007 and 2012. Additionally, 21 of the 56 independent treatment centers which submitted an annual report in 2007, exited the market before 2012 (i.e. did not submit an annual report in 2012). There were 739 board members affiliated to the 170 market entrants through a total of 770 affiliations, indicating that an average market entrant had 4.53 board members. Of the 170 independent treatment centers which entered the market, 23 (i.e. 13.52%) had board interlocks with one or more incumbent hospital. Furthermore, 17 market entrants (i.e. 10%) had board interlocks with other market entrants but not with incumbent hospitals, as indicated by Figure 3.3 which displays the board interlock network between market entrants (blue nodes) and incumbent hospitals (red nodes) in 2012. Lastly, 86 board members, affiliated to approximately one third of all market entrants (i.e. 58 organizations), reported alternative affiliations as active medical specialists to an incumbent hospital. These alternative affiliations occurred in various medical specialists, listed in Table 3.2.

Figure 3.3: Interlocking directorates between market entrants (blue nodes) and incumbent hospitals (red nodes) in 2012.

Table 3.2: Overview of market entrants' board members' additional affiliations to incumbent organizations as medical specialist

Type of specialty	Number of occurrences
Medical specialist (undefined specialty)	21
Ophthalmology	12
Dermatology	11
Cardiology	8
Surgery	5
Internal medicine	4
Plastic surgery	4
Clinical chemistry	3
Radiology	3
Ear Nose Throat medicine	2
Gynecology	2
Embryology	1
Geriatrics	1
Hematology	1
Nephrology	1
Neurology	1
Pediatrics	1
Psychiatry	1
Pulmonology	1
Radiotherapy	1
Rehabilitation medicine	1
Urology	1
Total	86

Discussion

The aim of this study was i.) to explore the occurrence of direct interlocking directorates in health care, including their occurrence between organizations in the same market segment and geographical region, ii.) to test whether the occurrence of direct board interlocks between healthcare organizations has changed over time, and iii.) to investigate the interlocks between market entrants and incumbent healthcare organizations. Our results shed light on the structure of governance networks in the healthcare industry as a whole and between incumbent and entering specialized care organizations in particular. They make the following contributions to the health services research literature, relevant to policymakers and antitrust agencies.

Firstly, our results indicate that direct interlocking directorates are a common phenomenon in health care. They occur between roughly half of all the healthcare organizations in the Netherlands. Congruent with the evidence regarding the occurrence of indirect board

interlocks in other industries (e.g. 12, 23), prior research in the Dutch healthcare sector has indicated that 95% of the Dutch hospitals are connected through indirect interlocking directorates (38). Direct board interlocks are thus substantially less common than indirect board interlocks in health care. However, since they can be created inadvertently, indirect interlocks are considered less deliberate (12). Furthermore, direct interlocking directorates are perceived as the most influential type of board interlocks and their influence is considered to last several years (22, 55). Our findings hence suggest that approximately half of all health care organizations deliberately seek connections with other healthcare organizations. Even though we analyzed board interlocks based on annual reports at concern level (i.e. the most consolidated annual report), a portion of the direct interlocks in our dataset could still be formed between wholly or partially owned subsidiaries and their parent company. Yet, similar to forming board interlocks, forming (partial) ownership relations with other organizations also constitutes a form of cooptation (56). This hence supports the notion that healthcare organizations deliberately seek connections with other healthcare organizations.

Secondly, our research shows that direct interlocking directorates between healthcare organizations have become more prevalent over time. This increase in prevalence of board interlocks is congruent with the introduction of several reforms in Dutch health care, for example increasing price-competition and altering the product structure in specialized care (3, 39). This finding is congruent with existing literature which posits that board interlocks are a mechanism to manage environmental uncertainty (13-17). However, the increase in board interlocks is mainly observable at the organizational level and not at the level of individual board members. That is, on average individual board members hold the same number of positions in 2007 and 2012 and the maximum number of positions held by board members is even lower in 2012 than in 2007. Because board interlocks erode the attention of board members when used in excess (57), the Dutch healthcare governance code has maximized the number of board positions an individual can hold at five (47). Our results thus support the suggestion that organizations should effectively manage their board interlocks at the organizational level (58). Hence, a multilevel perspective towards board interlocks seems necessary in order to facilitate governance structures which adequately safeguard the societal aspect inherent to health care. That is, policymakers and researchers should not only consider the maximum number of board positions of individual board members but should also consider the interlocks of organizations as a whole.

Thirdly, the fact that direct interlocking directorates appear among organizations located in similar geographical regions as well as organizations active in similar segments of the healthcare industry could raise the anti-competitive concerns which have been dominant throughout the initial research regarding board interlocks (e.g. 12, 22, 23). This is particularly

true when considering that healthcare markets are highly local (59) and the fact that the healthcare governance code explicitly stipulates that interlocking directorates between competitors should be avoided (47). That is, more interlocks imply more inter-organizational influence and interdependency, making common and coordinated action more likely (60). However, while the healthcare industry requires strict anti-trust enforcement (61), the anti-competitive effect of interlocking directorates is not irrefutably supported by empirical evidence (62). Future research could study this mechanism in more detail in the health care industry in order to safeguard effective healthcare markets.

Fourthly, we find that several market entrants are linked to incumbent healthcare organizations, either in the form of ‘traditional’ direct interlocking directorates or through board members who are simultaneously active professionals in incumbent organizations. These results are in line with findings of the Dutch Health Authority regarding the relation between independent treatment centers and hospitals (63). They reveal that professionals are not merely shared between organizations in order to treat patients elsewhere, as studied by Westra, Angeli (54), but that they can also hold board positions in other organizations. While these ties do not constitute a ‘traditional’ board interlock between two boards, there is no reason to assume why these ties are incapable of facilitating the flow of information and strategic influence typically associated with board interlocks (in health care) (38, 64). Along this line, the Dutch healthcare governance code stipulates that: “A member of the inside board cannot hold a remunerated or voluntary position in another organization without consent of the outside board in case the combination of positions constitutes a more than minimal burden of work, or in any other way conflicts with the interests of the primary organization.” (47). Given the various ties of independent treatment centers’ board members, it is unclear whether they should indeed be perceived as independent competitors of incumbent organizations.

Limitations

The current work is not exempt from limitations. Our analysis is based on the annual reports submitted by healthcare organizations and the names of the board members reported therein. Given the freedom in reporting the board member names it is conceivable that some names have unjustly been considered as the same or a different person. However, we have prepared the data in a way which minimizes this effect. Furthermore, given the exploratory nature of our work, in which we were mainly interested in the occurrence and dispersion of interlocking directorate ties throughout the industry, any misspecifications should have only minor influences on our results. Lastly, our results regarding the ties

between market entrants and incumbent organizations are congruent with those of the Dutch Health Authority (63). This serves as an indication that the amount of misspecifications was minimal.

Conclusion

This study has explored the phenomenon of interlocking directorates in the healthcare industry based on a national dataset of healthcare organizations in the Netherlands. It finds that direct board interlocks are common in health care and increase over time, supporting the notion that interlocking directorates are a vehicle to manage environmental uncertainty. Interlocking directorates furthermore occur between organizations in similar market segments and geographical regions as well as between market entrants and incumbent organizations, causing the traditional concerns regarding anti-competitive effects of board interlocks to resurface. Lastly, governance policies are predominantly geared towards individual board members, while a multi-level approach seems more reflective of reality. More in-depth research regarding interlocking directorates in health care can enhance our understanding of these forms of inter-organizational cooperation in the sector, as it has done in various other industries.

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CHAPTER 4

Understanding specialist sharing: A mixed-method exploration in an increasingly price-competitive hospital market

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Abstract

Introduction: Medical specialists seem to increasingly work in- and be affiliated to- multiple organizations. We define this phenomenon as specialist sharing. This form of horizontal inter-organizational cooperation has received scant scholarly attention. We investigate the extent of- and motives behind- specialist sharing, in the price-competitive hospital market of the Netherlands.

Methods: A mixed-method approach has been adopted. Social network analysis was used to quantitatively examine the extent of the phenomenon. The affiliations of more than 15,000 medical specialists to any Dutch hospital were transformed into 27 inter-hospital networks, one for each medical specialty, in 2013 and in 2015. Between February 2014 and February 2016, 24 semi-structured interviews with 20 specialists from 13 medical specialties and four hospital executives were conducted to provide in-depth qualitative insights regarding the personal and organizational motives behind the phenomenon.

Results: Roughly 20% of all medical specialists are affiliated to multiple hospitals. The phenomenon occurs in all medical specialties and all Dutch hospitals share medical specialists. Rates of specialist sharing have increased significantly between 2013 and 2015 in 14 of the 27 specialties. Personal motives predominantly include learning, efficiency, and financial benefits. Increased workload and discontinuity of care are perceived as potential drawbacks. Hospitals possess the final authority to decide whether and which specialists are shared. Adhering to volume norms and strategic considerations are seen as their main drivers to share specialists.

Discussion: We conclude that specialist sharing should be interpreted as a form of inter-organizational cooperation between healthcare organizations, facilitating knowledge flow between them. Although quality improvement is an important perceived factor underpinning specialist sharing, evidence of enhanced quality of care is anecdotal. Additionally, the widespread occurrence of the phenomenon and the underlying strategic considerations could pose an antitrust infringement.

Introduction

In an attempt to contain rising healthcare expenditures, policy reforms have altered health care systems in many countries. One such policy intervention is the market based- or competitive reform (1), of which pros and cons have been debated by scholars and practitioners since the introduction of the concept of ‘managed competition’ by Enthoven (2). Such pro-competitive reforms have led to a series of strategic reactions by healthcare organizations and health insurance companies (3), one of which is horizontal integration. Research regarding this topic primarily focuses on mergers, which have been a focal point of antitrust cases across the globe (4-6). Despite well-documented market imperfections in the healthcare sector (7), antitrust scrutiny of horizontal integration is commonly justified by the economic perception that competition maximizes social welfare (4).

Looser forms of horizontal inter-organizational cooperation, in which organizations uphold their organizational autonomy, have received less academic attention however (8). Pioneering studies consider looser forms of horizontal cooperation through patient transfers (9-12). Mascia, Di Vincenzo (12) for example, found a positive association between inter-hospital (quality) competition and cooperation through patient transfers in Italy. Furthermore, Mascia, Angeli (11) highlight that central hospitals in well-structured patient referral networks display lower readmission rates, indicating an association between horizontal cooperation and increased quality of care, in line with previous research (13).

In this study we focus on a previously uninvestigated form of horizontal cooperation between healthcare organizations, namely sharing medical specialists (i.e. human resources). Consistent with the terminology of nascent research regarding patient sharing, we refer to this phenomenon as ‘specialist sharing’. We define a specialist as shared between two organizations when he or she is physically present in, and uses the resources of, both organizations to treat patients. A specialist who, for example, works a few days per week in hospital A and a few days per week in hospital B is considered shared. A specialist who works in hospital A and occasionally (e.g. once every two weeks) works in hospital B is also considered shared. However, A specialist who works in hospital A and is consulted by colleagues of hospital B (e.g. by mail, phone, or face to face) or to whom colleagues of hospital B refer patients is not considered shared because the specialist in question does not personally treat patients in hospital A and B.

Contrary to previous research, we investigate horizontal cooperation in an increasingly price competitive hospital market, namely in the Netherlands, where price-competition has become increasingly prevalent since its introduction in 2006 (14, 15). In the Netherlands

medical specialists are either tenured by a hospital or independent (i.e. self-employed entrepreneurs organized in per-specialty partnerships called ‘maatschappen’) and can join a hospital’s medical staff upon acceptance by incumbent specialists and hospital management (16). Sharing specialists has furthermore been identified as a form of horizontal cooperation which potentially undermines effective competition in this setting (17), due to the economic perception that the optimal form of competition occurs between independent players in a market (18). Subsequently, the Dutch government has explicitly discouraged these strategies in its most recent Coalition Agreement (19).

Although research suggests that Dutch hospital managers are “reluctant to share talented employees because of the competitive pressure they experience.” (20), anecdotal evidence suggests that sharing medical specialists has become increasingly common in the Netherlands, especially in the form of merging specialty partnerships. Yet, this form of horizontal cooperation and its implications for competitive dynamics in healthcare markets have remained ill-investigated. This study intends to fill this gap using a mixed-method approach aimed to i) explore the extent of specialist sharing in a price competitive healthcare sector and ii) assess the motives underpinning specialist sharing.

Methods

We used a mixed-method approach to examine the extent and interpretation of specialist sharing between hospitals in the Netherlands. A quantitative exploration based on social network analysis (SNA) measured the extent of the phenomenon in 2013 and 2015 after which we analyzed whether there were significant differences in the extent at both time points. To ensure correct interpretation of the quantitative findings we explored the motives behind these inter-organizational ties through semi-structured interviews with experts (i.e. medical specialists and executives of several hospitals) in the country. The project within which this study was conducted has been approved by the Maastricht University Medical Center ethics committee under application number 14-5-028, based on the fact that it is not subject to the Dutch ‘Medical Research Involving Human Subjects Act’.

Quantitative stage

Data

Quantitative exploration of the extent of specialist sharing was conducted using health insurance data of Vektis, the Dutch insurance companies’ center for information and standardization in health care. Specifically, we used the ‘*Algemeen Gegevensbeheer Code*’

(AGB-code) data, which is used to handle claims and analyze health consumption (21). Dutch health professionals and healthcare organizations are required to possess a unique AGB-code to bill their services. An AGB-code is granted when certain requirements are met. For example, specialists have to be listed in the country's medical (BIG) registry, whilst hospitals need to be registered with the chamber of commerce and possess governmental admission to the hospital market (21). Claims submitted without a valid combination of a personal and an organizational AGB-code are not reimbursed by health insurers (21). According to the reasoning of Smeets, de Wit (22), this serves as a strong incentive for professionals and organizations to keep the database up to date, making it an adequate source to quantitatively explore the occurrence of specialist sharing.

Sample

Our sample included all independent Dutch academic and non-academic hospitals, which are all private, non-profit organizations. Specialized hospitals and independent treatment centers were excluded due to their often narrow range of services (23). In 2013, 89 hospitals met the inclusion criteria, 8 academic- and 81 general hospitals. Between 2013 and 2015 several hospitals merged and altered their AGB-code. Hence, 83 hospitals were included in our sample in 2015. In both years we selected all medical specialists with an active affiliation to at least one of the included hospitals for 6 months or longer. 15,615 and 15,980 medical specialists were included in 2013 and 2015, respectively. The specialists were divided across 27 medical specialties. Although the database distinguished 30 medical specialties, we excluded 'nerve diseases' because it contained no active specialists, 'allergology' because specialists could no longer register as allergologist, and 'clinical chemistry' because the specialty could include chemists as well as medical doctors.

Data Analysis

Using social network analysis (SNA) we built 27 (i.e. one per medical specialty) networks of shared specialists between hospitals. In each network all hospitals to which at least one specialist of the respective specialty had an active affiliation were included. The affiliations between medical specialists and hospitals served as 2-mode edge lists (24) which were projected to weighted inter-hospital networks using the Statnet package (25) in R version 3.1.0 'Spring Dance'. Specialists were considered shared when they had an active affiliation to two or more hospitals, at which point the hospitals were connected in the network. The weight of their connection is relative to the number of specialists shared. For each network we calculated the density by dividing the sum of all tie values by the number of possible ties in the network (26). The 27 inter-organizational networks were visualized using Visone version 2.15 (27). To analyze differences in the occurrence of specialist sharing we compared the average per specialty ratio of shared to non-shared specialist in 2013 and 2015 using 27 t-tests (i.e. one per specialty).

Qualitative stage

Sample

In order to correctly interpret inter-organizational cooperation through specialist sharing, we conducted 24 semi-structured interviews with involved stakeholders between February 2014 and February 2016. We sampled respondents from four hospitals (i.e. 3 non-academic and 1 academic hospital) located throughout the Netherlands, ranging from less than 200 million Euro to more than 650 million Euro annual revenues and 1,642 FTE to over 4,500 FTE employees. Respondents were currently or had previously been affiliated to a total of twelve hospitals, one of which in another country. Using a form of snowball sampling we asked the CEO's of two hospitals to refer specialists within their organizations who could participate in the study (28). To avoid a sample based on strategic referrals by CEO's, we approached specialists and CEO's using a bottom-up strategy in the other two hospitals. Due to the exploratory nature of the study specialists were not required to currently be shared in order to be included. They were however required to have finished their residency.

We included twenty medical specialists from thirteen different specialties. Those ranged from small (i.e. clinical genetics) to large (i.e. internal medicine) in terms of number of specialists registered in the AGB-code database and from low per-hospital sharing rates in 2013 (i.e. clinical genetics, orthopedics, and gastroenterology) to high per-hospital rates in 2013 (i.e. general surgery and internal medicine). Male and female specialists with various levels of experience and contract types (i.e. tenured or independent) were furthermore included (see Table 4.1 for details). To understand the implications of specialist sharing, we enquired specialists about their personal motives to work in or refrain from working in multiple organizations (i.e. be shared), as well as their perception of the hospital's motives, and external drivers. Additionally, we asked four hospital executives (i.e. members of the executive board or senior management team) about the same topics as the medical specialists with the exception of their personal motives to work in multiple organizations. We did ask them about their perception of specialists' motives to work for multiple organizations.

Table 4.1

	Sex	Experience as specialist	Role	Medical specialty	Hospital type	Specialist Shared	Duration of interview
Executive 1	Male	Not applicable	Board Member	Not Applicable	Academic hospital	Not applicable	38 minutes
Executive 2	Female	Not applicable	Board Member	Not Applicable	Non-academic hospital	Not applicable	52 minutes
Executive 3	Male	Not applicable	Senior manager	Not Applicable	Non-academic hospital	Not applicable	35 minutes
Executive 4	Male	Not applicable	Board Member	Not Applicable	Non-academic hospital	Not applicable	40 minutes
Specialist 01	Male	5-10 years	Specialist	Cardiology	Academic hospital	Never shared	15 minutes
Specialist 02	Male	5-10 years	Specialist	Plastic surgery	Academic hospital	Currently shared	21 minutes
Specialist 03	Male	10-15 years	Specialist	Plastic surgery	Academic hospital	Currently shared	19 minutes
Specialist 04	Female	Unassigned	Specialist	Cardiology	Academic hospital	Currently shared	23 minutes
Specialist 05	Male	10-15 years	Specialist	Orthopedics	Academic hospital	Never shared	18 minutes
Specialist 06	Male	20+ years	Specialist	Ophthalmology	Academic hospital	Previously shared	23 minutes
Specialist 07	Female	5-10 years	Specialist	Ophthalmology	Academic hospital	Currently shared	24 minutes
Specialist 08	Male	0-5 years	Specialist	Plastic surgery	Academic hospital	Currently shared	25 minutes
Specialist 09	Female	20+ years	Specialist	Internal Medicine	Academic hospital	Currently shared	24 minutes
Specialist 10	Male	20+ years	Specialist	Clinical genetics	Academic hospital	Currently shared	28 minutes
Specialist 11	Male	20+ years	Specialist	General Surgery	Non-academic hospital	Currently shared	33 minutes
Specialist 12	Female	10-15 years	Specialist	Geriatrics	Non-academic hospital	Currently shared	35 minutes
Specialist 13	Male	10-15 years	Specialist	General Surgery	Non-academic hospital	Currently shared	44 minutes
Specialist 14	Male	0-5 years	Specialist	Gynecology	Non-academic hospital	Currently shared	30 minutes
Specialist 15	Male	20+ years	Specialist	Dermatology	Non-academic hospital	Previously shared	33 minutes
Specialist 16	Male	15-20 years	Specialist	Gastroenterology	Non-academic hospital	Never shared	28 minutes
Specialist 17	Male	20+ years	Specialist	General Surgery	Non-academic hospital	Previously shared	24 minutes
Specialist 18	Male	10-15 years	Specialist	Rehabilitation medicine	Non-academic hospital	Currently shared	36 minutes
Specialist 19	Male	20+ years	Specialist	Internal Medicine	Non-academic hospital	Never shared	21 minutes
Specialist 20	Male	15-20 years	Specialist	Urology	Non-academic hospital	Previously shared	52 minutes

Data Collection and Analysis

All interviews were conducted in the personal office of the respondent. They were on average 30 minutes long (with a standard deviation of 9 minutes) and were conducted by one of two researchers. Both researchers used the same general questions and interviews were held in Dutch or in English. All interviews were recorded with the permission of the interviewees, and transcribed verbatim. Two researchers independently analyzed the transcripts by using the Nvivo software package version 10 and applying an integrated approach of inductive and deductive coding to identify recurring themes (29). Data saturation had been reached, indicated by the fact that no new themes emerged from the final interviews. Differences were compared and discussed and findings were taken into consideration when consensus was reached between both researchers. Anonymity was guaranteed to all respondents and information traceable to a particular respondent is therefore not reported. Lastly, we triangulated the qualitative and quantitative data to ensure consistency between both sources.

Results

Occurrence of specialist sharing

Specialist level

Table 4.2 displays the number of specialists in each medical specialty and the average number of hospital affiliations in 2013 and 2015. On average, specialists had 1.22 hospital affiliations in 2013 versus 1.27 in 2015. In total 2,261 specialists are shared between hospitals in 2013 versus 3,138 in 2015. The greatest absolute increase in the number of shared specialists is in anesthesiology with an increase of 109 shared specialists. In rehabilitation medicine and radiotherapy the number of shared specialists decreased with 2 and 3 specialists, respectively. Relatively, the increase in shared specialists is greatest in geriatrics. 27 additional specialists, which constitute 12 percent of all geriatric specialists with an active hospital affiliation in 2015, were shared between 2013 and 2015 in that specialty. In both 2013 and 2015 neurosurgery displays the highest rate of specialist sharing. Respectively, 62 and 66 percent of the specialists are shared in that specialty (see Table 4.2).

Table 4.2

Specialty Code	Medical specialty	Specialists in AGB (2013)	Specialists affiliated to a hospital (2013)	Specialists shared (2013)	Average number of affiliations per specialist (2013)	Specialists in AGB (2015)	Specialists affiliated to a hospital (2015)	Specialists shared (2015)	Average number of affiliations per specialist (2015)
1	Ophthalmology	721	579	92	1.18	719	577	123	1.27
2	Ear Nose Throat	527	501	60	1.13	532	508	101	1.21
3	General Surgery	1277	1209	261	1.26	1297	1228	296	1.30
4	Plastic Surgery	309	270	109	1.51	330	290	137	1.62
5	Orthopaedics	711	634	73	1.12	736	646	97	1.16
6	Urology	443	424	86	1.22	444	428	116	1.31
7	Obstetrics and Gynaecology	1056	1017	142	1.15	1060	1013	223	1.24
8	Neurosurgery	154	151	94	1.99	157	153	101	2.06
10	Dermatology	538	448	70	1.18	563	469	105	1.26
13	Internal medicine	1918	1835	169	1.10	1972	1895	254	1.16
16	Paediatrics	1340	1280	152	1.13	1362	1296	222	1.19
18	Gastroenterology	423	417	54	1.14	466	456	96	1.26
20	Cardiology	963	921	107	1.13	1010	968	162	1.20
22	Pulmonology	594	545	73	1.14	602	557	106	1.21
24	Rheumatology	291	255	85	1.42	323	285	85	1.36
27	Rehabilitation medicine	531	280	53	1.23	559	294	51	1.23
28	Cardiopulmonary surgery	107	105	11	1.12	114	111	12	1.14
29	Psychiatry	3186	342	31	1.09	3496	359	47	1.14
30	Neurology	889	803	80	1.10	907	823	116	1.16
35	Geriatrics	221	199	31	1.19	245	225	58	1.34
61	Radiotherapy	258	184	24	1.14	267	179	21	1.12
62	Radiology	1078	1032	87	1.09	1052	1007	165	1.18
63	Nuclear Medicine	161	150	39	1.33	165	157	44	1.34
87	Microbiology	207	179	39	1.27	199	173	49	1.34
88	Pathology	366	325	93	1.38	363	324	96	1.40
89	Anaesthesiology	1509	1445	143	1.10	1533	1466	252	1.20
90	Clinical genetics	101	85	3	1.04	116	93	3	1.03
Total		19879	15615	2261		20589	15980	3138	
Average		736	578	84	1.22	763	592	116	1.27
Std. deviation		668	454	54	0.19	713	460	76	0.19

Specialty level

Table 4.3 displays the number of hospitals that share specialists per medical specialty. In 2015, specialist sharing is most common in internal medicine, neurosurgery, and anesthesiology in relative terms. 95% or more hospitals share specialists in these specialties. In absolute terms the phenomenon is most common in pediatrics, anesthesiology, and gynecology and obstetrics. 77 or more hospitals share specialists in these specialties. The phenomenon is least common in clinical genetics in which 45 percent of the hospitals share medical specialists in 2013 and 2015. Clinical genetics, radiology, and psychiatry are the only specialties in which less than half of all hospitals share specialists in 2015. Clinical genetics and radiology are offered by only a few hospitals while psychiatry is predominantly offered in specialized hospitals which were excluded from the analysis. At least 69 percent of the hospitals share specialists in all other medical specialties. An ANOVA reveals significant differences in the average rate of specialist sharing in hospitals across specialties (p -value < 0.01). Using a Bonferroni post-hoc correction, plastic surgery, neurosurgery, and rheumatology for example all have significantly higher rates of specialist sharing than most other specialties. The absolute and relative number of specialists shared by hospitals within each medical specialty furthermore differs over time. In 14 of the 27 specialties the average absolute number of specialists shared by hospitals increases significantly between 2013 and 2015. Increases in the percentage of specialists shared per hospital in each specialty are significant in a third of all medical specialties (see Table 4.3).

The various rates of specialist sharing in each specialty result in different network structures which are graphically represented in Figure 4.1. Each node in these networks represents a hospital and the size of the node is proportionate to the number of specialists in that specialty affiliated to the hospital. The nodes are shaped according to their type. Triangles represent academic hospitals and circles represent non-academic hospitals. Hospitals that merged between 2013 and 2015 are displayed using a square in the 2015 network. Thickness of the ties between the nodes is relative to the number of specialists shared between them. These network structures are (partially) represented in the measure of network density (see Table 4.3). The average network density of all specialties does not increase significantly between 2013 and 2015 (p -value = 0.142).

Table 4.3

Specialty Code	Medical specialty	Hospitals offering specialty (2013)	Hospitals Sharing (2013)	Percentage of hospitals sharing (2013)	Network density (2013)	Hospitals offering specialty (2015)	Hospitals Sharing (2015)	Percentage of hospitals sharing (2015)	Network density (2015)
1	Ophthalmology*	89	59	66%	1.51	83	62	75%†	2.26
2	Ear Nose Throat**	89	49	55%	1.00	83	61	73%**	1.85
3	General Surgery	89	77	87%	3.14	83	75	90%	4.35
4	Plastic Surgery†	79	62	78%	2.50	81	68	84%	2.93
5	Orthopedics	89	55	62%	1.10	83	62	75%†	1.76
6	Urology*	89	63	71%	1.35	83	67	81%	2.17
7	Obstetrics and Gynecology**	89	75	84%	2.58	83	77	93%**	4.06
8	Neurosurgery	76	74	97%	3.93	73	70	96%	3.81
10	Dermatology**	89	58	65%	1.63	83	64	77%†	2.50
13	Internal medicine**	89	81	91%	4.01	83	79	95%**	5.88
16	Pediatrics*	89	74	83%	2.78	83	77	93%**	4.47
18	Gastroenterology**	79	48	61%	1.49	79	58	73%**	2.37
20	Cardiology*	89	70	79%	2.37	83	71	86%†	3.50
22	Pulmonology**	89	57	64%	1.25	83	62	75%†	1.85
24	Rheumatology	82	65	79%	1.90	76	59	78%	2.18
27	Rehabilitation medicine	80	52	65%	1.58	76	56	74%	1.93
28	Cardiopulmonary surgery	18	14	78%	8.50	18	14	78%	9.15
29	Psychiatry	71	31	44%	0.93	68	33	49%	1.27
30	Neurology*	89	56	63%	1.33	83	66	80%	1.97
35	Geriatrics**	67	43	64%	1.63	71	56	79%**	2.45
61	Radiotherapy	89	59	66%	1.56	83	67	81%	2.76
62	Radiology**	27	17	63%	4.84	25	11	44%**	3.33
63	Nuclear Medicine	62	41	66%	1.85	59	41	69%	2.16
87	Microbiology	71	49	69%	1.53	66	46	70%	1.91
88	Pathology	68	53	78%	2.63	65	54	83%	2.79
89	Anesthesiology**	89	79	89%	2.89	83	79	95%**	4.61
90	Clinical genetics	11	5	45%	5.45	11	5	45%	5.45
Average		75	54		2.49	71	57		3.18
Std. Deviation		22	19		1.65	20	20		1.66
All Specialties combined		89	89	100%	22.63	83	83	100%	31.59

Figure 4.1: Inter-organizational networks of hospitals (nodes) sharing medical specialists (ties). Triangles represent academic hospitals, circles represent general hospitals.

First row: Ophthalmology, Ear Nose and Throat, General surgery, Plastic surgery, Orthopedics

Second row: Urology, Obstetrics and Gynecology, Neurosurgery, Dermatology, Internal medicine

Third row: Pediatrics, Gastroenterology, Cardiology, Pulmonology, Rheumatology

Fourth row: Rehabilitation medicine, Cardiopulmonary surgery, Psychiatry, Neurology, Geriatrics

Fifth row: Radiotherapy, Radiology, Nuclear medicine, Microbiology, Pathology

Sixth row: Anesthesiology, Clinical genetics.

Hospital level

All Dutch hospitals share specialists with another hospital. When combining all specialties offered by each hospital, every hospital shares at least 9 medical specialists in 2013 and at least 19 specialists in 2015. On average, a hospital shares 27 percent of all their specialists (i.e. 55 specialists) in 2013 and 35 percent (i.e. 83 specialists) in 2015. The absolute number and the percentage of specialists shared by Dutch hospitals both increase significantly between 2013 and 2015 (both p-values < 0.01 based on paired-sample t-test). The hospital level network is displayed in Figure 4.2. Triangles represent academic hospitals, circles represent non-academic hospitals, and squares represent merged hospitals between 2013 and 2015. Hospitals are furthermore placed according to their geographical location (yet arranged to enhance visibility) and ties are only displayed when at least five specialists are shared between hospitals.

Underlying motives of specialist sharing

All respondents in our qualitative enquiry were familiar with the concept of medical specialists working in multiple organizations. Although one executive said *“It’s not a major issue”* (Executive 3), twelve of the twenty medical specialists indicated that they currently work in more than one healthcare organization and four that they had previously worked for multiple organizations. Several types of specialist sharing arrangements, in terms of the amount and type of organizations involved, emerged from the interviews however. Of the respondents who currently work or had previously worked in multiple organizations, two specialists (had) work(ed) in three different organizations simultaneously. All others (had) work(ed) in two organizations. The most common form of being shared amongst our respondents was between two hospitals, although five respondents (had) work(ed) in a hospital and in another type of organization such as an independent treatment center or a specialized hospital.

Financial arrangements between the organizations sharing specialists also differed. Although in all cases, some sort of financial or contractual arrangement regarding the shared specialist was present. Hospitals investing in a partially owned subsidiary, merged specialist groups working in several hospitals, secondment of specialists, and specialists covering weekend shifts on a *‘quid pro quo’* basis were, amongst others, mentioned by our respondents as types of financial arrangements between organizations. One respondent for example said: *“Look, what we do in essence in case a specialist works there [in another organization] for a day we send a bill for a day’s work. If he does that for an entire year it’s 20% of his salary.”* (Executive 1). In line with our quantitative exploration, our qualitative analysis considers arrangements involving specialists who work in two or more hospitals.

Figure 4.2 Specialist sharing between hospitals in 2013 (top) and 2015 (bottom). Ties are relative to tie weight and displayed when at least 5 specialists are shared between the hospitals. Triangles represent academic hospitals, circles represent general hospitals. Squares represent hospitals that merged between 2013 and 2015. Nodes are placed according to their geographical location in the Netherlands.

Initiators of specialist sharing

The interviews revealed that specialist sharing can be initiated by a single specialist, by a group of specialists (i.e. a department or a specialty partnership), or by the executive board of a hospital. However, all respondents indicated that there was an important role for individual specialist or a group of specialists. One respondent replied by saying: *"I think this is mostly a personal choice"* (Specialist 10). Another explained:

"You cannot force people to work together. If it doesn't come from them [the specialists] then it will never be an ideal result. You can try to force them, you can monitor them, but it's like making a child eat, it's impossible. You can put it in his mouth but you cannot make him swallow." (Specialist 3).

However, two respondents described situations in which the initiative to share specialists was explicitly taken by the hospital. One of them mentioned: *"We were approached by the board [of another hospital] at that time. Whether we would be interested to talk about taking over the practice there."* (Specialist 20).

The initiators of the specialist sharing indicated several factors which drive them to engage in this behavior. These factors are summarized in Table 4.4.

Table 4.4 Main drivers underpinning specialist sharing at organizational and specialist level

Organizational motives	Specialists' motives
Adhering to volume requirements	Facilitating sub-specialization
Secure market share	Adhering to volume requirements
Monopolize markets	Improve quality of care
Raising entry barriers	Working in diverse settings
	Fulfilling 24/7 shift duties
	Financial benefits

Specialists' drivers to be shared

Specialists reported several personal motives and benefits of working in multiple organizations. The most frequently mentioned personal drivers were sub-specialization, efficiency, and personal financial gains. More than half of the respondents indicated that sub-specialization in a specific part of their medical field was one of the main drivers to work in multiple organizations. In order to keep up with the advancement in their respective fields, they felt the need to treat as many patients with a specific condition as possible. One specialist replied:

“I mean more and more what we see is staff members are going to specialize. That’s good on one side because you increase your level of competence and it’s bad because you tend to lose the overall view. But probably that’s the evolution and development we can’t stop because it’s also medicine itself which is getting more and more complex so nobody can see or do everything.” (Specialist 1).

Specialists perceived working in multiple organizations as a practical way to facilitate such specialization: *“In this way specialists can increase their expertise and I think that is the main reason why they do it. You need to see a certain volume of a certain disease and health care is becoming more and more specialized.” (Specialist 8).* In some cases this necessity was explicitly present for specialists in the form of volume requirements set by a medical association. As one specialist put it: *“As specialists, and in my specialty, surgery, it is perhaps most apparent, we are forced to deliver a certain level of quality 24/7. Increasingly we are forced to have separate degree’s or registrations for every little sub-part.” (Specialist 17).*

With the exception of one specialist who replied: *“No, I like it here but I have to fill the place there.” (Specialist 7),* specialists typically reported that they enjoyed the diversity of working in another hospital. They said things like: *“It helps to keep an open mind if you work at several places” (Specialist 8),* and:

“You hear how things work over there, how people do things differently and vice-versa. You look in each other’s protocols and you look at each other’s practical, logistic, and medical problems. I find that almost more thrilling than doing the actual work on the work floor.” (Specialist 14).

Experiencing these diverse environments also enabled specialists to transfer some of these new insights to their own organization which helped them increase efficiency in their own organization. One specialist said for example: *“In that sense you pick up a few things. How to get those on point.” (Specialist 13).* Independent specialists who worked in specialties which require 24/7 attendance of a specialist furthermore pointed out that working in shifts across multiple hospitals was particularly beneficial in terms of efficiency and sustainable employment: *“It’s the four of us and five of them. Together that makes nine so now we take shifts every ninth weekend and that is a real improvement.” (Specialist 20)*

However, respondents also pointed out downsides of working in multiple locations. Those included having to manage two separate workloads: *“You need to be good at both places. You need to be there, so that takes more than two times the effort, it’s two and a half.” (Specialist 2),* and not being able to see the patient throughout the entire process: *“You*

have to be careful that you don't just do the surgery and are not involved in the pre- and post- surgical care. That's unpleasant. You want to keep the entire span of patient contact." (Specialist 11). Despite these potential downsides, some specialists indicated that they perceived specialist sharing to enhance quality and convenience of care for patients, which served as an important driver for them to engage in such behavior: *"The thing driving it is the wish to provide the best care for patients."* (Specialist 10) and: *"It enables patients to receive specialized treatment close to home"* (Specialist 14). Although several specialists do highlight that: *"It depends on the specialty whether it [working in multiple organizations] makes sense"* (Specialist 14). Other respondents indicated that the benefit for patients is not straightforward either: *"Perhaps it's nice for the patient if their specialist assists during the surgery in another hospital. But whether it's essential? I don't know."* (Executive 4).

Lastly, some respondents indicate that working in multiple organizations can be driven by financial motives. Tenured specialists in an academic hospital predominantly mentioned being able to make more money outside academia: *"The people I know do it for personal reasons, to earn more money."* (Specialist 9) whereas for independent specialists it served as a way to increase clientele and to protect their fiscal status of entrepreneur: *"The specialists' agenda to cooperate is more complex than just quality considerations. It's also their status as entrepreneurs."* (Executive 4)

Organizational motives

None of the specialists perceived working for multiple organizations as a fully autonomous decision. One specialist replied by saying: *"It is of course not a 100% autonomous decision."* (Specialist 16). Instead, the final decision to share a specialist lies with the hospital board, which is illustrated by responses such as: *"I need approval to do something in another hospital. Formally for sure"* (Specialist 11) and: *"A specialist has to bring it before the board and the board will assess whether it is a potential problem. If it's a problem it will not happen."* (Specialist 19). One specialist recalled a situation in which the hospital board forbade a specialty partnership to merge with the specialty partnership of another hospital:

"The reason it [the merge] did not happen was because of the hospital board. [...] The day we would sign the agreement on Monday evening, the executive board sent a messenger to all the specialists who weren't present because they had a compensation day for the weekend, on Monday morning with the decree not to sign the agreement." (Specialist 13).

The executives reiterated their formal position towards the specialists, mentioning: *"I think we would forbid it if a specialist said 'I am going to do that in another hospital one day per week'. If we didn't want that to happen."* (Executive 2) as well as: *"In fact, you actually*

need approval to do so [work in another hospital], so that happens only occasionally. Except for when there is an incentive for the hospital to do so.” (Executive 3). Furthermore, the independent specialists and their respective executives point out that the recent introduction of formal ‘specialist enterprises’ within the hospital (i.e. ‘medisch specialistisch bedrijf’) introduced an extra decision-making layer. One specialist said for example: *“The specialist enterprise says; “Executive board? We have to agree first.”” (Specialist 20).*

Specialist sharing thus occurs when the interests of specialists and the executive board are aligned. In the words of one respondent: *“I believe that at the end of the day, in a good hospital, the interests of the executive board and of the specialists are exactly the same; delivering good, efficient, effective health care.” (Specialist 17).* Respondents pointed out several motives a hospital can have to share specialists with another hospital. These include external drivers as well as strategic considerations. The former mostly involves volume requirements which health insurers have introduced for specific treatments as a pre-condition for hospitals to be eligible for a contract. Both specialists and executives indicate that these requirements are a strong driver to share medical specialists. They mention for example: *“The health insurer once doubled the volume requirement of the professional medical association. They just said; “you have to do 100 procedures a year.” Nobody knows where the number comes from.” (Specialist 17).* However, one specialist pointed out that specialist sharing does not necessarily facilitate meeting the volume requirements:

“It’s about the total package, the system. [...] A hospital asked THE surgeon in the country, who does it hundreds of times per year, to perform surgeries in their hospital. But the health insurer didn’t allow them to perform the procedure because they didn’t do enough. They said it doesn’t count, it’s the hospital that counts.” (Specialist 20)

Lastly, the respondents mentioned several strategic considerations a hospital might have to share medical specialists. For example, respondents indicated that specialist sharing was used to secure market share by ensuring the flow of specific patients towards the hospital: *“Referring patients to this hospital is ensured by having our own specialists in the other hospital.” (Specialist 6).* Monopolizing certain markets, diminishing competition, and raising entry barriers were also organizational motives pointed out by some respondents who said for example: *“We had come to an agreement with another hospital where we give them procedure A and B and they send us procedure C.” (Executive 2)* or: *“It diminishes competition because if you have an agreement with someone else then you don’t compete anymore.” (Specialist 3)* and: *“If we do that we make each other stronger and it’s less likely that a new treatment center will open in our market. So it’s also to protect our own work.” (Specialist 15).*

Discussion and Conclusion

The aim of our study was to investigate the extent of- and motives behind- specialist sharing, in the price-competitive hospital market of the Netherlands. All Dutch hospitals share specialists and the phenomenon occurs in all medical specialties. In roughly half of all specialties it has furthermore increased significantly between 2013 and 2015. Reasons for specialists to work in multiple organizations include learning, efficiency, and financial benefits but increased workload and discontinuity of care form potential drawbacks. Adhering to volume norms and strategic considerations are seen as hospitals' main drivers to share specialists.

The qualitative expert opinions and quantitative evidence did not always provide a congruent answer regarding the differences in- and extent of- the phenomenon per specialty. A specialist in internal medicine mentioned for example: *"My specialty does not lend itself for working in multiple organizations."* (Specialist 19). However, our quantitative results show that internal medicine is the specialty in which most hospitals share specialists. The discrepancy could be explained by the fact that several sub-specializations exist within internal medicine, but additional research is needed to disentangle these differences. We can nonetheless conclude that specialist sharing is a common phenomenon. Our quantitative evidence reveals that it occurs in every medical specialty and that every Dutch hospital shares multiple specialists with other hospitals. Although one respondent in our qualitative enquiry said: *"In this specialty we don't do that"* (Specialist 5), the widespread occurrence of the phenomenon is generally supported by our qualitative findings. All respondents indicated that they were familiar with it through personal experience or through that of a colleague. Our qualitative evidence furthermore indicates that the phenomenon extends beyond sharing between hospitals which offers avenues for future research.

Secondly, we set out to uncover the motives behind specialist sharing. Our qualitative findings highlight several motives at personal and organizational level along with different initiators and financial and practical arrangements of the phenomenon. In line with Scholten and Van der Grinten (30) we find that the final authority regarding decisions to share specialists lies with the executive board of a hospital. Such formal power suggests that organizational strategies drive the phenomenon but, with a few exceptions, specialists report having a strong involvement in the emergence of the phenomenon. Nonetheless, our results show that the personal motives to work for multiple employers and organizational motives to share specialists do not deviate to a great extent. Both groups of respondents furthermore identify the phenomenon as a form of cooperation through which knowledge flows from one organization to the next. Hence, we conclude that specialist sharing should

be interpreted as a form of inter-organizational cooperation which predominantly emerges as a bottom-up strategy requiring approval by hospital boards.

Lastly, we investigated specialist sharing within the price-competitive Dutch specialized care market. As Varkevisser, van der Geest (17) describe, the phenomenon leads insurance companies to negotiate for services which, at the back-end, are performed by the same specialist(s), which potentially frustrates effective competition. Enthoven (2) underlines this tension when he writes: “I believe the most effective competition occurs [...] with each doctor fully committed to one organization.” (2). The fact that our quantitative results indicate a significant increase in the phenomenon over time, congruent with increasing competitive pressure in the specialized care market is therefore a notable finding. Especially since our qualitative results indicate that although the phenomenon is largely quality-driven, it can also serve anti-competitive strategies. These findings are in line with those of Gaynor and Haas-Wilson (31) who point out that consolidation can be an efficient response to external factors as well as an anti-competitive strategy.

Although our respondents mention several points highlighted by previous research, such as scale economies, knowledge exchange, sub-specialization, and efficiency (32, 33), as drivers of specialist sharing, several respondents expressed doubts as to their achievability. While initial research posited that learning effects occur with increasing volumes (34), the association has not gone uncontested (35). Additionally, Huckman and Pisano (36) as well as Westert, Nieboer (37) indicate that the performance of surgeons is non-transferable across organizational boundaries. Regardless of the presence of anti-competitive intent, the establishment of specialist sharing as an emergent form of inter-organizational cooperation and ambiguity regarding its effect on quality beckon the question whether it bears anti-competitive effects (38). Further research is needed to discern whether specialist sharing constitutes an antitrust infringement in competitive healthcare markets.

Our work is subject to some limitations. First and foremost, possessing an AGB-code is not obligatory for medical specialists. Hence, the database could underestimate the actual number of medical specialists. However, a recent report concerning the match between the Dutch medical registry (i.e. BIG registry) and the AGB-database revealed that only in 0.5% of all cases the AGB records lacked a BIG number, indicating that the overlap between both sources is high. From 2013 onwards, the billing procedure in the hospital sector has furthermore been scrutinized, increasing specialists’ necessity to possess an AGB-code. Additionally, triangulation of our qualitative and quantitative data revealed large overlap of both methodologies. We identified three discrepancies: in two cases the specialist self-reported being shared between hospitals but the database did not support this claim and

one case vice-versa. Furthermore, specialists who reported that they were being shared in a manner which does not generate revenues for the receiving hospital, such as those covering weekend shifts, were not identified as shared in the AGB-database. Therefore, our quantitative analysis should be considered a conservative estimate of the phenomenon.

Lastly, generalizability of these findings depends on rules and regulations in other countries. In some countries being affiliated to multiple hospitals is forbidden by law and international comparison is therefore a point for future research. While our database did not enable us to quantitatively assess the extent of cross-border specialist sharing, one of our respondents indicated that he was shared between a Dutch and a non-Dutch hospital highlighting that the phenomenon is not limited to the Netherlands.

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CHAPTER 5

Studying patient referral networks in oncological care: A next step in centralization

Submitted

Abstract

Background: Based on the volume-outcome relationship, centralizing certain treatments in selected organizations has the potential to save lives. Centralization can be achieved by planning which organizations should refer patients to one another. However, patient referral networks have rarely been empirically studied in oncology. Neither has the overlap between planned referral networks and referral networks which exist in practice.

Methods: The Dutch national database of insurance claims, containing 63 million specialized care claims between 2008 until 2011, was used to analyze the structure of referral network of patients with prevalent cancer types (i.e. breast, colon, and prostate) and rare cancer types (i.e. pancreatic, esophageal, and cervical). Their correspondence to planned network structures in Dutch oncological care was tested using regression analysis based on the Quadratic Assignment Procedure.

Findings: Depending on the cancer type, between 9% and 42% of the patients are referred at least once. One-third to half of these patients is eventually referred back to their original hospital. Referral networks of prevalent cancer types are denser and more centralized than those of rare cancer types. Furthermore, the structure of observed referral networks varies considerably from their planned counterpart.

Interpretation: Patient referrals are highly common in oncological care, making adequately structuring patient referral networks imperative to efficient oncological care. Given the deviation between planned and observed referral networks however, merely formalizing desired network structures is unlikely to greatly improve oncological care. Policymakers and practitioners should instead consider the condition-specific characteristics of existing referral networks, incentivize specific referral directions, and monitor organizations' adherence to formalized referral networks.

Introduction

During the past four decades, research has indicated a positive association between hospital volume and treatment outcomes in various conditions, even after correcting for case mix (1, 2). Consequently, centralizing certain treatments, for example by imposing minimum volume requirements, can prevent thousands of deaths per year (3, 4) by avoiding mismatches between patient needs and hospital capacities (5, 6). Centralizing treatment in specific centers requires patients to be transferred (i.e. referred) to selected organizations in so-called ‘hub-and-spoke’ networks (7). Although transferring patients requires considerable degrees of cooperation and resource investment of healthcare organizations (8), healthcare networks operate more efficiently when centralized around one (or a few) organization(s) (9, 10).

The rationale to centralize care is strong and as a result, patient transfer networks have been increasingly studied during the past decade (10-12). While some studies show that patients are indeed referred to better hospitals (5, 13), others indicate that patients are not always referred to the best hospital (10, 14). Despite patients’ desire to be transferred to hospitals which they consider of higher quality (15), selecting a transfer destination is predominantly driven by organizational rather than patient incentives (16). In fact, hospitals typically refer their patients to several other hospitals (5), making the downsides of patient transfers, such as increased access barriers, time to treatment, and costs (11, 17), more likely.

This paper has two aims. Firstly, it studies the structure of patient referral networks in oncological care. Cancer is one of the most deadly and costly conditions (18, 19), organizations which treat more cancer patients are involved in more patient referrals (20), and centralizing care is a prominent topic in oncology (17). Nonetheless, most empirical patient transfer studies are conducted in inpatient populations such as intensive care patients. Secondly, this paper examines the extent to which planned patient referral networks resemble referral patterns which exist in practice. Standardizing which organizations should refer patients to which other, higher quality, organizations in formalized referral-network structures is a logical approach towards preventing mismatches between patient needs and hospital capacities (6). Essentially, such planned network structures aim to alter existing referral routines of organizations. Their effectiveness thus depends on implementing collective action of healthcare organizations, which requires investments beyond mere mutual agreement on its potential benefits (21). Considerable deviations between planned referral networks and existing referral patterns therefore render them less easy to be implemented.

Methods

Setting

Our study was conducted in the Netherlands where cancer constitutes the leading cause of death and a growing number of people are diagnosed with the disease (22). Approximately 90 hospitals offer cancer treatment in the Netherlands and survival rates are around the European average (23, 24). Centralizing the treatment of specific cancer types has been on the agenda in the country since 1993 (25). In 2013, eight leading stakeholders in Dutch oncological care, representing primary, secondary, and tertiary care organizations as well as the federation of cancer patient organizations, furthermore initiated the formation of collaborative networks between Dutch hospitals to treat cancer patients (26).

Data and Sample

Existing patient transfers were observed from routinely collected insurance claims data, in line with prior patient transfer studies (5, 10, 13). Our dataset, supplied by the Dutch information center for healthcare (Vektis), included all (i.e. over 63 million) specialized care insurance claims between January 1st 2008 and December 31st 2011. During these years, claims for Dutch specialized care services were based on a homegrown DRG-like structure called ‘Diagnose Behandel Combinatie (DBC)’ (27). DBCs indicate the medical specialty, diagnosis, nature (i.e. initial or follow-up), and type (e.g. surgical, conservative, inpatient, or outpatient) of care delivered to patients. In 2012, the DBC structure was revised to ‘DBC’s Op weg naar Transparantie (DOT)’, making the pre- and post-2012 claims structure incomparable.

We identified all DBCs associated with the treatment process of three relatively prevalent cancer types (i.e. breast-, colon-, and prostate cancer) and three relatively rare cancer types (i.e. cervical-, pancreatic-, and esophageal cancer) in the Netherlands (24) (see Table 5.1 for a specification of the included DBCs). DBCs associated with radiotherapy were excluded due to the limited number of organizations offering radiotherapy in the country. Next, we sought to extract newly diagnosed patients by selecting patients for whom an ‘initial’ (i.e. non-follow-up) DBC was claimed for one of the cancer types in 2009 or 2010 but no relevant DBC was claimed in 2008. For these patients we then selected the first initial DBC and all subsequent DBCs claimed by hospitals for each cancer type. No new patients were included in 2011 in order to allow for a one year follow-up period. Claims with a missing patient identification number or missing organizational identification number were disregarded. Ultimately, our sample included 35,386 breast cancer patients, 31,729 colon cancer patients, 21,921 prostate cancer patients, 7,290 pancreatic cancer patients, 5,757 esophageal cancer patients, and 1,180 cervical cancer patients.

The structure of the planned (i.e. formalized) networks was based on the description of the desired network structure published by the eight stakeholders in Dutch oncological care. The stakeholders state that ‘Academic medical centers and the national cancer institute are expected to fulfil a initiating and coordinating role, amongst others in terms of research and innovation’ in these networks (26). Furthermore, they distinguish between cooperation for prevalent and rare types of cancer by arguing; ‘for prevalent forms of cancer the focus will be on the regional networks, while for rare forms it will be on national level’ (26).

Analysis

The referral network of each cancer type was analyzed separately. For the existing referral networks, we used the unique patient identification number and organizational identification number to construct so-called two-mode patient-to-organization networks. These were transposed to one-mode networks of patient transfers between organizations (see Landon et al. (12) for a schematic representation of this process). Patients were considered transferred from organization A to organization B whenever organization B claimed a DBC within a year of the date on which organization A claimed a DBC for the same cancer type, without distinguishing between- and within- specialty referrals (13). Existing patient referral networks hence reflected so-called ‘total patient-sharing (TPS)’ networks, in which patients are considered transferred when they are discharged by one organization and admitted to another on the same day, as well as when they have an intervening period without being admitted (20). TPS networks more adequately capture all referrals between hospitals than networks which only consider same-day transfers (20).

Concerning the planned network structures, we constructed one planned referral network at regional and nine at national level. The planned regional networks consisted of ties from each non-academic hospital to the nearest academic hospital (the national cancer institute was also considered an academic hospital) and back. The nearest academic hospital was identified through geocoding based on the postal code of the visiting address of each hospital in SAS for Microsoft Windows. The planned referral networks at national level consisted of ties from each organization to one of the nine academic hospitals. Because the academic hospital designated to receive referrals at national level is not explicitly appointed by the oncological stakeholders and can thus vary based on the cancer type, nine national referral networks were constructed, each with an alternative academic hospital as designated referral organization.

In line with previous research, the referral networks were analyzed using social network analysis (12, 13, 20). We used visual representation as well as quantitative analysis. We visualized the referral networks in so-called sociograms using the Visone software package

version 2.8 (28). Nodes, which represent hospitals, were positioned according to the spring embedder layout algorithm and their size was proportionate to the number of patients for whom the organization claimed DBCs. Academic hospitals (including the national cancer institute) were shaped as triangles and non-academic hospitals as circles. In the existing referral networks of prevalent cancer types, referral relations (i.e. ties) are only displayed when 10 or more patients are referred between two hospitals. In the existing referral networks of rare cancer types, ties are displayed when five or more patients are referred between hospitals. The width of the ties is furthermore proportionate to the number of patients referred between the organizations. The sociograms of the planned networks are similar across all tumor types and hence only displayed once.

The quantitative analysis consisted of calculating several network metrics for each observed and planned referral network using the *sna*-package in R. We used all ties (i.e. including those below the visualization threshold) during the quantitative analyses. These metrics included the degree to which the referral network was centralized around one organization (i.e. centralization), the percentage of all possible ties formed by organizations in the network (i.e. network density), the number of reciprocated (i.e. going from A to B as well as from B to A) ties in the network (i.e. reciprocity), and the percentage of transitive triplets (i.e. when existing ties go from A to B and from B to C, a tie will be formed from A to C) in the network (i.e. transitivity) (29). Lastly, we used a regression analysis to test the degree to which the nine planned referral networks at national level and the planned referral network at regional level correlate with existing referral networks. The regressions were based on the Quadratic Assignment Procedure (QAP) in order to account for the interdependence of observations inherent to network data (30), were conducted using the *sna*-package in R, and used 1,000 repetitions.

Table 5.1 Specification of included DBC codes per tumor type

Medical specialty	Diagnosis description of DBC	DBC type	Cancer type					
			Breast	Colon	Prostate	Pancreas	Esophagus	Cervix
Initial DBCs								
General surgery	Malign neoplasm Mamma	Initial	X					
Internal medicine	Malignancy Mamma	Initial	X					
General surgery	Malign neoplasm Colon (excluding sigmoid/rectum)	Initial		X				
General surgery	Malign neoplasm recto-sigmoid connection	Initial		X				
General surgery	Malign neoplasm rectum	Initial		X				
Internal medicine	Malign colorectal	Initial		X				
Gastroenterology	Colorectal malignancy	Initial		X				
Urology	Prostate carcinoma	Initial			X			
Internal medicine	Malignancy Prostate	Initial			X			
General surgery	Malign neoplasm pancreas / bile duct	Initial						
Internal medicine	Malignancy pancreas	Initial				X		
Gastroenterology	Pancreatic neoplasm	Initial				X		
General surgery	Malign neoplasm esophagus	Initial						X
Internal medicine	Malignancy esophagus/Cardia	Initial						X
Gastroenterology	Esophagus/Cardia malignancy	Initial					X	
Gynecology	Malignancy Cervix	Initial						X
Internal medicine	Malignancy Cervix	Initial						X
Follow-up DBCs								
Plastic surgery	Mamma reconstruction	All	X					
Orthopedics	bone metastases	All	X	X	X	X	X	X
Gynecology	Mamma pathology	All	X					
Neurosurgery	Neoplasms	All	X	X	X	X	X	X
Gastroenterology	non-GE oncology	All	X		X			X
Pulmonology	Metastases of process elsewhere	All	X	X	X	X	X	X
Psychiatry	Psychiatric disorder due to somatic condition	All	X	X	X	X	X	X
Neurology	Neuro-oncology	All	X	X	X	X	X	X
Clinical geriatrics	Neoplasms	All	X	X	X	X	X	X
Radiology	Mamma	All	X					
Radiology	Prostate and seminal vesicle	All			X			
Radiology	Colon	All		X				
Radiology	Esophagus	All					X	
Radiology	Pancreas	All				X		
Radiology	Ovarium	All						X
Anesthesiology	Pain due to malignancy	All	X	X	X	X	X	X

Results

Table 5.2 describes the patient population in each of the cancer types. Patients are, on average, between 53 years of age for cervical cancer and 71 years of age for prostate cancer. Between two-and-a-half and four DBCs, excluding those for radiotherapy, are claimed for an average patient in each cancer type. Between 9% and 23% of the patients suffering from prevalent cancer types are referred at least once during their treatment. For roughly half of all referred patients in breast-and colon cancer, the first referral is to the surgery department (in another hospital). Similarly, roughly half of the patients who are referred at least once for prevalent cancer types are referred back to their original organization at some point during their treatment process. Conversely, between 24% and 42% of all patients suffering from rare cancer types are referred at least once. Approximately half of the referred patients in pancreatic cancer and roughly a third of the referred patients in esophageal cancer are initially referred to the surgery department (in another hospital). Around one third of the referred patients for rare cancer types are eventually referred back to their original organization.

Figure 5.1 displays the sociograms of the existing and planned patient referral networks for each cancer type. The visualizations reveal that in each cancer type there was at least one hospital which did not meet the threshold of referring at least 10 (or five) patients to other hospitals, indicated by the separate nodes at the bottom of each network. Conversely, some hospitals refer at least 10 (or five) patients to multiple other hospitals. The sociograms of the referral networks of colon-, pancreatic-, and esophageal cancer furthermore indicate that hub (i.e. central) positions are generally not exclusive to academic hospitals but are also held by non-academic hospitals. The structure of the observed networks furthermore varies considerably between- as well as within- prevalent and rare cancer types. The sharpest contrast is observable between the observed referral network of breast-, and cervical cancer. The former appears to be centralized around one particular academic hospital, corresponding to the planned network at national level. The latter appears to be centralized around several academic hospitals, most closely resembling the planned referral network at the regional level.

Table 5.2 Patient level descriptive statistics

	N	Mean	Std Dev	Amount
Breast cancer	Age of patient	35,386	62.13	13.82
	DBC's claimed per patient	35,386	4.20	2.17
	Organizations visited by patient	35,386	1.10	0.33
	Patients referred at least once (%)	35,386		3,152 (8.91%)
	Initial referral to surgery (%)	35,386		1,433 (4.05%)
	Patients referred back to original organization (%)	35,386		1,660 (4.69%)
Colon cancer	Age of patient	31,729	70.05	11.86
	DBC's claimed per patient	31,729	3.54	2.16
	Organizations visited by patient	31,729	1.12	0.36
	Patients referred at least once (%)	31,729		3,390 (10.68%)
	Initial referral to surgery (%)	31,729		1,674 (5.28%)
	Patients referred back to original organization (%)	31,729		1,664 (5.24%)
Prostate cancer	Age of patient	21,921	71.15	9.13
	DBC's claimed per patient	21,921	3.11	1.54
	Organizations visited by patient	21,921	1.25	0.48
	Patients referred at least once (%)	21,921		4,965 (22.65%)
	Initial referral to surgery (%)			
	Patients referred back to original organization (%)	21,921		2,577 (11.76%)
Pancreatic cancer	Age of patient	7,290	67.80	13.00
	DBC's claimed per patient	7,290	2.48	1.78
	Organizations visited by patient	7,290	1.28	0.52
	Patients referred at least once (%)	7,290		1731 (23.74%)
	Initial referral to surgery (%)	7,290		733 (10.05%)
	Patients referred back to original organization (%)	7,290		643 (8.82%)
Esophageal cancer	Age of patient	5,757	68.01	11.44
	DBC's claimed per patient	5,757	3.44	2.24
	Organizations visited by patient	5,757	1.41	0.59
	Patients referred at least once (%)	5,757		2,042 (35.47%)
	Initial referral to surgery (%)	5,757		782 (13.58%)
	Patients referred back to original organization (%)	5,757		779 (13.53%)
Cervical cancer	Age of patient	1,810	53.47	16.02
	DBC's claimed per patient	1,810	3.17	1.85
	Organizations visited by patient	1,810	1.51	0.62
	Patients referred at least once (%)	1,810		769 (42.49%)
	Initial referral to surgery (%)			
	Patients referred back to original organization (%)	1,810		273 (15.08%)

Figure 5.1 Visual representation of observed and planned patient referral networks

Table 5.3 presents the descriptive statistics of the observed and planned referral networks and underlines the visual observation of the sociograms. That is, the breast cancer network is most centralized (i.e. around one organization) and the cervical cancer network is least centralized. Overall, the observed referral networks of prevalent cancer types are more centralized than those of rare cancer types, contradicting the planned referral networks. That is, the planned referral network of rare cancer types is centralized around one organization (i.e. a centralization score of 0.99), whereas the planned referral network of prevalent cancer types has various central organizations, leading to lower centralization scores (i.e. 0.18). The observed referral networks of prevalent cancer types are furthermore denser and more transitive than those of rare cancer types, indicating that hospitals tend to refer patients suffering from prevalent cancer types to a broader range of other hospitals than those suffering from rare cancer types. Lastly, reciprocity is close to one in all observed referral networks which implies that when a hospital (A) refers patients to another hospital (B), in almost all cases the receiving hospital (B) also refers (other) patients to the sending hospital (A).

Table 5.3 Network level descriptive statistics

	Observed referral networks						Planned referral networks	
	Breast cancer	Colon cancer	Prostate cancer	Pancreatic cancer	Esophageal cancer	Cervical cancer	Regional level	National level
Centralization	0.85	0.75	0.70	0.72	0.50	0.26	0.18	0.99
Density	0.14	0.15	0.15	0.07	0.08	0.04	0.02	0.02
Reciprocity	0.95	0.93	0.93	0.97	0.96	0.98	1.00	1.00
Transitivity	0.29	0.31	0.32	0.18	0.22	0.16	0.00	0.00

Table 5.4 reveals the results of the QAP regression analysis. The planned referral networks at the regional and the national levels explain roughly a quarter of the variance in the observed referral networks in prevalent cancer types versus a third of the variance in rare cancer types, indicated by the adjusted R-squared of around 0.25 and over 0.30, respectively. The planned referral network at regional level, as well as three of the planned referral networks at national level (i.e. number 4, 7, and 9), significantly predict the observed referral networks of all cancer types. The other six versions of the planned referral networks at national level explain the observed networks to various degrees across the six tumor types. The planned network at national level, specifically scenario 9, is the strongest predictor of the referral network of each of the prevalent cancer types. Conversely, the strongest predictor of the referral network of each of the rare cancer types is the planned referral network at regional level.

Table 5.4 QAP network regression results

	Breast cancer	Colon cancer	Prostate cancer	Pancreatic cancer	Esophageal cancer	Cervical cancer
Intercept	0.086**	0.087**	0.100*	0.028†	0.027	0.002
Regional	0.625***	0.638***	0.547***	0.576***	0.589***	0.583***
National 1	0.014	0.068	0.000	0.067*	0.063†	0.092*
National 2	0.069	0.167*	0.391***	0.012	0.058†	0.093*
National 3	0.184**	0.335*	0.042	0.144**	0.214**	0.085*
National 4	0.197**	0.292*	0.269*	0.104*	0.169**	0.068*
National 5	0.063	0.310*	0.135†	0.717**	0.490**	0.192**
National 6	0.058	0.085†	0.099†	0.045†	0.070*	0.155**
National 7	0.339**	0.269**	0.256†	0.321**	0.311***	0.138**
National 8	0.156**	0.043	0.055	0.018	0.016	0.084*
National 9	0.799**	0.691***	0.608***	0.081*	0.437**	0.112**
adj R-squared	0.251	0.244	0.189	0.334	0.315	0.320

† p-value < 0.10

* p-value < 0.05

** p-value < 0.01

*** p-value < 0.001

Discussion

This study had two aims. The first was to study the structure of patient referral networks in oncology. The second was to study the extent to which planned referral networks resemble observed referral networks. Although cancer is among the most expensive conditions and leading causes of death in many countries (18, 19) and there have been several calls to centralize oncological care (17), to the best of our knowledge, referral networks of cancer patients have not previously been studied empirically. Our findings offer several contributions for researchers, policymakers, and practitioners.

Firstly, our results reveal that between 9% and 42% of oncological patients are referred at least once during their treatment, depending on the cancer type. Patient referrals thus appear more common in oncology than in critical care, where approximately 5% of the patients are (directly) transferred (5). Our results hence seem to support findings of previous research that treating cancer patients increases the likelihood that an organization is involved in referrals and that TPS networks are more connected than direct patient transfer networks (20). Additionally, our study shows that, depending on the cancer type, 36% to 53% of the referred patients are eventually referred back to their original organization. Furthermore, at network level, almost all ties are reciprocated. The relatively

high prevalence of patient referrals in oncology suggests that adequately structuring referral networks can be beneficial. However, given their relatively high occurrence, these should also consider referrals back to a patient's original organization.

Secondly, we find that the structure of existing referral networks differs across tumor types. Our results reveal that hospitals have more referral partners (i.e. other hospitals) for patients with prevalent cancer types than for patients with rare cancer types for example. Furthermore, non-academic hospitals hold a relatively central position in the observed referral network of some cancer types, while they do not in others. Lastly, the extent to which existing referral networks are centralized around one single hospital varies greatly across the six cancer types. The referral network of prevalent cancer types are more centralized than those of rare cancer types, which contradicts the proposed structure of the planned referral networks. These findings all indicate that existing referral networks have developed into condition-specific structures. Consequently, stakeholders should not overlook these distinctions when seeking to implement planned referral networks.

Thirdly, the results of the quantitative analysis reveal a considerable discrepancy between the structure of the planned and observed referral networks. The statistical models explain a considerable amount of the variance in observed referral networks. However, the referral networks of prevalent cancer types are highly centralized and the strongest predictor of referral patterns in all three prevalent cancer types is a national network. Similarly, the referral networks of rare cancer types are best predicted by the regional referral structure. Both findings conflict with the suggestion put forth by the stakeholders in Dutch oncological care. The relatively regionally-oriented referral structure and high percentage of referred patients in rare cancer types could indicate that non-academic hospitals tend to refer these patients to the nearest academic hospitals more quickly. Conversely, the relatively centralized structure and lower percentage of referred patients in rare cancer types suggests that these patients are only referred in very rare cases which then require such specialized expertise that they are referred to one (or a few) organizations at national level.

The deviation between planned and observed referral networks implies that considerable effort is required to alter the often routinized existing referral patterns of hospitals. Merely formalizing the desired or intended structure of patient referral networks without actively managing and monitoring the restructuring process in practice is unlikely to foster great contributions to improved quality and reduced costs of care. Incentivizing providers to adhere to planned referral patterns, for example by introducing specific (integrated) payment schemes, could potentially facilitate this process. In order to maximize the benefit for patients, the process of centralizing healthcare delivery should be closely monitored by repeatedly testing hospitals' adherence to planned referral networks.

Limitations

Our study has some limitations. The first is our use of relatively old data (i.e. from 2008 until 2011). This is due to the fact that the new product structure in Dutch specialized care rendered it impossible to utilize more recent data with a similar inclusion and follow-up period, given the delay in availability of Dutch claims data. However, oncological care was not actively centralized during our observation period. The observed referral networks hence reflect referral patterns based on hospitals' autonomous referral decisions. Secondly, the planned referral networks were based on the geocoded distance between hospitals based on their visiting address, overlooking the fact that some organizations provide care at multiple locations. However, Dutch hospitals typically serve relatively confined geographical areas in the Netherlands, rendering the effect of this approach minimal. Thirdly, we were unable to exclude 'rule-out DBCs' in which patients were tested for a specific form of cancer but did not have the disease. Lastly, only DBCs pertaining explicitly and exclusively to one of our cancer types were included in the analysis, which could have excluded some relevant DBCs. In the most extreme scenario however, both the third and fourth limitation render our findings at network level an underestimation.

Conclusion

Centralizing care in specific organizations can increase quality of care and be achieved through adequately structuring patient referral networks. In oncology, one of leading causes of death and greatest health expenditures, this is imperative. Patient referrals are not only highly common in oncological care, they are also often reciprocal. However, referral patterns in prevalent cancer types do differ from those in rare cancer types and both deviate from the optimal structure of planned referral networks. In order to optimize oncological care, policymakers and practitioners should thus consider the condition-specific characteristics of existing referral networks and go beyond merely formalizing desired network structures by incentivizing specific referral directions and monitor organizations' adherence to formalized referral networks.

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PART III

Competition and inter-organizational relations

CHAPTER 6

Coopetition in health care: A multi-level analysis of its individual and organizational determinants

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Abstract

Cooperative inter-organizational relations are salient to healthcare delivery. However, they do not match with the pro-competitive healthcare reforms implemented in several countries. Healthcare organizations thus need to balance competition and cooperation in a situation of 'coopetition'. In this chapter we study the individual and organizational determinants of coopetition versus those of cooperation in the price-competitive specialized care sector of the Netherlands. We use shared medical specialists as a proxy of collaboration between healthcare organizations. Based on a sample of 15,431 medical specialists and 371 specialized care organizations from March 2016, one logistic multi-level model is used to predict medical specialists' likelihood to be shared and another to predict their likelihood to be shared to a competitor. We find that different organizations share different specialists to competitors and non-competitors. Cooperation and coopetition are hence distinct organizational strategies in health care. Cooperation manifests through spin-off formation. Coopetition occurs most among organizations in the price-competitive market segment but in alternative geographical markets. Hence, coopetition in health care does not appear to be particularly anti-competitive. However, healthcare organizations seem reluctant to share their most specialized human resources, limiting the knowledge-sharing effects of this type of relation. Therefore, it remains unclear whether coopetition in health care is beneficial to patients.

Introduction

Health care is a service which is typically delivered to patients by several providers (i.e. organizations) cooperating in inter-organizational networks (1-3). This is the result of the high level of specialization of providers and the fragmented nature of the sector due to its funding schemes (4, 5). Inter-organizational networks can consist of various types of temporary or long-lasting inter-organizational relations through which resources are transferred between organizations, underpinned by various organizational motives (6, 7). Examples of inter-organizational relations in health care include patient transfers, consortia, shared human resources, and interlocking directorates (e.g. 8, 9). Well-structured cooperative inter-organizational healthcare networks are considered an efficient resource allocation method and have proven beneficial for quality of care (e.g. 10, 11).

The absence of (price-)competition has long been considered a salient factor for inter-organizational cooperation to flourish (12) and much of the initial research regarding inter-organizational cooperation was consequently conducted in industries like health care (e.g. 13). However, several Western countries have passed market-based reforms in an attempt to contain healthcare costs (14, 15). Such reforms, aim to stimulate competition between providers which should in turn optimize value in the industry (9, 16), with value being the best health outcomes per dollar spent (17). The introduction of competition effectively renders many cooperating healthcare providers in a situation where they simultaneously cooperate and compete, two diametrically opposed logics (18).

During the past two decades, simultaneous cooperation and competition between organizations has become an increasingly established phenomenon in strategic management literature known as coopetition (19). It has attracted particular attention in knowledge-intensive industries (20, 21). While some have dubbed coopetition 'sleeping with the enemy' (22), the concept is primarily based on 'growth commensalism' (23). It is described as a phenomenon in which competitors cooperate to create or expand a market but compete to appropriate the largest possible share of that market in academic literature (e.g. 24). Along this line, knowledge sharing and inter-organizational learning are considered the primary motives to cooperate with competitors (e.g. 24). Improved competitiveness and innovativeness resulting from scale advantages are considered the main outcomes of this process (e.g. 25) when the tensions inherent to the opposite logics of competition and cooperation are well-managed at individual and organizational level (e.g. 26). Coopetition is primarily studied at the inter-organizational level using case studies (21) and empirical work has mostly failed to capture the multi-level nature of the phenomenon (20).

In health care, coopetition has been described as ‘the new market milieu’ (27). Yet, despite the implementation of competition in several healthcare systems, and the inherent tensions this brings cooperating competitors, coopetition has not been studied extensively in the sector. In their systematic review of the coopetition literature, Bouncken, Gast (21) identified only two studies which explicitly utilize the concept of coopetition in health care (i.e. 28, 29). Albeit perhaps not explicitly referencing coopetition, simultaneous competition and cooperation has not gone unnoticed by health services researchers. Studies by Lomi and Pallotti (30), Mascia, Di Vincenzo (31), and Mascia, Pallotti (32) for example show that competing hospitals in the Italian National Health System (NHS) are more likely to collaborate with one another. Mascia and Di Vincenzo (33) find that while cooperation benefits hospitals’ performance, competition hampers it. Conversely, Plochg, Delnoij (34) find that market-based reforms hamper cooperation between providers in the Netherlands.

Most of the empirical research regarding coopetition in health care stems from the Italian NHS in which price-competition is absent (31) and has focused on transferring patients, a temporary relation between organizations (31). Empirically, long-lasting resource flows between organizations have only been considered to a limited extent in this stream of literature. Furthermore, the coopetition literature in health care has either operationalized competition as a relational phenomenon at the dyadic level (e.g. 35) or at the industry level as an industry characteristic (e.g. 34). Conceptualizations of competition at the sub-industry level (23), which have been applied in healthcare management research (e.g. 36), have not been juxtaposed with cooperation. Strategic groups are arguably the most well-known sub-industry conceptualization of competition. Strategic groups refer to groups of organizations within an industry which offer similar products or services and which can thus be considered each other’s main competitors (e.g. 37).

We aim to advance our understanding of coopetition in health care, and thus of competitive healthcare markets using the following research question; *‘What are the individual and organizational determinants of coopetition versus those of cooperation in health care?’*. Consequently, we study the determinants of coopetition (i.e. simultaneous cooperation and competition) and contrast these with the determinants of cooperation. This enables us to unravel the similarities and differences between cooperation and coopetition in a price-competitive healthcare market. Furthermore, we answer the call for a multi-level approach to studying coopetition by examining which resources are shared by which organizations. Lastly, we study a long-lasting relation specific to the healthcare sector, namely shared human resources (i.e. medical specialists). Medical specialists are a key resource of hospitals (38), yet it is common for them to be affiliated to multiple hospitals simultaneously (27, 39). This approach draws from the labor mobility literature in which employee inflows are perceived

as vehicles to attract tacit knowledge of an employee's former employer and as conduits of communication between current and former employers (e.g. 40, 41). It also captures the tension inherent to simultaneous cooperation and competition since shared medical specialists between healthcare organizations has been described as anti-competitive (42).

Methods

Setting

We study coopetition in the specialized care market of the Netherlands. Price-competition was introduced in this sector by the Health Insurance Act (HIA) in 2006 as a consequence of selective contracting of providers by third-party purchasers (i.e. insurers) (43). Upon introduction of the HIA in 2006, it was limited to approximately 7% of the specialized care services but since 2012, price-competition pertains to roughly 70% of the specialized care services (44). In 2013, more than half of the curative healthcare expenditure under the HIA was spent on specialized care services which are delivered by academic hospitals, teaching hospitals, general hospitals, specialized hospitals, and independent treatment centers (45, 46).

Data

Our study, which was not subjected to the Dutch 'Research involving Human Subjects act' following the decision of the Maastricht University Medical Center ethics committee (number 14-5-028), was based on data owned by Vektis, the Dutch center for information and standardization in health care. Specifically, we used the publically available '*Algemeen Gegevensbeheer Code*' (AGB-code) data (version U145, released in the second half of March 2016) which is designed to handle claims and to analyze healthcare consumption (47). An AGB-code is a unique identifier for healthcare professionals and healthcare organizations in the Netherlands. Insurers only reimburse claims with a valid combination of a professional's and organization's AGB-code (47). In order to receive an AGB-code, medical specialists need to be listed in the country's medical (BIG) registry and specialized care organizations need to possess a unique chamber of commerce number and governmental admission to the market (47). The AGB-code database contains the active affiliations of professionals to healthcare organizations as well as a professional's and an organization's basic characteristics (e.g. age, gender, experience, type of organization, and location). AGB-code data has previously been used to explore the occurrence of shared specialists in the Netherlands (48).

Sample

From the database we selected all medical specialists ($n=19,852$), all specialized care organizations ($n=969$), and all active affiliations of the specialists to the organizations ($n=26,614$). Because the financial incentive for specialists to keep the database up to date (49) becomes obsolete upon their retirement, all specialists who had reached the Dutch retirement age on April 1st 2016 were excluded. Five specialist who were below the age of 30 on April 1st 2016 were also excluded, since only professionals who have completed their residencies are eligible for an AGB code, which is practically impossible before the age of 30 in the Netherlands (50). Specialists without an active affiliation to any of the organizations in our sample were disregarded.

Specialized hospitals, including psychiatric hospitals, were excluded because they can also be categorized as long-term care organizations in the AGB-code data and different entry barriers can apply (47). Our sample hence included independent treatment centers (ITCs), general hospitals, teaching hospitals, and academic hospitals. Similar to what Gaynor and Town (51) describe as ambulatory surgical centers, ITCs are ambulatory clinics that typically offer low-complex outpatient care in a few specialties. Furthermore, the distinction between general, teaching, and academic hospitals is similar to what Zwanziger, Melnick (52) describe as primary, secondary, and tertiary hospital services. General hospitals offer basic (i.e. 'primary') hospital services in several specialties. Teaching hospitals offer services which require more specialized resources (i.e. 'secondary services') and are hospitals where medical students and residents can be placed. Academic hospitals offer highly specialized (i.e. 'tertiary') services on a regional basis and are responsible for the training of medical students and residents in close collaboration with a university (52, 53). Because the services offered by organizations within each of these categories are distinct and most closely resemble the services offered by organizations in the same category, each organizational type was considered a separate strategic group.

All specialists were assigned an organization to which they were primarily affiliated and, if applicable, an organization to which they were shared. We calculated the duration of each active affiliation a specialist had using the starting date of the affiliation. The organization to which a specialist had the longest active affiliation was considered the specialist's primary organization. The second organization to which a specialist was affiliated was considered the organization to which a specialist was shared. Specialists with more than two affiliations were considered shared to the strongest competitor. That is, the most geographically proximate organization in the same strategic group. In cases none of the additional affiliations were to an organization in the same strategic group we considered them shared to the organization to which they had the second-longest affiliation. Specialists with equal affiliation durations

for their first two affiliations were disregarded because we were unable to determine the primary organization which decided to share the specialist in these cases. Ultimately, we retained a sample of 15,431 medical specialists in 29 medical specialties (see Appendix 1), primarily affiliated to 371 specialized care organizations.

Measures and model specification

Dependent variables

In the Netherlands, medical specialists are either employed by a hospital or independent, self-employed, entrepreneurs organized in per-specialty partnerships called '*maatschap*' (54). Sharing a medical specialist thus either implies that an organization shares a tenured employee or that a '*maatschap*' is affiliated to multiple organizations. In both cases the hospital board is responsible for its specialists (55) and decides whether or not to share a specialist (48). Previous research has identified sharing specialists as an emergent, yet deliberate, strategy of healthcare organizations given the formal decision-making authority and the strategic considerations underpinning the decision (48).

We used two dependent variables, both of which indicated whether a specialist was shared between two organizations in our sample. Our first was a binary indicator coded 1 when a specialist was shared to another organization in our sample and 0 otherwise. Based on this first dependent variable, we modeled the individual and organizational determinants of cooperation. That is, a specialist's general likelihood to be shared. Our second dependent variable was a binary indicator coded 1 when specialists who were shared, as identified by our first independent variable, were shared to an organization in the same strategic group as their primary organization and 0 otherwise. Based on this second dependent variable we modeled the individual and organizational determinants of coopetition. That is, a specialist's likelihood to be shared to a competitor (i.e. an organization in the same strategic group).

Model specification

We constructed a multilevel logistic regression model with maximum likelihood estimation, Laplace likelihood approximation, and logit link function for both dependent variables using the 'glimmix' procedure in the SAS software for Microsoft Windows version 9.3. The multilevel structure was used in order to account for the separation of effects at the individual and organizational level (56). Formally we specified the following model:

$$\begin{aligned} \text{Logit}(\pi_{ij}) = & \alpha_j + \beta 0_{ij} + \beta 1 \cdot \text{Gender}_i + \beta 2 \cdot \text{PhD}_i + \beta 3 \cdot \\ & \text{Experience}_i + \beta 4 \cdot \text{Affiliation Duration}_{ij} + \beta 5 \cdot \text{Independent}_{ij} + \\ & \sum_{k=6}^{34} \beta k \cdot \text{Specialty}_{ijk} + \beta 35 \cdot \text{Traveltime}_{ij} + \beta 36 \cdot \text{Traveltime}_{ij}^2 + \\ & \gamma 1 \cdot \text{Size}_j + \gamma 2 \cdot \text{Competition}_j + \gamma 3 \cdot \text{MHG membership}_j + \gamma 4 \cdot \\ & \text{ITC}_j + \gamma 5 \cdot \text{General Hospital}_j + \gamma 6 \cdot \text{Teaching Hospital}_j + \gamma 7 \cdot \\ & \text{Academic Hospital}_j + \varepsilon_{ij} \end{aligned}$$

Where:

$$\alpha_j = \alpha + \mu_j$$

Level-1 independent variables

$\beta 0_{ij}$ through $\beta 37_{ij}$ represent personal characteristics of medical specialists and serve as first-level predictors of the likelihood that a specialist is shared. $\beta 0_{ij}$ represents the first-level intercept. Gender, experience, and the specialty of a specialist are all common personal-level variables in research regarding collaboration in health care (e.g. 57). Gender_i was coded 1 for male and 0 for female. Experience_i was operationalized as the number of years between April 1st 2016 and the date on which a specialist finished his or her residency. $\sum_{k=6}^{34} \beta k \cdot \text{Specialty}_{ijk}$ represents 29 mutually exclusive dummies indicating a specialist's medical specialty coded 1 for yes and 0 for no. Internal medicine, the largest specialty in our sample, serves as the reference category. PhD_i indicates whether the specialist holds a PhD (i.e. 1 for yes and 0 for no) and is used as an indication of seniority (58) in medical terms. Affiliation Duration_{ij} represents how long a specialist has been affiliated to their primary organization measured in years per April 1st 2016 and is a predictor of employee turnover in labor economics (e.g. 59). Independent_{ij} is a dummy variable coded 1 for specialists who work in a 'maatschap' and 0 for employed specialists. Traveltime_{ij} and Traveltime_{ij}², are only used in model 2 and indicate the (curvilinear) effect of geographical proximity, operationalized as travel time in hours, between a specialist's primary and secondary organization. The travel time between each dyad of organizations was retrieved from the Google Maps API through inputting both organizations' visiting address using the SAS software for Microsoft Windows version 9.3. Our findings proved robust against operationalizing proximity as geographical distance like in previous research (57, 58).

Level-2 independent variables

α_j denotes the second level random intercept specified as the grand mean α and hospital specific deviation from that mean μ_j . $\gamma 1_j$ through $\gamma 7_j$ represent organizational characteristics of a specialist's primary organization and serve as second-level predictors of the likelihood to be shared. Size_j constitutes a common variable in studies regarding hospital strategies and was operationalized as the total number of specialists affiliated to the organization expressed in hundreds. Competition_j represents a measure of the degree of competition to

which an organization is exposed. It is operationalized as the cumulative degree of service-overlap of organization j with all other organizations k in a 10 kilometer radius. The degree of service overlap between organization j and another organization k was defined as the percentage of specialties offered by organization j which organization k also offers. We considered an organization to offer a specialty when at least one specialist of a specialty was primarily affiliated to the organization. The 10 kilometer radius represents the local nature of specialized care markets (60) but findings proved robust against higher radiuses. MHS membership is a dummy variable coded 1 when an organization is part of a multihospital system (MHS) (61) in which at least one other organizations from our sample is also a member and 0 otherwise. The variable was constructed based on the group ID associated with each AGB-code in the Dutch national company registry of Statistics Netherlands. ITC_j , $General\ Hospital_j$, $Teaching\ Hospital_j$, and $Academic\ Hospital_j$ are mutually exclusive dummies indicating the type (i.e. strategic group) of each organization. General hospitals serve as the reference category. Lastly, ε_{ij} indicates the error term.

Results

Descriptive statistics

Table 6.1 presents the descriptive statistics of the first-level variables. It reveals that roughly 28% of all medical specialists in our sample ($n=15,431$) are shared and that 31% of those shared specialists ($n=4,277$) are shared to an organization in the same strategic group. Of the 15,431 specialists, 61% are male, 52% are employed by their primary organization, and 22% have obtained a PhD. Of the 4,277 shared specialists 66% is male, 45% is employed by their primary organization and 20% has a PhD. On average, specialists have almost 12 years of experience and have been affiliated to their primary organization for roughly 9.5 years. Shared specialists are, on average, more experienced (i.e. 13 years) and have longer affiliations to their primary organization (i.e. 10.5 years). Most of the specialists, as well as the shared specialists, are primarily affiliated to a general or a teaching hospital. Lastly, on average, shared specialists are shared to organizations located almost an hour away from their primary organization.

Table 6.2 displays the descriptive statistics of the characteristics of healthcare organizations. It indicates that 371 organizations served as the primary organization of one or more specialists in our sample. On average, 56 specialists were affiliated to an organization and organizations were exposed to 5.74 organizations in a 10 kilometer radius with which they had full service overlap. Most organizations in our sample are ITCs (78%), followed by general hospitals (13%), teaching hospitals (8%), and academic hospitals (2%). Of those 371

organizations, 226 organizations cooperate. That is, they served as the primary organization of at least one shared specialist. On average, 90 specialists are affiliated to these organizations and they have 5.15 organizations in a 10 kilometer radius with which they have complete service overlap. Most of the organizations to which shared specialists are primarily affiliated are ITCs (63%), followed by general hospitals (21%), teaching hospitals (13%), and academic hospitals (4%). Of these 226 organizations, 176 engage in coopetition. That is, they share at least one specialist to an organization in the same strategic group.

Table 6.3 indicates the number of specialists shared between each type of organization at organizational level. The rows represent the type of organization to which specialists are primarily affiliated and the columns represent the type of organization to which specialists are shared. The diagonal represents the number of specialists shared to organizations in the same strategic group (i.e. 31%, or 1,325 of the 4,277). Almost half of the specialists shared by an ITC are shared to another ITC (i.e. 158 of the 359). Approximately a third of the specialists who are shared by a general hospital or a teaching hospital are shared to another general hospital or teaching hospital (574 out of 1,761 and 500 out of 1,614 respectively), while roughly a fifth of the specialists shared by an academic hospital are shared to another academic hospital (i.e. 93 out of 543). Table 6.3 furthermore highlights that 45% of the specialists who are primarily affiliated to an ITC, 33% of all specialists primarily affiliated to a general hospital, 28% of all specialists primarily affiliated to a teaching hospital, and 15% of all specialists primarily affiliated to an academic hospital are shared.

Table 6.1

	Model 1					Model 2				
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max
Specialists shared	15,431	27.72%		0	1					
Specialists shared within strategic group						4,277	30.98%		0	1
Gender	15,431	61.25%		0	1	4,277	66.03%		0	1
PhD	15,431	21.53%		0	1	4,277	20.22%		0	1
Experience of specialist	15,130	11.86	7.73	0	36	4,198	12.90	7.65	0	36
Affiliation duration	15,426	9.44	7.12	0	36	4,277	10.50	7.08	0	36
Independent	15,431	47.77%		0	1	4,277	55.18%		0	1
Medical specialty	See Appendix 1					See Appendix 1				
Travel time to secondary organization						4,277	0.92	0.59	0	3.20
Primarily affiliated to an ITC	15,431	5.17%		0	1	4,277	8.39%		0	1
Primarily affiliated to a general hospital	15,431	34.82%		0	1	4,277	41.17%		0	1
Primarily affiliated to a teaching hospital	15,431	36.85%		0	1	4,277	37.74%		0	1
Primarily affiliated to an academic hospital	15,431	23.15%		0	1	4,277	12.70%		0	1

Table 6.2

	Model 1					Model 2				
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max
Size	371	0.56	1.14	0.01	7.07	226	0.90	1.35	0.01	7.07
Cooperate	371	60.92%		0	1	226	100%		0	1
Engage in coopetition						226	77.88%		0	1
Competition	371	5.74	6.90	0.67	81.11	226	5.15	6.98	0.95	81.11
MHS membership	371	22.91%		0	1	226	30.97%		0	1
Academic hospital	371	2.16%		0	1	226	3.54%		0	1
ITC	371	77.63%		0	1	226	63.27%		0	1
Teaching hospital	371	7.55%		0	1	226	12.39%		0	1
General hospital	371	12.67%		0	1	226	20.80%		0	1

Table 6.3

		Shared to				Number of specialists shared	Number of specialists primarily affiliated to organizational type*	% of specialist shared per organizational type
		ITC	General hospital	Teaching hospital	Academic hospital			
Shared by	ITC	158	75	120	6	359	798	44.99%
	General hospital	661	574	423	103	1,761	5,373	32.77%
	Teaching hospital	451	579	500	84	1,614	5,687	28.38%
	Academic hospital	81	191	178	93	543	3,573	15.20%
Total		1,351	1,419	1,221	286	4,277	15,431	

* The total number of affiliated specialists to each type of organization was calculated based on the percentage of specialists affiliated to each type reported in Table 6.1.

Table 6.4 presents the results of our logistic multilevel regression models predicting the likelihood a specialist is shared and the likelihood a specialist is shared within a strategic group. Only the results of the full model are presented. In both cases the full model, including all individual and organizational level predictors, displayed the best model fit, indicated by the Akaike Information Criterion. The intraclass correlation (ICC), calculated following the method described by Snijders and Bosker (56), reveals that a specialist's primary organization explains roughly a quarter of the variance in the likelihood to be shared (i.e. model 1) and more than a third of the variance in the likelihood to be shared to a competitor.

Likelihood of cooperation

Model 1 in Table 6.4 reveals the results of the regression model predicting the likelihood that a specialist is shared (i.e. the likelihood of cooperation). The results indicate that male specialists are 25% more likely to be shared than female specialists. Furthermore, a specialist is 3% more likely to be shared for each year he or she has been affiliated to their primary organization. Additionally, independent specialists are 10% less likely to be shared than specialists who are employed by their primary organization. Lastly, the likelihood of a specialist to be shared differs across medical specialties. In 21 of the 28 specialties the likelihood to be shared differs significantly from the reference category (see Appendix 2).

At the organizational level, neither the size of a specialist's primary organization nor the degree of competition to which it exposed significantly influence the likelihood of specialists

to be shared. The type of organization to which a specialist is primarily affiliated and whether that organization is part of a MHS do significantly influence a specialist's likelihood to be shared. Specialists who are primarily affiliated to an academic hospital are 76% less likely to be shared than specialists affiliated to a general hospital (i.e. the reference category). Specialists affiliated to organizations which are part of a larger system of multiple organizations are 84% more likely to be shared.

Likelihood of cooptation

Model 2 in Table 6.4 presents the results of the regression model predicting the likelihood that a shared specialist is shared within a same strategic group (i.e. the likelihood of cooptation). At the individual level, the contract type, specialty of a medical specialist, and the traveling time between the primary and secondary organization all significantly influence a specialist's likelihood to be shared within a strategic group. Independent specialists are 31% less likely to be shared within a strategic group. A specialist is furthermore more likely to be shared within a strategic group if the organization to which he or she is shared is located further away, as indicated by the positive and significant effect of traveling time. However, the negative and significant effect of the squared travel time indicates that this likelihood decreases when the travel time between both organizations exceeds 96 minutes. The likelihood of a specialist to be shared within a strategic group differs significantly from the reference category in 8 of the 28 medical specialties (see Appendix 2).

At the organizational level, neither the size, the degree of competition to which an organization is exposed, nor MHS membership influence the likelihood that a specialist is shared within a strategic group. The type of organization to which a specialist is primarily affiliated does have a significant influence on the likelihood of a specialist to be shared in a strategic group. Specialists who are primarily affiliated to an ITC are 2.44 times as likely to be shared to an organization in the same strategic group (i.e. another ITC) than specialists affiliated to a general hospital (i.e. the reference category).

Table 6.4

	Model 1	Odds Ratio Model 1 (95% CI)	Model 2	Odds Ratio Model 2 (95% CI)
Level-1 fixed effects				
Intercept	-2.017 (0.246)***	-	-0.576 (0.373)	-
Gender	0.220 (0.048)***	1.246 (1.135 - 1.369)	0.103 (0.094)	1.108 (0.921 - 1.334)
PhD	0.040 (0.055)	1.041 (0.934 - 1.160)	-0.038 (0.108)	0.963 (0.779 - 1.190)
Experience of specialist	-0.001 (0.005)	0.999 (0.989 - 1.008)	0.005 (0.010)	1.005 (0.986 - 1.024)
Affiliation duration	0.030 (0.006)***	1.030 (1.019 - 1.041)	-0.011 (0.011)	0.989 (0.968 - 1.010)
Independent	-0.110 (0.054)**	0.896 (0.806 - 0.996)	-0.372 (0.103)***	0.689 (0.563 - 0.844)
Medical specialty	Omitted	See Appendix 2	Omitted	See Appendix 2
Travel time	Omitted		1.230 (0.279)***	3.420 (1.978 - 5.914)
Squared travel time			-0.383 (0.119)***	0.682 (0.540 - 0.860)
Level-2 fixed effects				
Size	0.129 (0.109)	1.138 (0.920 - 1.408)	-0.196 (0.140)	0.822 (0.625 - 1.082)
Competition	0.011 (0.011)	1.012 (0.989 - 1.034)	-0.002 (0.016)	0.998 (0.967 - 1.030)
MHS membership	0.612 (0.189)***	1.845 (1.274 - 2.671)	-0.112 (0.264)	0.894 (0.534 - 1.499)
ITC	0.387 (0.253)	1.473 (0.897 - 2.420)	0.890 (0.349)**	2.436 (1.229 - 4.826)
General hospital	Reference	-	Reference	-
Teaching hospital	-0.375 (0.280)	0.687 (0.397 - 1.188)	-0.346 (0.372)	0.707 (0.341 - 1.467)
Academic hospital	-1.439 (0.546)***	0.237 (0.081 - 0.692)	-0.753 (0.725)	0.471 (0.114 - 1.950)
Random effects				
Level 2 intercept	1.074 (0.176)***		1.784 (0.334)***	
ICC	0.246		0.352	
Model fit				
AIC	14808.21		4178.86	
ROC	0.786		0.843	

Estimation method: Laplace

* p-value<0.10

** p-value<0.05

*** p-value<0.01

Discussion

The aim of the study was to identify the individual and organizational determinants of cooperation and coopetition in health care. We based our analysis on shared human resources between healthcare organizations and used a multilevel approach to study which healthcare organizations share which human resources in general and to competitors. We find that more than a quarter of all specialists are shared. This contradicts the notion that specialists have a lifetime affiliation with one single hospital (54). In line with previous research (27, 48, 62) it instead indicates that sharing specialists is a common inter-organizational relation in health care. This is particularly true for male specialists which can be explained by the fact that females are three times more likely to work part-time than males in the Netherlands (63) and sharing part-time employees could erode the already limited availability of these employees to an organization.

Our results indicate that cooperation and coopetition entail different strategies. This becomes apparent in several ways. Firstly, the organizational level explains a considerable amount of the variance in a specialist's likelihood to be shared (to a competitor), underlining the notion that sharing medical specialists is a deliberate organizational strategy. Secondly, not all organizations which cooperate engage in coopetition. Sixty-one percent of the organizations in our study cooperate. Of those, 78% engage in coopetition. Thirdly, the type of specialists shared in general and shared to competitors differs. While male specialists and specialists with longer affiliations, and consequently higher degrees of firm-specific knowledge, are more likely to be shared in general, they are not more likely to be shared to competitors. There are furthermore significant differences between the likelihood to be shared versus the likelihood to be shared to competitors in several medical specialties. Lastly, coopetition is more common for ITCs while cooperation is more common for organizations which belong to a multi-hospital system but less common for academic hospitals. Coopetition ultimately entices decisions 'what to share, with whom, when, and under which conditions' (64) and our results show that different organizations share different resources (i.e. specialists) in situations of cooperation versus coopetition.

Cooperation predominantly manifests itself through spin-off formation by general and teaching hospitals. Model 2 indicates that specialists shared to organizations in the same geographical market are likely to be shared to non-competitors. Subsequently, inspection of Table 6.3 reveals that 40% (i.e. 1193 of 2952) of the specialists who are shared to non-competitors are shared to an ITC. Although such ambulatory clinics compete with hospitals for patients (65), hospital boards do share specialists to ITCs which constitute (potential) competitors (48) and these ITCs are thus likely to constitute spin-offs. Creating a spin-off

in the same geographical market furthermore minimizes the travel-time for specialists and allows hospitals to outsource certain activities while ensuring incoming referrals of patients (48). The finding that specialists with high degrees of firm-specific knowledge (i.e. longer affiliations to their primary organization) are more likely to be shared underlines the notion of spin-off formation as these specialists can maximize the alignment between both organizations.

Coopetition manifests itself most clearly in organizations which are active in the price competitive segment of the market. That is, ITCs typically perform services in the price competitive market segment (66) and specialists primarily affiliated to an ITC are 2.5 times more likely to be shared to a competitor. Furthermore, 45% of all specialists primarily affiliated to an ITC are shared. However, Model 2 also indicates that cooperation with competitors predominantly occurs with competitors located further (i.e. one hour on average) away. Given the local nature of specialized care markets (60) these competitors thus reside in different geographical markets. The risk of anti-competitive effects resulting from sharing medical specialists, which has been suggested by previous research (42, 48, 67) thus seem limited. The fact that coopetition seems most common in organizations which operate in the price-competitive market segment does raise the question on which criteria these organizations select appropriate partners to share their resources to. Future research should attempt to unravel these mechanisms at a dyadic level, preferably through longitudinal approaches.

Lastly, our results suggest that both cooperation and coopetition based on shared medical specialists fails to fulfill its full knowledge-sharing potential. Inter-organizational learning and knowledge exchange are considered important drivers of coopetition in general and sharing specialists in particular (20, 48, 62) However, neither more experienced specialists nor specialists with medical seniority (i.e. those who have obtained a PhD) are more likely to be shared. Healthcare providers thus seem reluctant to share their most experienced, specialized, and arguably most knowledgeable human resources. Furthermore, specialists who are primarily affiliated to an academic hospital and who typically have experience with treating the most complex patients are significantly less likely to be shared. Considered in conjunction with the finding that specialists with higher degrees of firm-specific knowledge are less likely to be shared, this result suggests that healthcare organizations seek to protect their competitive advantage (i.e. their most specialized resources).

Limitations

Our work is subject to a few caveats. Firstly, medical specialists and healthcare organizations are not obliged to possess an AGB-code. However, it is a requirement for reimbursement by health insurers. This constitutes a strong financial incentive to keep the database up to date, making it a reliable source for research purposes (49). Additionally, the AGB-code database has recently undergone a quality review in which all specialists were requested to update their records (68). Secondly, we have operationalized competitors through mutual strategic group membership. However, competition is not exclusive to organizations within a strategic group. Hospitals can cross-subsidize unprofitable services with the revenues of simpler services for which they compete with ITCs for example (51). Nonetheless, organizations offer services which most closely resemble those offered by organizations from the same strategic group and the sub-industry categorization on which we based our strategic groups is generally accepted in multiple healthcare settings (52).

Conclusion

The presence of price-competition in several healthcare markets makes it compelling to understand the mechanisms of cooperation and competition in the sector. In this chapter we studied cooperation and competition between healthcare organizations based on shared human resources. We show that coopetition and cooperation entail different strategies in health care. That is, different organizations share different resources under circumstances of cooperation and competition. Cooperation predominantly manifests through spin-off formation. Coopetition occurs most in the price-competitive segment of the market but does not seem to be anti-competitive. However, healthcare organizations are reluctant to share their most specialized human resources, seemingly protecting their competitive advantage which limits the full knowledge-sharing potential of this type of inter-organizational relationship. Whether coopetition in healthcare benefits patients hence remains a point for future research.

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Appendix A

Appendix A Descriptive statistics of medical specialty dummies

	Model 1 (n=15,431)			Model 2 (n=4,277)		
	Mean	Min	Max	Mean	Min	Max
Ophthalmology	3.81%	0	1	6.08%	0	1
Ear nose throat	3.05%	0	1	2.81%	0	1
Surgery	7.42%	0	1	8.44%	0	1
Plastic surgery	1.66%	0	1	3.39%	0	1
Orthopedics	4.21%	0	1	3.41%	0	1
Urology	2.43%	0	1	3.06%	0	1
Gynecology	6.17%	0	1	6.13%	0	1
Neurosurgery	0.86%	0	1	2.10%	0	1
Dermatology	3.15%	0	1	8.42%	0	1
Pediatrics	8.09%	0	1	5.78%	0	1
Gastroenterology	2.82%	0	1	2.57%	0	1
Cardiology	6.07%	0	1	10.12%	0	1
Pulmonology	3.43%	0	1	3.37%	0	1
Rheumatology	1.61%	0	1	1.61%	0	1
Allergology	0.12%	0	1	0.12%	0	1
Rehabilitation	1.72%	0	1	1.31%	0	1
Cardio thorax surgery	0.73%	0	1	0.33%	0	1
Psychiatry	3.27%	0	1	1.75%	0	1
Neurology	5.02%	0	1	3.02%	0	1
Geriatrics	1.50%	0	1	1.26%	0	1
Radiology	5.97%	0	1	5.59%	0	1
Radiotherapy	1.13%	0	1	0.37%	0	1
Nuclear medicine	0.87%	0	1	0.87%	0	1
Clinical chemistry	0.99%	0	1	0.58%	0	1
Microbiology	0.97%	0	1	1.08%	0	1
Pathology	1.76%	0	1	1.64%	0	1
Anesthesiology	9.16%	0	1	6.83%	0	1
Clinical genetics	0.63%	0	1	0.12%	0	1
Internal medicine	11.38%	0	1	7.86%	0	1

Appendix B

Appendix B Odds ratios of medical specialty dummies omitted from Table 6.4

	OR (95% CI) Model 1	OR (95% CI) Model 2
Ophthalmology	3.852 (3.058 - 4.852)	0.811 (0.521 - 1.262)
Ear nose throat	1.440 (1.104 - 1.880)	1.118 (0.643 - 1.943)
Surgery	1.954 (1.613 - 2.369)	0.896 (0.603 - 1.332)
Plastic surgery	6.074 (4.469 - 8.257)	0.641 (0.366 - 1.121)
Orthopedics	1.106 (0.864 - 1.415)	1.551 (0.941 - 2.559)
Urology	2.448 (1.869 - 3.205)	1.014 (0.601 - 1.711)
Gynecology	1.659 (1.350 - 2.039)	0.829 (0.535 - 1.284)
Neurosurgery	11.813 (7.787 - 17.92)	0.844 (0.438 - 1.625)
Dermatology	15.813 (12.152 - 20.577)	0.372 (0.242 - 0.572)
Pediatrics	1.147 (0.933 - 1.409)	1.199 (0.773 - 1.858)
Gastroenterology	1.472 (1.120 - 1.936)	1.298 (0.734 - 2.295)
Cardiology	3.756 (3.086 - 4.571)	0.318 (0.210 - 0.482)
Pulmonology	1.524 (1.186 - 1.960)	0.537 (0.310 - 0.931)
Rheumatology	1.874 (1.347 - 2.606)	1.454 (0.750 - 2.820)
Allergy	1.100 (0.343 - 3.533)	1.122 (0.064 - 19.702)
Rehabilitation	1.213 (0.851 - 1.730)	0.581 (0.270 - 1.251)
Cardio thorax surgery	0.800 (0.442 - 1.449)	4.832 (1.399 - 16.695)
Psychiatry	0.532 (0.381 - 0.743)	0.803 (0.397 - 1.622)
Neurology	0.754 (0.587 - 0.969)	1.169 (0.688 - 1.988)
Geriatrics	1.489 (1.034 - 2.145)	2.142 (1.061 - 4.324)
Radiology	1.279 (1.032 - 1.585)	0.901 (0.57 - 1.423)
Radiotherapy	0.540 (0.308 - 0.947)	0.006 (<0.001 - >999.999)
Nuclear medicine	1.925 (1.249 - 2.964)	1.087 (0.463 - 2.549)
Clinical chemistry	0.633 (0.385 - 1.040)	0.908 (0.318 - 2.592)
Microbiology	1.923 (1.271 - 2.909)	1.389 (0.629 - 3.066)
Pathology	1.563 (1.121 - 2.179)	2.069 (1.101 - 3.885)
Anesthesiology	1.026 (0.843 - 1.249)	1.745 (1.171 - 2.601)
Clinical genetics	0.542 (0.216 - 1.360)	1.426 (0.146 - 13.901)
Internal medicine	-	-

CHAPTER 7

The evolution of cooperative inter-organizational healthcare networks: The role of price-competition

Under review

A preliminary version of this study has been awarded the 'Best International Paper award' at the 2016 Academy of Management Annual Meeting in Anaheim, CA, USA

Abstract

Objective: To study the evolution of inter-organizational networks in health care and the role of price-competition therein.

Data sources: Secondary data from the national information center on health care, Ministry of Health, Antitrust Authority, Healthcare Inspectorate and National Health Institute, and the Health Authority in the Netherlands between 2010 through 2015.

Study design Longitudinal social network analysis (i.e. stochastic actor-based model) analyzing the influence of organizational characteristics and network characteristics on forming or severing inter-organizational relations.

Data collection Data in the study is routinely collected for the billing process of health care services, annual reporting, quality assurance, and antitrust purposes.

Principal findings Although hospitals form a limited amount of cooperative relations, inter-organizational networks become increasingly dense. Hospitals in close geographical proximity and with a license to merge are particularly prone to form inter-organizational relations, as are large and high-quality hospitals. Hospitals exposed to greater degrees of price-competition are significantly more likely to form cooperative relations.

Conclusions Cooperative inter-organizational networks in health care evolve as a result of social-, quality-, and competition-related factors. These contradict the neoclassical perception of competition, rendering effects on consumer welfare unclear.

Introduction

Since the formalization and introduction of managed competition in the healthcare sector (1, 2), a wide and rich scholarly debate concerning its effects has emerged. It mainly revolves around the question whether the theoretical merits of (price-)competition as a resource allocation method hold in the healthcare industry, given that its characteristics deviate from traditional industries (3). In their extensive review of the scientific literature, Gaynor, Ho (4) found mixed evidence of the effect of price- and non-price- competition on outcomes such as price and quality. Nonetheless, pro-competitive healthcare reforms have been introduced in several Western countries as an instrument to contain the rapidly rising expenditures and optimize value within health care (e.g. 4, 5, 6-9).

The introduction of competition alters existing rules and regulations (i.e. institutional context) of the healthcare industry (2, 10, 11). Such alteration aims to stimulate competitive behavior and strategies of healthcare organizations, which in turn should improve health outcomes (12). However, mergers, which constitute a cooperative response, have arguable been the most prominent example of strategic responses to competitive pressures in healthcare markets (e.g. 13, 14-18). Scholars have suggested several motives for hospitals in competitive markets to merge (i.e. horizontally integrate), ranging from explanations rooted in resource dependency theory to matters of bargaining power explained by industrial organization paradigms (19-22).

Mergers constitute the tightest or most formal type of cooperative inter-organizational strategies between organizations (23, 24). Due to its highly specialized and fragmented nature however, healthcare is a service which is typically delivered by networks of providers linked by loose(r) forms of inter-organizational relations (e.g. 11, 25, 26). In fact, management scholars' interest in phenomena like strategic networks stems from research in non-profit industries such as healthcare (27). Most of the research regarding networks of cooperative inter-organizational relations in the healthcare industry has mainly studied the network directly, identifying several types of inter-organizational relations between healthcare organizations and various network typologies (e.g. 11, 23, 25, 28), or has studied the effect networks have on outcomes like quality and safety (e.g. 29, 30-33). The precursors of forming or severing inter-organizational relations and the evolution of inter-organizational networks in health care, and particularly the role of (price-)competition in this regard, have not gained equal academic attention however.

Several factors can influence the formation of different types of cooperative inter-organizational relations (34). However, the influence of competition on forming such relations has recently attracted increasing scholarly through concepts such as coopetition (e.g. 35, 36). Outside the healthcare industry, researcher has shown that competition can make cooperation between organizations more likely (e.g. 37, 38) as well as less likely (e.g. 39). The effect is contingent on the degree to which organizations have and emphasize similarity goals (40, 41). In health care, Lomi and Pallotti (42), Mascia, Di Vincenzo (43), and Mascia, Pallotti (44) all find that that competing hospitals are more likely to cooperate with each other. However, these studies have mostly adopted cross-sectional designs and were conducted in the Italian National Health System (NHS) which revolves around non-price-competition (i.e. quality competition) rather than price -competition (43, 45).

Well-structured inter-organizational networks result in higher quality of care (33, 46) and cooperation benefits hospitals' performance (47). Understanding the determinants of inter-organizational relations in health care and the evolution of inter-organizational networks can thus help researchers, policymakers, and practitioners to structure such networks in ways that optimize value for patients. Understanding the role of price-competition in the evolution of these networks will furthermore shed light on the effect that introducing competition in health care has on the formation of inter-organizational relations, which indicates the desirability of competition as a resource allocation method in health care. Given the benefits and widespread occurrence of cooperative inter-organizational networks in health care and the presence of price-competition in several healthcare sectors, in this chapter we study how cooperative inter-organizational networks in health care evolve and what the role of price-competition is in the evolution of such networks.

Methods

Empirical setting

We model the evolution of cooperative inter-organizational network between hospitals in the Netherlands. The Health Insurance Act (HIA) introduced various competitive elements in the Dutch healthcare sector in 2006. The most notable of which is arguably the introduction of price competition between specialized care organizations (i.e. hospitals) (48, 49). Initially price-competition was limited to 10% of all hospital services but it has been gradually increased between 2006 and 2012 and applies to 70% of all hospital services as of 2012 (49). Similar to the US model, price competition between Dutch hospitals is the result of selective contracting of providers by third party purchasers (i.e. insurance companies) (50-53). Like in most Western countries, the hospital sector constitutes the largest part of healthcare expenditure in the Netherlands (4, 54-56).

Data

Our study was based on five longitudinal data sources between 2010 through 2015. Firstly, we used data supplied by Vektis, the Dutch center of information on health care which handles the claims of all services under the HIA, to identify inter-organizational relations between hospitals. Specifically, we used the so-called AGB-code (*‘Algemeen Gegevensbeheer Code’*) database which contains unique identifiers of all medical professionals and healthcare organizations and the affiliations between them. It forms the foundation of the billing process for healthcare in the Netherlands (57) and has been used in prior studies regarding shared specialists (58). Hospitals’ annual reports, the content of which is made publically available in a dataset by the ministry of Health, form our second data source. The dataset includes general indicators of each hospital such as size, production output, and productivity as well as detailed financial information (59). Our third data source is Elsevier’s annual ranking of hospital quality in the Netherlands. It contains a rating on a 4-star scale for each hospital on overall quality and 6 sub-dimensions of quality based on 799 quality indicators collected by the Dutch Healthcare Inspectorate and the National Healthcare Institute (60). Hospitals with below average quality receive 1 or 2 stars while 3 or 4 stars are reserved for hospitals with above average quality scores. Fourthly, the Dutch Antitrust Authority, to which all hospitals need to submit their intent to merge (49), supplied an overview of their final decision to (dis)allow each hospital merger since 2006. Lastly, these data sources were coupled using a coupling table supplied by the Dutch Healthcare Authority, based on the general corporate registry of Statistics Netherlands, including the unique identifier in the insurance data (i.e. AGB-code), annual reports (i.e. chamber of commerce number), Elsevier ranking (i.e. name of the hospital), and Antitrust Authority (i.e. name of the hospital).

Sample

Our sample consists of all general hospitals in the Netherlands which possess a unique identifier (i.e. AGB-code) and which, according to the records of the Antitrust Authority, had not merged at the start of our observation period (i.e. 2010). Academic hospitals were excluded due to the fact that they typically offer more complex services than their non-academic counterparts (51). Independent treatment centers and specialized hospitals, such as psychiatric and rehabilitation hospitals, were excluded due to their narrow scope of services (51, 53, 61). The Dutch Health Authority identified 84 general hospitals in 2010 (62). However, we considered hospitals which had obtained a license to merge prior to 2010 as one organization. Therefore, our sample instead contains 80 hospitals.

Variables

Dependent variables

Networks of cooperative inter-hospital relations constituted the dependent variable in this study. These were operationalized through shared medical specialists between hospitals. Medical specialists constitute one of the main resources of hospitals (63) and sharing specialists between hospitals is a highly common phenomenon (58, 64, 65). In the Netherlands, medical specialists typically have a life-time affiliation to just one hospital (66) and sharing medical specialists is considered an emergent hospital strategy and an adequate indicator of inter-hospital cooperation (58). In the original conceptualization of managed competition, specialists with multiple affiliations have been described as a hindrance to effective competition (1).

The network of shared specialists between each dyad of hospitals was represented by a non-symmetrical $n \times n$ adjacency matrix in which each cell indicated how many specialists were shared between hospital i in the row and hospital j in the column. One such matrix was constructed for each of the six years of our study period. The non-symmetrical nature of the matrices indicates that hospital i can share specialists to hospital j but hospital j can opt not to share specialists to hospital i . The matrices were constructed based on the affiliation records of medical specialists in the AGB-code database. The hospital to which a specialist had the longest affiliation was regarded as the sending organization. All other organizations to which a specialist had an active affiliation were considered receiving organizations. Specialists with missing starting dates for any of their affiliations or multiple organizations to which they were affiliated longest were disregarded.

To accommodate our analysis, the six matrices were dichotomized to indicate the absence or presence of a relation between two hospitals. Although specialists have a financial incentive to add new affiliations to their record (i.e. it enables them to bill for their services), no such incentive exists for removing former affiliations. To reduce the likelihood that hospitals were unjustly deemed to have a cooperative relation, we hence only considered hospitals to have a relation when more than one specialist was shared between them. Two dichotomization scenarios were used. In the first, all hospitals which shared two or more specialists were considered to have a relation. In the second, hospitals were considered to have a relation when they shared specialists from at least two different medical specialties. In line with the work of Büchner, Hinz (47) the two dichotomization scenarios indicate depth and breadth of cooperation respectively. Scenarios with higher dichotomization values resulted in an average degree below 2 rendering the network too sparse for our analyses (67). We present the results from the analyses based on the two dichotomization scenarios.

Independent variables

Our analysis technique allowed for the incorporation of two types of independent variables; actor-based (exogenous) effects and network-based (endogenous) effects. Actor-based effects account for the evolution of the network as a result of (dyadic) characteristics of actors (i.e. hospitals) within the network. The network-based effects account for the evolution of the network as a result of the structure of the network itself (68).

The actor-based variables used in our model were characteristics of individual hospitals and characteristics of a relation between a dyad of hospitals. All hospital and dyadic attributes in our model varied across observation years with the exception of the distance between two hospitals. Because we sought to study the role of price-competition in the evolution of inter-organizational networks in healthcare, our main variable of interest was the percentage of services each hospital offered in the price-competitive segment of the market. It serves as an indication of a hospital's exposure to price-competition. The variable was constructed based on hospitals' annual reports, in which they are obliged to report the number of services provided in the price-competitive and non-price-competitive market segment. Hospital size, financial performance, efficiency, and quality, all of which constitute common variables in the hospital performance literature (e.g. 33, 47, 69), were also included in our model as hospital attributes. The latter was based on the Elsevier quality ranking and the three former variables were based on hospitals' annual reports. Size was operationalized as the number of available beds. Financial performance was operationalized as net profit divided by total sales. Efficiency was defined as the amount of days patients were unnecessarily admitted to the hospital as a fraction of the total number of admission days (i.e. percentage of delayed discharges). Quality was represented by a dummy variable indicating whether a hospital offered above (coded 1) or below (coded 0) average quality.

Three dyadic attributes were used to model the evolution of cooperative inter-organizational hospital networks. The first was a binary variable indicating whether a dyad of hospitals was granted a license to merge by the antitrust authority to account for the consolidation wave in the Dutch hospital market (4, 70). It was represented by a symmetrical $n \times n$ matrix which included a 1 for the first observation year in which the approval had been granted (provided that it was granted in the first half of the year) and every subsequent observation year. Geographical distance and service overlap constituted the remaining dyadic attributes in our model and represent the two main dimensions of Sohn's (71) measure of inter-hospital competition; geographical- and service-market overlap. The geographical distance between each dyad of hospitals was calculated using the geocode procedure in SAS for Microsoft Windows based on the zip-code of each hospital reported in the AGB-code database and represented by a symmetrical $n \times n$ matrix which was constant over time. Service overlap

indicated the extent to which hospitals offer similar services. Because the Dutch DRG-like system deviates from that used in the US (72), we recreated the service categories used by (71) based on the Dutch DRG-like system following the argumentation by Zwanziger, Melnick (51). This resulted in the identification of 29 service domains based on the medical specialties recognized in the AGB-code database. Consequently, the service overlap between two hospitals was represented by a non-symmetrical $n \times n$ matrix indicating the percentage of hospital i 's services (i.e. specialties) offered by hospital j . A hospital was considered to offer a specialty when at least one specialist in a specialty was primarily affiliated to the hospital. One service-overlap matrix was constructed for each observation year to account for possible changes in hospitals' service mix.

Several basic network-based effects were included as independent variables in our model; the outdegree-, reciprocity-, transitivity-, and three-cycle effects. The outdegree and reciprocity effects are such basic network-based effects that they cannot be omitted (67). The outdegree effect represents the tendency for hospital i to form relations with other hospitals j at time t_{+1} based on the number of outgoing relations at time t . A negative outdegree value is common due to the social costs involved with maintaining relations. A hospital is thus likely to only form a few of the 79 (i.e. $n-1$) relations it can possibly form. Reciprocity indicates the likelihood of relations to be reciprocated. In this case it represents the tendency of hospital j to share specialists to hospital i at time t_{+1} if hospital i shares specialists to hospital j at time t . The transitivity and three-cycle effects both represent the tendency towards triadic structures. The transitivity effect indicates the tendency for hospital i to share medical specialists with hospital h at time t_{+1} if hospital i shares specialists with hospital j and hospital j shares specialists with h at time t . It is often described using the saying 'a friend of a friend is a friend'. The three-cycle effect indicates whether, under the same conditions, hospital h is instead likely to share specialists with hospital i . Three additional network-based effects were added to ensure adequate representation of the number of incoming and outgoing ties per hospital. These were the squared in- and outdegree popularity effect and the out-out assortativity effect. The two former effects represent the tendency for hospitals with many incoming or outgoing relations to attract or send additional relations respectively. The latter effect represents the tendency for hospitals with many outgoing ties to form relations with hospitals who also have many outgoing ties. All network-based effects are graphically represented in Figure 7.1. Solid lines in this figure represent ties present at time t . Dotted lines represent ties created at time t_{+1} for each effect.

Figure 7.1: Visual representation of network effects.

Results

Table 7.1 displays the descriptive statistics of the independent variables in each year. The RSiena package automatically imputes missing data using the last-observation-carry-forward method. The descriptive statistics in Table 7.1 are therefore based on the imputed data. However, missing data did not exceed the maximum of 10% of the observations, as suggested by Ripley, Snijders (67). Table 7.1 indicates that in all years, on average, hospitals in the Netherlands had approximately 450 beds, between 0.7 and 2.2 percent delayed discharges, and a net profit margin between 3.4 and 4.6 percent. More than half (i.e. between 58 and 73 percent) of the hospitals offered above average quality. Congruent with the increase of services subject to price-competition in 2012, the average percentage of services offered in the price-competitive market segment by hospitals increased from 25.4 percent in 2011 to 72.9 percent in 2012. Furthermore, hospitals are, on average, located roughly 100 kilometers from each other and their services overlap for more than 80%. Lastly, 16 hospital mergers were approved during our study period.

Table 7.2 displays the descriptive statistics of both dependent inter-hospital networks for each observation year. It indicates that, under both dichotomization scenarios and across all indicators, inter-hospital relations have become increasingly common over time. That is, the absolute number of ties, the network density (i.e. the percentage of possible ties formed in the network), the average degree (i.e. the average number of connections a hospital has), and the maximum number of outgoing ties in the network (i.e. maximum outdegree) increase over the years. The absolute values of each indicator do vary between the alternative dichotomization scenarios however.

Table 7.1

	Observation wave (year)					
	1 (2010)	2 (2011)	3 (2012)	4 (2013)	5 (2014)	6 (2015)
<i>Varying actor covariates</i>						
Mean size of hospital (sd)	471.375 (224.058)	466.488 (225.954)	473.313 (231.612)	462.125 (213.475)	444.688 (198.627)	451.213 (210.546)
Mean Percentage of price-competitive DRGs (sd)	25.357 (2.672)	25.386 (2.364)	72.855 (28.848)	80.422 (24.600)	89.353 (13.114)	82.154 (17.882)
Mean percentage of delayed discharges (sd)	1.711 (1.520)	2.181 (4.595)	1.463 (1.247)	0.919 (0.994)	0.699 (0.895)	0.874 (1.211)
Mean profit margin (sd)	4.009 (2.138)	3.925 (2.795)	4.028 (2.710)	4.625 (2.5447)	3.794 (2.605)	3.399 (2.261)
Hospitals with above average quality	47	55	54	59	55	52
<i>Constant dyadic variables</i>						
Mean distance between hospitals in km (sd)	100.202 (54.735)	100.202 (54.735)	100.202 (54.735)	100.202 (54.735)	100.202 (54.735)	100.202 (54.735)
<i>Varying dyadic variables</i>						
Number of mergers during study period (cumulative)	0 (0)	0 (0)	2 (2)	7 (9)	5 (14)	2 (16)
Mean service overlap percentage (sd)	83.161 (10.256)	88.031 (10.408)	88.487 (10.344)	88.736 (10.934)	88.828 (11.273)	88.589 (12.493)

Note 1: In line with the way RSiena handles missing values, the descriptive statistics are calculated based on the imputed data using the last-observation-carry-forward-method.

Note 2: To meet the time-homogeneity assumption of stochastic actor-based models, the first and last observation wave were omitted in accordance with the RSiena manual.

Table 7.2

	Observation wave (year)					
	1 (2010)	2 (2011)	3 (2012)	4 (2013)	5 (2014)	6 (2015)
<i>Dichotomized at 2 specialties shared</i>						
Network density	0.032	0.036	0.038	0.045	0.053	0.057
Average degree	2.500	2.837	3.038	3.550	4.175	4.537
Minimum outdegree	0	0	0	0	0	0
Maximum outdegree	9	11	11	13	15	18
Number of ties	200	227	243	284	334	363
Missing	0	0	0	0	0	0
<i>Dichotomized at specialists in 2 specialties shared</i>						
Network density	0.024	0.028	0.032	0.038	0.046	0.051
Average degree	1.900	2.212	2.525	3.000	3.650	4.025
Minimum outdegree	0	0	0	0	0	0
Maximum outdegree	8	10	10	13	14	17
Number of ties	152	177	202	240	292	322
Missing	0	0	0	0	0	0

Note: To meet the time-homogeneity assumption of stochastic actor-based models, the first and last observation wave were omitted in accordance with the RSiena manual.

The increase in inter-organizational relations is furthermore supported by Table 7.3, which displays the tie changes between each year and the accompanying Jaccard-index. The latter is well above the 0.3 threshold described in Ripley, Snijders (67). The $0 \rightarrow 0$ column contains the number of hospital dyads which remain unconnected between waves, which applies to the majority of dyads in the network. The $1 \rightarrow 1$ column includes the number of relations sustained between observation waves. The $0 \rightarrow 1$ and $1 \rightarrow 0$ column indicate the number of relations formed and dissolved between observation waves. More ties are created than dissolved between all observation waves under both dichotomization scenarios.

Table 7.4 shows the results of the final model under both dichotomization scenarios. The constants of the rate function indicate the rate by which each actor in the network has the opportunity to change ties (67, 68). The other parameters represent the so-called evaluation effects and can be split up in the network-based and hospital-based effects. The interpretation of the network-based effects is similar across all models, with the exception of the indegree popularity effect. The outdegree, three-cycle, and outdegree popularity effects are negative and significant. Hospitals thus send outgoing relations to a select number of hospitals and are less likely to receive relations from ‘friends-of-friends’. The reciprocity, transitivity, and out-out assortativity effects are positive and significant in all models. Hospitals are thus more likely to form relations with hospitals that already have a relation with them, with ‘friends-of-friends’, and with hospitals which also have many outgoing relations. The indegree popularity effect is positive and significant in one of the models and indicates that hospitals with many incoming relations are likely to receive even more incoming relations.

Table 7.4 furthermore indicates that size, quality, mergers, levels of competition, and distance all significantly influence the evolution of inter-hospital networks, albeit in different ways in both models. Large and high quality hospitals are significantly more likely to share specialists. Likewise, hospitals in close geographic proximity and which have obtained a license to merge are more likely to have relations amongst them. However, the influence of mergers and size is only significant at the 10% confidence level. The influence of size and quality is furthermore not consistent across both models. Lastly, the results of model 1 show a positive and significant effect of the percentage of services a hospital offers in the price-competitive market segment. Hospitals which offer many services in the price-competitive market segment are more likely to form cooperative inter-organizational relations. However, the effect is only significant in model 1.

Table 7.3

Observation wave (year)	0 → 0	0 → 1	1 → 0	1 → 1	Distance	Jaccard-index	Missing
<i>Dichotomized at 2 specialties shared</i>							
1 (2010) → 2 (2011)	6088	32	5	195	37	0.841	0
2 (2011) → 3 (2012)	6063	30	14	213	44	0.829	0
3 (2012) → 4 (2013)	6022	55	14	229	69	0.768	0
4 (2013) → 5 (2014)	5980	56	6	278	62	0.818	0
5 (2014) → 6 (2015)	5942	44	15	319	59	0.844	0
<i>Dichotomized at specialists in 2 specialties shared</i>							
1 (2010) → 2 (2011)	6139	29	4	148	33	0.818	0
2 (2011) → 3 (2012)	6112	31	6	171	37	0.822	0
3 (2012) → 4 (2013)	6069	49	11	191	60	0.761	0
4 (2013) → 5 (2014)	6021	59	7	233	66	0.779	0
5 (2014) → 6 (2015)	5987	41	11	281	52	0.844	0

Note: To meet the time-homogeneity assumption of stochastic actor-based models, the first and last observation wave were omitted in accordance with the RSiena manual.

Table 7.4

	Model 1 (dichotomized at 2 shared specialists between hospitals)			Model 2 (dichotomized at specialists in 2 specialties shared between hospitals)		
	Estimate	Standard error	Convergence ratio	Estimate	Standard error	Convergence ratio
Rate function						
Constant period 1	0.644	-0.10		0.534	-0.09	
Constant period 2	0.999	-0.13		0.862	-0.11	
Constant period 3	0.872	-0.12		0.938	-0.12	
Evaluation function						
Outdegree (density)	-3.596**	-0.49	0.068	-4.198**	-0.49	-0.052
Reciprocity	1.417**	-0.26	0.029	1.530**	-0.26	0.028
Transitivity	0.412**	-0.10	0.057	0.365**	-0.12	-0.006
Three-cycles	-0.639**	-0.19	0.058	-0.614**	-0.22	-0.005
Indegree popularity (sqrt)	0.087	-0.21	0.063	0.446*	-0.22	-0.053
Outdegree popularity (sqrt)	-1.148**	-0.36	0.060	-1.595**	-0.50	-0.041
Out-out assortativity	0.587**	-0.17	0.090	0.837**	-0.28	-0.054
Distance	-0.031**	-0.00	-0.030	-0.034**	-0.01	0.020
Merger	2.865†	-1.73	0.067	3.092†	-1.86	0.101
Service overlap	0.005	-0.01	0.006	0.000	-0.01	-0.020
Efficiency	0.042	-0.26	0.039	0.241	-0.51	-0.024
Financial performance	0.033	-0.08	0.003	0.129	-0.11	-0.055
Percentage price-competition	0.011*	-0.01	0.017	0.004	-0.01	-0.011
Size	0.002	-0.00	0.039	0.003†	-0.00	0.099
Quality	0.837*	-0.35	0.014	0.643	-0.48	-0.068
Total number of iteration steps	3929			4213		
Overall convergence ratio	0.1676			0.1944		

† = p < 0.1

* = p < 0.05

** = p < 0.01

*** = p < 0.001

Note: To meet the time-homogeneity assumption of stochastic actor-based models, the first and last observation wave were omitted in accordance with the RSiena manual.

Discussion

In this chapter we investigated the evolution of cooperative inter-organizational networks in the healthcare industry and the role of price-competition therein. We have done so in the Netherlands based on a common inter-organizational relation between hospitals, namely sharing medical specialists. This study is among the first to investigate which factors influence the formation and evolution of inter-organizational networks in the healthcare industry and contributes to existing literature on inter-organizational (healthcare) networks in three ways.

Firstly, we find that inter-organizational relations are formed (and inter-organizational networks hence evolve) as a result of social processes. Three such processes become apparent in our results. The first, indicated by the outdegree and the outdegree popularity effects, reveals that healthcare organizations are selective in their partners. That is, they form only a few of the $n-1$ possible ties and organizations with many outgoing ties are less likely to add outgoing ties. Hospitals thus seem to deliberately choose hospitals to share their resources with, supporting the notion that sharing specialists is best perceived as an organizational strategy, at least in the current empirical setting (58). The second, indicated by the transitivity, three-cycle, and assortativity effects, is that inter-organizational healthcare networks follow hierarchical structures. Hospitals tend to send out relations to other well-connected hospitals and are less likely to receive relations from hospitals which are 'lower' in hierarchy (i.e. friend-of-friend) (76). The third is that inter-organizational relations are likely to be reciprocated. Following the reasoning of Oliver (34), this suggests that relations are formed based on notions of collaboration and coordination among organizations.

Secondly, we find that inter-organizational networks serve as a potential vehicle to improve quality of care in the healthcare sector. Our results indicate that hospitals with above average quality ratings and larger hospitals are more likely to send out relations (i.e. share their specialists) to other hospitals. The former is true in the dichotomization scenario representing depth of collaboration while the latter is true for the scenario representing breadth of collaboration. These findings follow existing literature which suggests that combining complementary resources and learning from other organizations drive the formation of cooperative inter-organizational relations, both within and outside the healthcare context (e.g. 77, 78, 79). Although our findings support research which finds that well-structured networks facilitate high quality care (33, 46), they contradict the neoclassical perception of competition in health care. That is, in a (price-)competitive market, sharing key resources to competing organizations potentially erodes an organization's competitive advantage.

Thirdly, we find that competition stimulates the formation of inter-organizational relations. Research in non-healthcare industries has generated mixed conclusions regarding the influence of competition on the formation of cooperative inter-organizational relations (e.g. 37, 38, 39), while several studies in non-price-competitive healthcare markets found that competition increases the likelihood of cooperation (42, 44, 80). Our results indicate that in price-competitive healthcare markets, competition stimulates cooperation. This is indicated by the fact that inter-organizational relations between hospitals have become increasingly common congruent with the increase in price-competition and that hospitals which are exposed to higher degrees of price-competition are more likely to form cooperative relations. Furthermore, hospitals in similar geographical markets (i.e. geographical proximate hospitals) are more likely to form inter-organizational relations with each other. These findings also contradict the traditional neoclassical perception of competition which forms one of the main arguments of pro-competitive healthcare reforms (e.g. 2).

Because healthcare is predominantly a local (71, 80, 81) and highly concentrated market (4) our findings could indicate deliberate anti-competitive intents of healthcare organizations. This is particularly relevant to the type of inter-organizational relation used in our work as it potentially hinders effective managed competition (1, 82). Whether such behavior have anti-competitive effects depends on the degree to which quality can be improved through these relations, to what extent they result in abnormal prices, and if they do, how these are translated to insurance premiums of consumers (53). Future research should study these effects.

Limitations

This study has a few limitations. Firstly, medical specialists are not obliged to register their affiliations in the AGB-code database. However, Dutch health insurers data is reliable (83) and has previously been used to study the phenomenon (58). Secondly, inter-organizational relations were operationalized through shared medical specialists. Although this constitutes an emergent cooperative inter-organizational relation in the Netherlands (58), it potentially carries alternative meaning in other contexts. Regardless of the context however, sharing specialists constitutes an enduring flow of resources and knowledge between hospitals, a core characteristic of inter-organizational relations (34).

Conclusion

Cooperative inter-organizational networks in health care evolve as a result of social, quality-, and competition-related factors. High quality and greater exposure to price-competition both significantly enhance the likelihood of forming cooperative inter-organizational relations between healthcare organizations. These mechanisms are not in line with the traditional neoclassical view of competition which forms the backbone of many healthcare reform policies. The effects on consumer welfare, and hence the desirability of competition in healthcare markets, remain unclear.

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PART IV

Discussion, Summary, and Addenda

CHAPTER 8

General discussion

General discussion

In 2006, the Netherlands introduced competition in its healthcare system in an attempt to improve efficiency, stimulate patient-choice, and enhance solidarity (1-3). Considerable public and political debate regarding the desirability of competition in the health care sector has ensued ever since (4). The scientific evidence regarding the effect of competition in health care on outcomes such as price and quality of care is ambiguous (5). However, the majority of this evidence is based on empirical studies which disregard the cooperative inter-organizational strategies and relations of healthcare providers (i.e. organizations). Yet, it is common for healthcare providers to deliver their services in various cooperative inter-organizational networks (6-9). Therefore, the main aim of this dissertation was to study cooperative inter-organizational relations between healthcare providers in a price-competitive market. More specifically, this dissertation aimed to a.) study the interaction between pro-competitive reforms, inter-organizational relations, and health outcomes, b.) investigate the structure of inter-organizational networks between healthcare providers based on shared board members, shared professionals, and shared patients, including the evolution of these structures over time, and c.) examine the influence of (price-)competition on the formation of cooperative inter-organizational relations. These aims were met by one theoretical and five empirical studies, which have been presented in this dissertation. The remainder of this chapter will commence by summarizing the main findings of the studies presented in this dissertation. It will subsequently describe several theoretical as well as methodological reflections. The chapter concludes by discussing the implications of this work for policymakers and practitioners and by offering various suggestions for future research.

Main findings

The central argument of this dissertation, introduced in Chapter 2, is that the effect of competition in health care cannot be fully understood without considering the (networks of) cooperative inter-organizational relations of healthcare providers. Instead, they have an intermediary role between pro-competitive policy reforms, which are likely to influence the formation of inter-organizational relations, and health outcomes, which are likely to be influenced by the structure of inter-organizational networks. The empirical studies described in Chapter 3, Chapter 4, and Chapter 5 assess the structure of inter-organizational networks based on shared board members, shared medical professionals, and shared patients. The results of these chapters reveal that all these types of inter-organizational relations are common between healthcare providers in a price-competitive market. They

furthermore occur between organizations in similar geographical regions and have become increasingly common in line with the increase of price-competition. This could foster concerns regarding potential anti-competitive effects, especially in the case of shared board members, studied in chapter 3, and shared professionals, studied in chapter 4. Additionally, chapter 4 shows that inter-organizational relations are formed according to various strategic motives of healthcare providers including quality-related as well as competitive motives. However, chapter 5 indicates that the structure of inter-organizational networks, of referred (i.e. shared) patients, does not always resemble optimal network structures. The results of the studies in Chapter 6 and Chapter 7 indicate that the formation of inter-organizational relations is indeed influenced by competition. Contrary to the traditional view of competition markets however, chapter 7 indicates that price-competition stimulates cooperation between hospitals. Yet, chapter 6 reveals that organizations share different specialists to their direct competitors than to non-competitors, indicating that cooperation between direct competitors, a phenomenon known as cooptation, entails a different strategy than cooperation in general. Overall, inter-organizational relations between healthcare providers have the potential to increase consumer welfare, by increasing quality of healthcare services through inter-organizational knowledge sharing, as well as decrease consumer welfare through anti-competitive behavior.

Theoretical reflection

Occurrence of inter-organizational relations

The results of the studies described in this dissertation are unanimous in their finding that various types of cooperative inter-organizational relations are highly common in the healthcare industry. These findings underline the existing notion in health services research literature that healthcare is a service which is typically delivered by networks of cooperating providers (8-10). Existing research has furthermore shown that well-structured inter-organizational networks of healthcare providers can enhance the quality of the delivered services (e.g. 11, 12). Additionally, the studies described in this dissertation indicate that inter-organizational networks between healthcare providers have become increasingly common with the increase in price-competition over time (13). These findings thus substantiate the central argument of the dissertation that, solely studying market structure as much of the existing empirical literature has done (5) is inadequate when attempting to understand the effect of competition in health care. Instead, networks of inter-organizational relations constitute an intermediary between policy at the macro level and outcomes at the micro level.

Competition and cooperation: two peas in a pod

Considering that cooperative inter-organizational networks hold a mediating role between pro-competitive policy reforms and health outcomes, the pertinent question to understand the effect of pro-competitive healthcare reforms is whether and how competition influences the formation of inter-organizational relations between healthcare organizations. Competition and cooperation have traditionally been perceived as two non-reconcilable concepts. According to neoclassical theory, the ideal market consists of many buyers and sellers seeking to maximize their self-interest and interacting in arms-length transactions (14, 15). However, during the past two decades researchers have increasingly noted that a firm's performance cannot be understood without considering its inter-organizational relations, which can form a source of unique resources for organizations (e.g. 16, 17, 18). Consequently, cooperation and competition have increasingly been viewed as concepts which coexist and in which organizations engage simultaneously, rather than being considered two opposing ends of the same spectrum (18-21). In fact, more recent research has posited that competition leads to mutual awareness, repeated interaction, and personal knowledge and trust, which increases the likelihood that competing organizations cooperate (22). However, in for-profit industries, the empirical evidence that competitors indeed increasingly cooperate is mixed (22-25).

In line with research conducted in non-healthcare settings, the findings regarding the effect of competition on inter-organizational cooperation, presented in Chapter 6 and Chapter 7 of this dissertation, are somewhat mixed. That is, the results of the study described in Chapter 6 indicate that the level of competition to which an organization is exposed, defined as the cumulative degree of service overlap an organization has with organizations in a pre-defined geographical radius, does not influence the likelihood that an organization cooperates (with competitors). Conversely, the study described in Chapter 7 finds that organizations engaged in higher levels of price-competition are in fact more likely to cooperate and that cooperation is furthermore more likely between organizations located in close geographical proximity to one another (i.e. active in similar geographical markets). However, Chapter 7 also indicates that the degree of service overlap between organizations does not influence organizations' likelihood to cooperate.

Competition between healthcare providers is considered a function of the overlap of the services organizations provide and geographical market from which they draw patients (26). However, Chapter 6 and Chapter 7 both indicate that increased service overlap between organizations does not influence the likelihood that organizations cooperate. The results thus suggest that competing geographically (i.e. being active in the same geographical market) more strongly influences the cooperative behavior of healthcare providers than

being engaged in fierce service competition (i.e. offering many similar services than other organizations). This suggests that mutual awareness (22) predominantly stems from geographical proximity rather than service overlap. It is plausible that organizations pay more attention to organizations located in similar geographical markets and increasingly interact with these organizations. Following the mutual awareness argument of Trapido (22), repeated interaction builds trust between organizations, making cooperation with organizations in similar geographical markets more likely. The findings could also be partially driven by specific empirical decisions. For example, the cooperation has been operationalization as shared medical specialists in both chapters. Given the impracticalities for specialists to travel between distant organizations, this form of cooperation is likely to occur between geographical proximate organizations. Furthermore, in line with the approach of Sohn (26), service overlap was operationalized as the number of specialties which both organizations offer. However, most Dutch hospitals offer a relatively broad range of specialties (27). Service overlap between most hospitals is thus high and the degree of service overlap does not vary much between dyads of organizations. Additionally, a medical specialty is a relatively broad characterization of service offering. Specialists can offer a range of treatments within one specialty, which are not necessarily substitute services. Two organizations could hence both offer specialty X but offer distinct services within that specialty, effectively rendering service overlap between the organizations non-existent even though a high degree of service overlap is detected at specialty level. Future research should investigate this matter further and attempt to create more sophisticated measures of service overlap between healthcare organizations.

Despite their discrepancies, the empirical findings presented in Chapter 6 and Chapter 7 do indicate that competition does not make healthcare providers averse towards cooperation. This confirms that, at least in the healthcare industry, the traditional view of competing organizations as atomistic actors is inadequate (14, 16). The findings also explain the increased occurrence of various types of inter-organizational relations in an increasingly price-competitive healthcare market (13). They are furthermore in line with the outcomes of studies conducted in healthcare industries which are not based on price-competition (28-30). Overall, the existing empirical evidence thus suggests that competition increases the likelihood of inter-organizational cooperation in the healthcare industry. However, organizations can engage in competition and cooperation simultaneously (20, 21). Therefore, the fact that competition fosters collaboration between healthcare providers does not automatically imply that the level of competition has reduced. The co-existence of competition and cooperation between healthcare providers thus generates ample opportunities for future research.

Methodological reflection

Macro – Meso and Meso – Micro

Several lessons can be drawn from the methodologies employed by the work in this dissertation. While the central argument of the dissertation is that inter-organizational relations mediate the effect of pro-competitive healthcare reforms at the macro level and outcomes at the micro level, the empirical focus of the dissertation has been on the interaction between macro level policy and inter-organizational relations at the meso level. Although the effect of (networks of) inter-organizational relations at the meso level on outcomes such as costs and quality of care at the micro level has been the subject of existing research (11, 12, 31), it has not taken a central position in the empirical components of this dissertation. Analogous to the interaction between the macro, meso, and micro levels however, the effect of inter-organizational relations on micro level outcomes should not be overlooked. This is especially true for the implications of relatively understudied forms of inter-organizational collaboration in healthcare such as interlocking directorates and shared medical professionals on micro level outcomes. Future research should hence focus on the effect of such inter-organizational relations on outcomes such as costs and quality of care.

Insurance data: the good, the bad, and the ugly

The majority of the empirical studies presented in this dissertation are based on insurance data. One of the empirical studies was based on claims data and three empirical studies were based on the affiliation data of medical specialists to healthcare organizations. Using claims data is quite common in US-based research regarding matters of competition in health care (e.g. 32, 33). In the Netherlands however, claims data have primarily been used to study the effect of payment reforms such as bundled payments (e.g. 34). The use of insurance data other than claims data has not had similar applications in previous research. The work in this dissertation hence constitutes a first step towards utilizing insurance data (i.e. claims and non-claims data) for research purposes in the field of industrial organization of (Dutch) healthcare markets. All Dutch inhabitants are obliged to take out at least a basic insurance package for which health insurers cannot refuse applicants (35, 36). All health insurers in the country are furthermore obliged to submit their data to the national information center of health care (Vektis) on a quarterly basis. One of the main strengths of Dutch insurance data is therefore that it offers a comprehensive picture of the healthcare market. Similar to US-based claims data, Dutch claims data furthermore includes the actual price paid for specific services. The question whether this data should therefore be publically available to consumer has caused considerable public debate recently. Nonetheless, the availability of detailed price information adds to the usability of Dutch insurance data for research purposes, especially within the health services research realm and matters regarding the industrial organization of healthcare markets.

Like most secondary data sources, insurance data also has some inherent drawbacks. Most of these drawbacks are a consequence of the data's stand-alone nature. That is, insurance data result from the process of handling claims by healthcare providers to insurers. One of the most well-recognized drawbacks of Dutch insurance data is the lack of detailed clinical information (37). In specialized care for example, Dutch hospitals are reimbursed based on a home-grown DRG-like product structure called DBCs which is based on the resource utilization of the 'average patient' (38). Dutch claims data hence does not include information such which activities were performed how many times during the course of a patient's treatment. Similarly, the data is not linked with patients' medical records, rendering specific clinical details unobservable. Secondly, given the specificities of the claims procedure in Dutch healthcare and the quarterly cycle of submitting data to the national information center for health (Vektis), there is typically a time-lag in the availability of Dutch insurance data. Therefore, its application is predominantly in post hoc analysis. Another practical drawback is that coupling insurance data to other (secondary) data sources can be an arduous task. This became most apparent when accounting for mergers in some of the empirical studies. Healthcare providers with an intention to merge are obliged to indicate their intentions to the Dutch antitrust authority for approval. The antitrust authority keeps a record of when each merger is approved or forbidden, which in some cases requires an in-depth review of the case. Organizations which have obtained a license to merge but have not yet merged into one organizational entity continue to submit separate annual reports to the chamber of commerce. Once both organizations become one organizational entity, which can be at any point in time after having obtained the license to merge and which is occasionally preceded by a merger of the boards of both organizations (i.e. '*bestuurlijke fusie*'), a joint annual report will be submitted to the chamber of commerce. The records of the chamber of commerce will indicate that a merger has occurred once organizations submit one annual report. Lastly, Vektis registers a merger when the organizations actively request a new organizational ID for billing purposes (i.e. AGB code) or request that an existing code be discontinued. Organizations are not obliged to do so however. Lastly, the widespread use of lump-sum contracting of healthcare providers (13) can render the price of specific DBCs uninformative. Furthermore, hospital-to-insurance prices are intermediary prices. That is, following the structure of competitive healthcare markets, patients select the health plan to which they enroll based on monthly premiums and coverage of these plans (5), rather than hospital-to-insurers prices.

The network level of analysis

The empirical studies in this dissertation have been conducted at various levels of analysis. These include analyses at the level of individuals (i.e. board members of healthcare organizations, medical specialists, and patients), analyses at the level of healthcare

organizations, and analyses at the network level (i.e. a collection of multiple healthcare organizations and their cooperative ties). Although delivering healthcare to patients requires the cooperation of several organizations in various networks (9, 39, 40) and scholars argue that competition should occur between integrated networks of providers (41, 42), analyses at the network level have long been neglected in the healthcare industry (43). More recently however, network analysis has been described as an adequate way to analyze how health services are organized at the network level (44, 45). The application of longitudinal social network analysis, such as applied in Chapter 7 of this dissertation, is furthermore unprecedented in the health services research field. Although the empirical work in this dissertation thus offers a methodological advancement to existing literature, it has mainly studied horizontal networks, namely networks between organizations which offer similar services (46). Yet, vertical networks, namely between organizations active at different stages of the healthcare delivery process such as primary and secondary care providers are equally, if not more, common in the healthcare sector (47). These should hence be studied in future research regarding the organization of health care using social network analysis techniques.

Implications for policy and practice

Besides constituting a large part of the economy in most Western countries (5, 48), the healthcare industry, above all, concerns itself with peoples' health and well-being. In his seminal paper published approximately half a century ago, Arrow (49) noted that risk and uncertainty associated with health distinguishes the healthcare market from commodity markets. Yet, rising healthcare costs have rendered efficient healthcare delivery essential (50). Consequently, various countries have structured and reformed their healthcare sector based on the 'traditional', micro-economic, rules of competition (50, 51). Overall, the work in this dissertation has clearly demonstrated that inter-organizational relations in the form of shared board members, shared professionals, and shared patients are common in price-competitive healthcare markets and that they have become increasingly common in increasingly (price-)competitive healthcare markets. The degree of price-competition has furthermore been shown to significantly predict tie formation between healthcare organizations. The studies in this dissertation thus indicate that introducing pro-competitive reforms in the Dutch healthcare sector (i.e. at the macro level) has triggered increased inter-organizational cooperation by Dutch healthcare providers (i.e. at the meso level).

The findings of the studies in this dissertation can lead to two similar but distinct interpretations and subsequent courses of action by policymakers. To supporters of applying competition in the healthcare industry, they could be considered an indication of

anti-competitive behavior by healthcare organizations and be interpreted as evidence of collusion. In fact, interlocking directorates (i.e. shared board members) and shared medical professionals have both previously been described as potentially collusive by scholars (52, 53). Similarly, the Dutch healthcare authority recently indicated that concentrating specific service in a few selected organizations, which can occur by referring patients to these organizations, could also harness anti-competitive effects (54). In line with this interpretation, protagonists of competition in the healthcare could call for stringent anti-trust enforcement regarding horizontal inter-organizational cooperation between healthcare organizations. Scholars have in fact already suggested that besides mergers, anti-trust agencies should consider novel inter-organizational arrangements in the healthcare industry (55). Anti-trust regulations should furthermore be applied equally stringent in health care as in other markets (56). More stringent scrutiny of cooperation inter-organizational relations by the anti-trust authority will directly affect board members, professionals, and patients however. The study described in Chapter 4 of this dissertation revealed that specialists and board members are currently already weary of anti-trust punishment. Increased scrutiny of inter-organizational relations will likely only increase this notion. Therefore, more stringently applying anti-trust measures is only desirable in case inter-organizational relations clearly impede micro level outcomes such as costs, quality, and accessibility of care. To opponents of applying the competitive model in the healthcare industry, the findings of this dissertation could be perceived as an additional indication that healthcare markets deviate from commodity markets. This could lead to the conclusion that competition is ineffective and therefore undesirable in the healthcare industry. Consequently, antagonists of the competitive approach to healthcare could propose a shift away from the competitive model. It is unclear whether such an alternative healthcare system would also produce outcomes which place the Dutch healthcare sector among the best in the world (57, 58) however.

Directions for future research

The studies presented in this dissertation clearly show that inter-organizational networks should not be overlooked when studying healthcare markets. That is, researchers, policymakers, anti-trust agencies, and healthcare organizations should not solely focus on structural characteristics of healthcare markets. Instead, networks of various cooperative inter-organizational relations are common in health care, serve strategic purposes, and are influenced by competitive policies at the national (i.e. macro) level. At the same time however, inter-organizational networks merely constitute an intermediary outcome between macro level policies and micro level outcomes. While pro-competitive policy reforms are enacted with the intent to stimulate healthcare providers to compete more fiercely, this ultimately

serves as a means to improving micro level outcomes such as costs, quality, and accessibility of healthcare services. Therefore, several avenues for future research emerge from this dissertation. First and foremost, research should be concerned with the interplay between inter-organizational networks at the meso level and health outcomes at the micro level. That is, in order to contribute to efficient healthcare delivery, it should seek to reveal which network structures produce favorable health outcomes. Secondly, a wide range of inter-organizational relations have been identified in the healthcare industry, yet only some have been thoroughly studied empirically. Future research should thus not only focus on various forms of cooperative inter-organizational networks, it should predominantly seek to test the antecedents and effects of various types of relations empirically. Thirdly, research should focus on understanding the interrelation and interdependence between various networks. For example, it is unclear whether organizations which share board members are also more likely to share professionals or patients, and vice-versa. Understanding these interactions facilitates a deeper understanding of how healthcare markets function in practice. Some types of inter-organizational relations could furthermore be preludes of or substitutes for mergers between healthcare organizations, which are typically considered the extreme end of the spectrum of inter-organizational relations (59, 60) and directly influence the structural characteristics of healthcare markets. Fourthly, the studies presented in this dissertation have predominantly been conducted in the specialized care (i.e. hospital care) sector. Although in monetary terms this is typically the largest part of the healthcare industry (5), studying inter-organizational cooperation is equally relevant in other healthcare domains and is arguably most relevant when studied across various domains of the healthcare industry. Future research should hence attempt to do both of these.

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Summary

Summary

Although the Netherlands has introduced (price-)competition in its healthcare industry in an attempt to curb the trend of increasing health expenditure and optimize the quality of healthcare services, scientific evidence regarding the effect of competition in health care is mixed. This is, at least in part, due to the fact that empirical studies overlook cooperation between competing healthcare providers, while inter-organizational cooperation is a widespread phenomenon in the healthcare sector. Therefore, this dissertation aimed to study cooperative inter-organizational relations between healthcare organizations in a price-competitive healthcare market. Specifically it assessed the conceptualization of inter-organizational relations, studied the structure, evolution, and formalization of various network ties, and investigated the influence of competition on the formation of such relations. The dissertation is split up into four parts.

Chapter 2 constitutes Part I of the dissertation and describes the central notion and theoretical foundation of the dissertation. It establishes the role and relevance of cooperative inter-organizational relations in pro-competitive healthcare reforms. Based on a narrative literature review, Chapter 2 introduces a conceptual framework to guide the empirical investigation of competition in healthcare markets. In this framework, cooperative inter-organizational relations are positioned alongside structural market characteristics at the meso level, which forms the intermediary between pro-competitive reforms at the macro level and outcomes at the micro level. Several testable propositions are derived from the framework. These pertain to i.) the relation between macro level policy reforms and meso level inter-organizational relations, ii.) the relation between market structure and inter-organizational relations at the meso level, iii.) inter-organizational relations at the meso level and micro level outcomes, and iv.) the influence of micro level outcomes on macro level policy reforms.

Part II of the dissertation is comprised of Chapter 3, Chapter 4, and Chapter 5. The focus of **Chapter 3** is on networks of interlocking directorates (i.e. shared board members) between Dutch healthcare organizations. While they have been widely studied in various industries, interlocking directorates have attracted only limited academic attention in the healthcare industry. The quantitative study described in chapter is based on the annual reports of Dutch healthcare organizations in 2007 and 2012. The results indicate that approximately half of the healthcare organizations in the Netherlands are connected through direct interlocking directorates. These ties furthermore exist between organizations located in similar geographical regions and which provide similar types of services. Interlocking directorates have also become increasingly common over time, congruent with the increase

of price-competition. Additionally, half of all market entrants in the specialized care market are connected to incumbent hospitals through interlocking directorates or alternative affiliations of their board members. In line with existing research, the evidence presented in Chapter 3 indicates that interlocking directorates constitute a mechanism to reduce environmental uncertainty in the Dutch healthcare sector. However, the findings also raise traditional antitrust concerns of interlocking directorates.

In **Chapter 4**, the phenomenon of shared professionals (i.e. medical specialists) is explored using a mixed-methods approach. Although sharing medical specialists is considered widely common in the healthcare industry and it has been explicitly mentioned as a potential anti-competitive force, it has remained a relatively understudied form of inter-organizational cooperation in the healthcare industry. The quantitative findings of Chapter 4 indicate that all hospitals share medical specialists, that sharing medical specialists occurs in every medical specialty, and that sharing specialists has become increasingly common over time in approximately half of all specialties. The qualitative findings of Chapter 4 furthermore indicate that medical specialists can have various motives to be affiliated to multiple organizations. These include improving quality of care, facilitating sub-specialization, adhering to volume requirements, lowering the amount of night and weekend shifts, working with diverse teams, and financial benefits. Along similar lines, healthcare organizations will share medical specialists if it serves strategic purposes such as adhering to volume requirements, securing market share, monopolize markets, or deterring market entry. Given the formal decision-making authority of hospital boards to share their specialists, sharing medical specialists is best considered a deliberate but emergent cooperative strategy of healthcare organizations.

Chapter 5 examines the structure of patient referral networks (i.e. shared patients) in Dutch oncological care, one of the most deadly and costly conditions in many countries. Using claims data of all Dutch health insurers, Chapter 5 tests how existing referral networks resemble structures which are considered favorable by several prominent stakeholders in Dutch oncology. It does this for three high-volume and three low-volume cancer types. The results indicate that although the referral networks are structured differently across tumor types, up to 42% of all cancer patients are referred to different organizations at least once during the course of their treatment. Up to 53% of the patients are furthermore referred back to their original organization at some point during their treatment. Organizations typically refer patients with common forms of cancer to various other organizations, while referring patients with less prevalent types of cancer to fewer organizations. Referral networks of prevalent cancer types are denser and more centralized than those of rare cancer types. Furthermore, the structure of observed referral networks varies considerably from their planned counterpart. As a result, organizations need to adapt their often routinized patient

referral patterns and integrated financing mechanisms could be a way to incentivize organizations to do so.

Part III of the dissertation is formed by Chapter 6 and Chapter 7. **Chapter 6** studied cooperation and coopetition (i.e. simultaneous cooperation and competition) in the healthcare sector, using shared medical specialists as a proxy of inter-organizational cooperation. It aimed to understand the differences between these two inter-organizational strategies. The study shows that organizations share different medical specialists to their competitors than to their non-competitors. This indicates that cooperation and coopetition are two distinct strategies of healthcare providers. Cooperation mainly seems to manifest itself through spin-off formation, indicated by the fact that male specialists who have been affiliated to the organization for a longer period of time are typically shared by organizations which belong to a group of co-owned organizations. Conversely, coopetition is predominantly used by independent treatment centers, which are typically active in the price-competitive market segment. In coopetition, tenured specialists are mainly shared to organizations located in separate geographical markets. Specialists of academic hospitals are less likely to be shared and specialists with higher degrees of specialization and with more experience are neither more nor less likely to be shared. Consequently, the learning-effect, which is commonly perceived as one of the most important aims of cooperation and coopetition, might not be maximized leaving the benefits of these two strategies for patients unclear. However, coopetition does not seem to be an anti-competitive strategy.

Similar to Chapter 6, **Chapter 7** also uses shared medical specialists as a proxy of collaboration between hospitals. While various motives to form cooperative inter-organizational relations have previously been studied, this chapter investigates the influence of price-competition on the formation of cooperative inter-organizational relations between hospitals over time. In line with the preceding chapters, the study described in Chapter 7 reveals that inter-organizational cooperation between hospitals has become increasingly common over time. Large hospitals, hospitals with above average quality ratings, hospitals with a license to merge, and hospitals in close geographical proximity are particularly prone to cooperate. Furthermore, the greater the degree of price-competition in which a hospital is engaged, the more likely the hospital is to share its specialists to other hospitals. This indicates that price-competition in the healthcare industry fosters collaboration between healthcare providers. The effect of this behavior on consumer welfare is unclear. On the one hand, the fact that competing hospitals tend to cooperate more often and do so with hospitals in close geographical proximity could indicate anti-competitive behavior which could lead to reduced consumer welfare. Contrastingly however, the fact that high-quality hospitals are particularly prone to cooperate could increase consumer welfare by raising the quality of all providers in the market through inter-organizational knowledge transfer.

Chapter 8 constitutes Part IV of the dissertation. It presents the main findings of the studies included in this dissertation. It furthermore discusses the theoretical contributions of the work, the methodological strengths and weaknesses, the implications for policymakers and practitioners, and several avenues for future research. Overall, the studies presented in the dissertation indicate that various forms of cooperative inter-organizational relations are common in the healthcare industry, have become increasingly common over time, and are formed according to various strategic motives. The dissertation thus demonstrates that analyzing (the evolution of) healthcare systems at the network level can generate useful insights. These can furthermore be generated with routinely collected insurance data. Lastly, although price-competition coexists with and can even stimulate cooperation between healthcare providers, cooperation and coopetition do entail two distinct strategies. Policymakers can hence interpret the findings of the dissertation as evidence that antitrust regimes should be more stringent or that the traditional competitive model does not apply to health care.

Samenvatting

Samenvatting

In 2006 werd er, middels de introductie van de Zorgverzekeringswet (Zvw), prijsconcurrentie ingevoerd in het Nederlandse zorgstelsel. De voornaamste redenen hiertoe waren het afremmen van de toenemende zorgkosten en het verhogen van de kwaliteit van zorg. Het wetenschappelijk bewijs omtrent het effect van concurrentie in de gezondheidszorg is echter wisselend. Dit is deels te verklaren doordat empirisch onderzoek veelal methoden hanteert die geen rekening houden met samenwerkingsrelaties tussen verschillende zorgaanbieders, terwijl dergelijke relaties wijdverspreid zijn in het zorglandschap. Het doel van dit proefschrift was daarom om samenwerkingsrelaties tussen zorginstellingen te onderzoeken in een zorgmarkt waarin prijscompetitie van kracht is. Binnen het onderzoek dat in dit proefschrift beschreven is, werd eerst bepaald welke rol samenwerkingsrelaties vervullen in het zorgstelsel. Vervolgens werd de structuur, de evolutie en de formalisering van verschillende samenwerkingsrelaties tussen zorginstellingen onderzocht. Tot slot werd de invloed van concurrentie op het ontstaan van samenwerkingsrelaties tussen zorginstellingen getoetst. Het proefschrift bestaat in totaal uit vier delen.

Hoofdstuk 2 beslaat het eerste deel van het proefschrift. Hierin is het theoretisch fundament van het proefschrift beschreven. Op basis van een narratieve literatuurstudie wordt in hoofdstuk 2 een conceptueel model geïntroduceerd. Dit model vormt een leidraad voor verder empirisch onderzoek naar het effect van (de introductie van) concurrentie in de zorgsector. Samenwerkingsrelaties tussen zorginstellingen worden in dit model, samen met marktstructuur, gezien als het mesoniveau. Samenwerkingsrelaties en marktstructuur vervullen een intermediërende rol tussen de invoering van concurrentie op beleidsniveau (i.e. macroniveau) en patiëntuitkomsten op microniveau. Het model is tevens voorzien van een aantal empirisch te testen proposities. Deze proposities beschrijven I.) de samenhang tussen beleidsveranderingen op macroniveau en samenwerkingsrelaties op het mesoniveau, II.) de samenhang tussen marktstructuur en samenwerkingsrelaties binnen het mesoniveau, III.) de samenhang tussen samenwerkingsrelaties op het mesoniveau en patiëntuitkomsten op het microniveau en IV.) de samenhang tussen patiëntuitkomsten op het microniveau en beleidsveranderingen op het macroniveau.

Deel 2 van het proefschrift bestaat uit hoofdstuk 3, hoofdstuk 4 en hoofdstuk 5 waarin verschillende samenwerkingsrelaties tussen zorginstellingen zijn bestudeerd. In **hoofdstuk 3** ligt de focus op netwerken van zogenoemde '*interlocking directorates*', oftewel bestuurlijke dubbelrollen in de Nederlandse gezondheidszorg. Dergelijke dubbelrollen ontstaan wanneer bestuurders of toezichhouders van zorginstellingen actief zijn als bestuurder en/of toezichthouder in meerdere zorginstellingen tegelijk. Hoewel bestuurlijke dubbelrollen

in verschillende bedrijfstakken veelvuldig onderwerp van wetenschappelijk onderzoek zijn geweest, is dat in de zorg slechts in beperkte mate het geval. Hoofdstuk 3 beschrijft een kwantitatieve studie die gebaseerd is op de jaarverslagen die Nederlandse zorginstellingen in 2007 en 2012 hebben gedeponneerd. De uitkomsten van deze studie tonen aan dat ongeveer de helft van alle zorginstellingen in Nederland aan een of meerdere andere zorginstellingen gelinkt zijn middels bestuurders in dubbelrollen. Bovendien komt het voor dat bestuurders dubbelrollen hebben bij organisaties die in een vergelijkbare geografische markt actief zijn en die vergelijkbare diensten aanbieden. Parallel aan de toenemende mate van prijsconcurrentie kwamen bestuurlijke dubbelrollen in 2012 significant meer voor dan in 2007. Verder heeft de helft van alle toetreders tot de markt van medisch specialistische zorg een relatie met een bestaande instelling in diezelfde markt. Hetzij via bestuurders of toezichthouders die eenzelfde rol vervullen in een bestaande organisatie in de markt, hetzij door middel van bestuurders of toezichthouders die actief zijn als medisch specialist in een bestaande organisatie in de markt. Deze resultaten suggereren dat bestuurlijke dubbelrollen voor zorgorganisaties een manier kunnen zijn om grip te houden op de externe omgeving. Daarmee worden de bevindingen uit andere bedrijfstakken bevestigd. Net als in andere bedrijfstakken roepen ze echter ook mededingingsrechtelijke vragen op.

In **hoofdstuk 4** is door middel van een combinatie van kwantitatieve en kwalitatieve onderzoeksmethoden het fenomeen van zorgprofessionals (i.e. medisch specialisten) met een aanstelling in meerdere zorginstellingen geëxploreerd. Tentatief bewijs suggereert dat *het delen van medisch specialisten* tussen zorginstellingen veelvuldig voorkomt en het fenomeen wordt door sommigen auteurs in de literatuur gezien als mogelijk concurrentiebeperkend. Er bestaat echter nog geen wetenschappelijk bewijs waaruit blijkt hoe wijdverspreid het delen van medisch specialisten daadwerkelijk is, noch waaruit blijkt wat de motieven van specialisten zijn om in meerdere instellingen te werken of wat de motieven zijn van zorginstellingen om specialisten te delen. Het kwantitatieve deel van het onderzoek bewijst dat alle ziekenhuizen in Nederland medisch specialisten delen met één of meer andere ziekenhuizen, dat het fenomeen niet is voorbehouden aan specifieke specialismen en dat in ongeveer de helft van alle specialismen het delen van specialisten significant is toegenomen in de loop der jaren. Het kwalitatieve deel van het onderzoek wijst uit dat specialisten voornamelijk in meerdere instellingen willen werken om de kwaliteit van zorg te verbeteren, subspecialisatie mogelijk te maken, aan volumennormen te voldoen, het aantal nacht- en weekenddiensten te kunnen verdelen over meer collega's, in verschillende teams te werken en om er financieel op vooruit te gaan. Vergelijkbaar met deze motieven is het voor zorginstellingen aantrekkelijk om specialisten te delen vanwege strategische overwegingen zoals het voldoen aan volumennormen, het veiligstellen van marktaandeel, het monopoliseren van markten, of het weren van toetreders tot de markt. Gezien de

formele beslissingsbevoegdheid van het ziekenhuisbestuur om specialisten wel of niet te delen met andere organisaties kan het delen van specialisten getypeerd worden als een spontane samenwerkingsstrategie (i.e. emergent strategy) van ziekenhuizen.

Hoofdstuk 5 focust zich op *patiëntenstromen* tussen verschillende zorginstellingen. In de studie zijn patiëntenstromen van oncologische patiënten bestudeerd. In veel Westerse landen is kanker niet alleen een van de meest dodelijke- maar tevens een van de duurste aandoeningen. Op basis van declaratiegegevens van alle Nederlandse verzekeraars wordt in hoofdstuk 5 getoetst in welke mate verwijksnetwerken van oncologische patiënten in 3 hoog-volume en 3 laag-volume tumorsoorten overeenkomen met het verwijksnetwerk dat verschillende stakeholders in de Nederlandse oncologiezorg als optimaal beschouwen. De resultaten van de studie wijzen uit dat patiëntverwijzingen in alle tumorsoorten voorkomen. In de tumorsoort waar patiëntverwijzingen het meest voorkomen, wordt 42% van de patiënten minimaal 1 keer verwezen naar een andere instelling. Ten hoogste 53% van deze patiënten wordt uiteindelijk terugverwezen naar de instelling die hen in eerste instantie verwees. Ziekenhuizen gebruiken meerdere verwijkspartners (i.e. andere ziekenhuizen) voor patiënten met hoog-volume tumoren, terwijl zij voor patiënten met laag-volume tumoren over het algemeen slechts één verwijkspartner hanteren. Verwijksnetwerken van hoog-volume tumoren hebben een hogere dichtheid en zijn meer gecentraliseerd dan die van laag-volume tumoren. De structuren van de verwijksnetwerken van hoog- en laag-volume tumoren wijken af van de optimale structuur. Ziekenhuizen zullen hun verwijksroutines dus actief moeten aanpassen om aan de optimale structuur te voldoen. Integrale bekostiging zou hiertoe een incentive kunnen vormen.

Deel 3 van dit proefschrift bestaat uit hoofdstuk 6 en hoofdstuk 7 en analyseert de invloed van concurrentie op samenwerkingsrelaties tussen zorginstellingen. In **hoofdstuk 6** is het verschil tussen samenwerking en coöpetitie (i.e. het gelijktijdig plaatsvinden van concurrentie en samenwerking) tussen organisaties onderzocht. In de studie is onderzocht of er verschillen bestaan tussen deze twee strategieën. Het delen van medisch specialisten, het fenomeen dat in hoofdstuk 4 werd geëxploreerd, dient in deze studie als indicatie van samenwerking tussen zorgorganisaties. De resultaten van deze kwantitatieve studie laten zien dat zorgorganisaties andere specialisten delen met directe concurrenten dan met organisaties die geen directe concurrent zijn. Coöpetitie en samenwerking vormen dus twee verschillende strategieën. Coöpetitie is een strategie die voornamelijk wordt toegepast door zelfstandige behandelcentra, organisaties die veelal zorg uit het prijs-competitieve B-segment aanbieden. In situaties van coöpetitie worden over het algemeen specialisten die in loondienst zijn gedeeld met organisaties die in een andere geografische markt actief zijn. Samenwerking komt voornamelijk tot uiting in de vorm van spin-offs. Dit blijkt

uit het feit dat specialisten die al lang aan een organisatie verbonden zijn vaker worden gedeeld en dat dit in het bijzonder wordt gedaan door organisaties die deel uitmaken van een groep waaronder meerdere zorgorganisaties vallen. De studie laat tevens zien dat mannelijke specialisten vaker gedeeld worden dan vrouwelijke en levert geen bewijs voor het leereffect. Specialisten met meer ervaring of met een doctoraat worden namelijk niet meer of minder gedeeld dan anderen en specialisten van universitaire centra worden zelfs minder vaak gedeeld dan specialisten van andere ziekenhuizen. Hoewel coöpetitie geen anti-competitieve strategie lijkt te zijn, blijven de effecten van deze strategie voor patiënten onduidelijk.

Net als hoofdstuk 6 gebruikt ook **hoofdstuk 7** gedeelde specialisten als een proxy voor samenwerking tussen ziekenhuizen. Hoewel de wetenschappelijke literatuur verschillende motieven van organisaties beschrijft om samenwerkingsrelaties aan te gaan, focust de studie die in hoofdstuk 7 beschreven staat zich op de invloed van prijsconcurrentie op het aangaan van dergelijke relaties. Evenals uit voorgaande hoofdstukken blijkt uit hoofdstuk 7 dat samenwerkingsrelaties tussen Nederlandse ziekenhuizen in toenemende mate voorkomen. Daarnaast blijkt uit de studie dat grote ziekenhuizen, ziekenhuizen die bovengemiddelde kwaliteitsscores hebben, ziekenhuizen met een goedgekeurd fusieverzoek, en ziekenhuizen die dicht bij elkaar liggen meer samenwerkingsrelaties hebben. De hoeveelheid prijsconcurrentie waarin een ziekenhuis verwickeld is, beïnvloedt bovendien het aantal samenwerkingsrelaties dat het ziekenhuis heeft. Hoe hoger de mate van prijsconcurrentie, hoe meer samenwerkingsrelaties een ziekenhuis heeft. Concurrentie tussen ziekenhuizen lijkt daarmee vooral een stimulans voor ziekenhuizen om samen te werken. Het effect hiervan op de consumentenwelvaart (i.e. patiënten) is onduidelijk. Enerzijds kan het feit dat samenwerkingsrelaties zich vooral manifesteren bij ziekenhuizen die aan veel prijsconcurrentie onderhevig zijn en tussen ziekenhuizen die dicht bij elkaar liggen duiden op anti-competitief gedrag, wat een negatieve invloed zou kunnen hebben op de consumentenwelvaart. Anderzijds kan het feit dat samenwerkingsrelaties vooral worden aangegaan door ziekenhuizen die bovengemiddelde kwaliteitsbeoordelingen hebben een indicatie zijn van kennisdeling waardoor de kwaliteit van zorg gestimuleerd wordt, wat een positief effect kan hebben op de consumentenwelvaart.

Hoofdstuk 8 beslaat het vierde en laatste deel van dit proefschrift. Hierin zijn de belangrijkste bevindingen van het proefschrift beschreven. Verder zijn de theoretische contributies van de studies, de methodologische sterktes en zwaktes en de implicaties voor de praktijk en beleid uitgelicht. De studies die in dit proefschrift beschreven staan, wijzen uit dat samenwerkingsrelaties tussen zorginstellingen verschillende verschijningsvormen kennen, wijdverspreid zijn, in toenemende mate toegepast worden en op basis van verschillende

strategische motieven worden aangegaan. Hiermee demonstreert dit proefschrift dat het bestuderen van netwerken tussen zorginstellingen een waardevolle manier is om (de evolutie binnen) de zorgsector te bestuderen. Verzekeraarsdata, die structureel verzameld worden door zorgverzekeraars, vormen in dit opzicht een belangrijke bron van data en informatie. Hoewel (prijs)concurrentie en samenwerking gelijktijdig kunnen bestaan tussen zorgorganisaties, vormen samenwerking en coöpetitie twee verschillende strategische keuzes. Beleidsmakers kunnen de bevindingen van dit proefschrift interpreteren als bewijs dat er in de zorgsector behoefte is aan strikter toezicht op mededingingsvraagstukken of als bewijs dat het competitieve model niet werkt in de zorg.

Valorization

Valorization

‘Think before you act’ is a principle which is instilled within most individuals at an early age. It is typically reiterated shortly after an undertaking which lacked sufficient (or any) anticipatory thinking and serves as a warning for future endeavors. In essence, it endorses one to contemplate whether or not to act at all. As one advances through the various layers of the educational system, thinking becomes increasingly emphasized in spite of acting. Doctoral education, arguably the pinnacle of that educational system, consequently brings forth thinkers (intellectuals). Obliging these very thinkers to act after they have thought is quite the reverse of what has been instilled within them for many years and can thus be a daunting task. Nevertheless, it makes things come full circle. Hence, this chapter describes the practical relevance and implications of the research which has been presented in this dissertation.

General relevance

In most developed countries, the healthcare sector constitutes the largest sector of the economy, outdoing commonly known sectors such as construction, broadcasting and telecommunication, or computer and electronic products (1). In 2015, the average OECD country spent 9% of its gross domestic product (GDP) on health care for example, an increase of almost 2% compared to the average expenditure on health in OECD countries in 2000 (2). In other words, health expenditure is high and on the rise. Many countries feel the need to break the upward trend of health expenditure in order to keep healthcare accessible to future generations and have passed various reforms towards this aim (3). Not surprisingly, the field of health services research (or health systems research), which studies how health services are delivered and organized, has become increasingly well-established during the past two decades (4). In fact, given the sheer (economic) size of the healthcare industry and its relevance to people’s overall health and wellbeing, one could argue that health services research is one of the most vital areas of scientific research today. It is within that very context and with the aim to contribute to creating an efficient and well-functioning healthcare system which will guarantee the access to health care services for future generations that this research has been undertaken.

One of the crucial distinctions between health services research and biomedical or clinical research is the context-specific nature of health services research work (5). The Netherlands is no exception to the trend of high and increasing health expenditure. In 2015, the country spent almost 11% of its Gross Domestic Product (GDP) on health care (roughly 72 billion

Euros), making it the largest spender on health with the exception of the United States (2, 6). In the same year, the combined expenses on health and social care even approximated 94 billion Euros, roughly 14% of the country's GDP (6). However, the Dutch healthcare system is, as are the healthcare systems of nearly all countries, one of a kind. Like in many countries, healthcare and the healthcare system have furthermore been a matter of fierce public debate in the Netherlands. While the discussants typically agree that providing high quality and affordable healthcare to the entire population is an important goal, opinions about how to reach that goal at a macro level (i.e. how to organize the healthcare sector) can deviate substantially. The current way of organizing the healthcare sector in the Netherlands (i.e. through mechanisms of managed competition between providers and third-party payers) has been the focus of the studies presented in this dissertation. Through studying the way the healthcare system functions, this research seeks to contribute to a sustainable healthcare system. Its findings are hence relevant to all who concern themselves with healthcare in the Netherlands.

Relevance for researchers

This research has three main points of relevance for scholars in the health services research and healthcare management field. First and foremost, the research presented in this dissertation advances the study (and understanding) of various types of inter-organizational relations which are present in the healthcare industry. They challenge healthcare management and health services research scholars to go beyond studying well-known and commonly studied types of inter-organizational relations like patient transfers or contractual alliances. This dissertation includes several papers which study forms of inter-organizational relations which had previously remained under-researched in the healthcare industry (e.g. shared medical specialists). These papers have been well-received in respectable outlets such as the Academy of Management conference, EGOS colloquium, and Social Science and Medicine journal. This serves as a testament to the notion that inter-organizational relations occupy a relevant space within the health services research and healthcare management fields. The studies in this dissertation advance scholars' understanding of the healthcare sector and encourage them to investigate novel types of inter-organizational relations within the industry (i.e. at the meso-level).

Secondly, four of the five empirical studies described in this dissertation utilize a network perspective. That is, they utilize an analysis of inter-organizational relations which transcend the traditional dyadic (i.e. between two organizations) approach. The fragmented nature of the healthcare industry is well recognized throughout the health services research and

healthcare management fields. As a result of this fragmentation, scholars agree that various organizations or organizational units typically collaborate with one another in order to deliver healthcare services to patients. Nevertheless, a large share of the scientific research still uses single organizations or dyads of two organizations as the unit of analysis. The studies in this dissertation have shown, albeit in some cases in a mere descriptive sense, that the whole network can be a useful level of analysis to understand certain phenomenon on an industry-wide scale. Researchers are thus stimulated to utilize networks as level of analysis in future studies within the industry.

Thirdly, this dissertation contributes to the rich field of science concerned with studying the effects of (price-)competition in health care. Most importantly, it makes a case for incorporating various types of inter-organizational arrangements in these studies, rather than merely focusing on market structure as predictors of organizational performance. In essence, the argument is made that the combination of industrial organization paradigms and healthcare management principles can together foster a deeper and clearer understanding of the effects of competition in the healthcare industry. Combining these research fields in future studies should hence bring forth new insights within the sector and open several relevant avenues for scientific discovery.

Relevance for policymakers

The past decade has seen an increasing emphasis on the use of scientific evidence in health policy (5). Ultimately, the managed competition is one of many different ways to organize a country's healthcare system at the macro level. In practice, the choice to (continue to) let the healthcare system revolve around the principles of managed competition is hence one of policymakers. The studies presented in this dissertation reveal to policymakers one of the effects of their choice to utilize price-competition in the Dutch healthcare sector. At the very least, it demonstrates that even within a price-competitive regime, healthcare providers increasingly cooperate with one another in various ways. This could in fact challenge the assumptions underpinning the principle of managed competition. During the course of this dissertation trajectory, (preliminary versions of) these results have hence been disseminated to the Dutch Healthcare Authority and the Dutch Antitrust Authority, which concern themselves with adequate functioning of healthcare markets and antitrust issues in the healthcare market. On the other hand, the exploratory study of shared medical specialists reveals that competition is not the only factor driving cooperation between healthcare providers. Increasing medical specialization, minimal volume requirements and other purchasing strategies of health insurers, and increasing prevalence of comorbidities

are a few examples of factors which increase providers' need to cooperate in order to be able to deliver (high quality) health care services. The research presented in this dissertation thus indicates to policymakers that various processes reinforce or counteract one another when it comes to the strategies employed by healthcare organizations. Such processes not only constitute top-down policy reforms but also include bottom-up phenomena stemming from professionals, healthcare organizations, third-party payers (such as insurers), and other stakeholders.

Relevance for practitioners

From a practical perspective, some of the empirical research presented in this dissertation perhaps constitutes a mere formalization of ongoing processes. That is, part of the empirical work regarding cooperation through shared board members or shared medical professionals is descriptive in nature and thus illustrates the occurrence of and changes in specific cooperative strategies. However, these studies all reveal the widespread nature of such cooperative strategies, indicating to managers of healthcare organizations that organizational boundaries are becoming increasingly blurred in the current healthcare landscape and that traditional, mono-organizational views to managing healthcare organizations likely seem outdated. Research nascent to the PhD trajectory has furthermore indicated that crossing organizational boundaries can have various effects on the employability of health professionals. Healthcare managers and health professionals alike can translate these insights into direct policy by closely considering how well professionals fit in other environments in order to maximize the benefit boundary spanning behavior by professionals. Particularly because previous research has indicated that physicians do not necessarily perform equal in different organizations (7)

Building on findings which showed that hospitals can utilize vertical inter-organizational relations to serve strategic purposes (8), our research suggest that horizontal inter-organizational relations could have similar effects. In order to fully comprehend the relation between horizontal inter-organizational relations and the performance of healthcare organizations however, further empirical research is warranted. A novel research project is therefore being initiated within the current Health Services Research department to investigate which types of inter-organizational relations contribute to positive patient (i.e. micro level) outcomes in which way.

Knowledge dissemination

The knowledge produced by the studies presented in this dissertation has been disseminated through various channels during the past several years. These include the common methods of scientific knowledge dissemination by way of numerous presentations during international scientific conferences and various publications in international peer-reviewed scientific journals. However, there has been a strong emphasis on disseminating the knowledge generated by the work presented in this thesis in a more direct way to policymakers and practitioners rather than to just fellow academics. Such dissemination has been strongly encouraged through the Academic Collaborative Center for Sustainable Care, a joint initiative of Maastricht UMC+ and Maastricht University. The Academic Collaborative Center for Sustainable Care has funded this research and the practical impact of scientific research is one of its core driving philosophies. Examples of such direct knowledge dissemination include sharing published work through online communication channels, the creation of audiovisual material to support the research and distributing it through online outlets, publications in open source national and international journals about nascent fields and topics (e.g. competition in mental health care and vertical integration), presenting (preliminary) results to independent regulatory agencies in the Netherlands such as the Dutch Healthcare Authority and the Dutch Antitrust Authority, incorporation of the research findings in teaching material for students in the master program Health Policy, Innovation and Management, and conducting consultation work for local healthcare providers and policymakers regarding the management and organization of health care. All of these activities have contributed to directly translating the insights gained from the research work conducted during the past years to practical knowledge relevant to a wide range of stakeholder. In future work, knowledge dissemination furthermore continues to be an important pillar. In fact, several new research projects have already been initiated in collaboration with independent regulatory agencies, local policy makers, and healthcare managers. These co-created projects not only ensure that the most practically relevant research questions are being addressed but also that the results of these studies are translated into direct actionable insights.

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List of publications

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Dankwoord

Dankwoord

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hebben geleverd. Het is een stukje sturen van Maastricht naar Zeist en weer terug maar het was het dubbel en dwars waard en ik zou de keuze om met jullie te werken zonder enige vorm van twijfel weer maken. Sterker nog, ik hoop dat er nog vele gezamenlijke projecten volgen in de toekomst, in Zeist, Maastricht of ergens daar tussenin.

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Geweldige kamergenootjes van 0.015, wat had ik zonder jullie moeten doen? Met 6 kids en een zevende onderweg was het in ieder geval een hele vruchtbare kamer (no pressure Mitchel en Ingrid). Maar veel belangrijker nog, het was met afstand de leukste kamer op DUB 30! Diepgaande discussies over willekeurige maar altijd heel belangrijke en meestal lichtelijk feministisch getinte onderwerpen met Willemine. Talloze tips en tricks over wat wel en niet te doen met pasgeboren en aanstaande kinderen van Linda. Samen met Sofie de leuke maar vooral ook de minder leuke kanten van promoveren meemaken. Ingrid als benjamin van het stel iets wijs proberen te maken (niet dat het ooit echt lukte). Als mannen onder elkaar lullen over Ajax (ik hoop overigens dat het me met de nieuwe FIFA beter zal vergaan dan de vorige) of over een van de vele series waarvan Mitchel volledige op de hoogte was (met wie moest ik nu het nieuwe seizoen Game of Thrones doornemen?). Met z'n alle room-escapen en gezellig een hapje eten. Nieuwe huizen zoeken, kopen, bekijken en bespreken. Wat het ook was het was super! Hoewel onze paden inmiddels wat uit elkaar zijn gelopen, kijk ik met heel veel plezier en lichte weemoed terug op de tijd in kamer 0.015. Ik had me geen betere kamergenootjes dan jullie kunnen wensen, punt.

Next door in 0.019 is het er echter zeker niet slechter op geworden. AOM buddy Maike, het voelt niet alsof we 'maar' 8 maanden een kantoor hebben gedeeld. We zaten min of meer in hetzelfde schuitje waardoor we over allerlei dingen konden sparren. We hebben in 0.019 niet alleen oneindig veel ideeën voor nieuwe projecten bedacht maar we hebben ook samen gereisd, veel aan elkaar gehad en enorm gelachen. Een mooie balans! Mijn

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Het is eigenlijk onmogelijk om aan een leek uit te leggen waarom de uitspraak 'Brazilian Jiu Jitsu changes lives' zo goed samenvat wat Braziliaans Jiu Jitsu zo bijzonder maakt. Volgens mij heeft het te maken met de honderd procent focus op het hier en nu die de sport vereist en de onvoorstelbare 'aliveness' die dat met zich meebrengt. De sport vormt al bijna 10 jaar een centrale rol in mijn leven en heeft bijzondere vriendschappen voortgebracht. 4,5 jaar geleden was BJJ een van de belangrijkste redenen om te willen promoveren. De flexibiliteit die inherent is aan de baan als promovendus leek me de ideale mogelijkheid om naast (of tijdens) mijn werk zo veel mogelijk met de sport bezig te blijven. Naarmate het PhD traject echter intensiever werd vormde de sport steeds meer een rustpunt en een manier om alles los te laten. Even weg uit de hectiek en focussen op het hier en nu. Jordy, je hebt niet alleen een van de beste teams van het land gecreëerd maar je hebt ook een club opgebouwd waarin verschillende mensen op hun eigen manier van deze prachtige sport genieten. Chapeau! Ik ben blij dat ik daar samen met de mensen van het eerste uur zoals Wout, Stijn, Laura, Geert, Etienne en de mensen van de iets latere uurtjes zoals Stefan, Noël, Roel, Florent en nog vele andere een onderdeel van kan zijn. We hebben de halve wereld over gereisd, geweldige avonturen meegemaakt en vele successen gevierd. Maar na de 'slap en bump' doet iedereen op de mat nog steeds (of misschien juist nu) maximaal zijn best om me te laten kloppen. Vaak met succes. Er bestaan maar weinig dingen die mooier zijn dan dat.

Lieve Giel, Mirte, Lex en Anne. Mijn dankwoord is niet compleet als er geen apart stukje over jullie, de Tripledate, in staat (hoewel Joëll en Sheila inmiddels toch hard bezig zijn om er een vaste Quardrupledate van te maken). Giel en Lex, we kennen elkaar al jaren. Jullie zijn de peetooms van mijn (aanstaande) kinderen. Wat ik hier ook aan mooie herinneringen zou opschrijven, het zou nooit 100% de lading dekken dus dat zal ik ook niet doen. Ik kan jullie met recht mijn beste vrienden noemen. Bedankt voor alles. Ik hou van jullie. Mirte en Anne, stiekem kennen wij elkaar ook al heel lang. Behalve een hele goede band met Romy en mij maken jullie die twee heren gelukkig. Dat is al een hele prestatie. Jullie zijn schatten en hopelijk hebben we nog heel veel mooie dingen in het verschiep samen.

Ruud, Steef, Berdy en Joost, het is toch een beetje spannend als je vriendin je voor de eerste keer meeneemt naar 'vrienden' of 'familie'. Vanaf het eerste moment dat ik bij jullie binnen kwam bleek die spanning echter nergens voor nodig. Jullie zijn in de afgelopen 5 jaar stuk voor stuk uitgegroeid tot goede vrienden en belangrijke personen in mijn leven en ik ben enorm trots dat jullie (Steef en Berdy) peettantes van onze kinderen zijn. Wat het ook is, van gezellige middagjes en avonden tot de geboorte van prachtige kinderen, de momenten met jullie zijn altijd bijzonder en bijzonder gezellig.

Jean en Anita, jullie zijn de beste schoonouders die ik me kan wensen. Niet alleen omdat jullie Romy's ouders zijn maar vooral omdat jullie me met open armen hebben ontvangen. Bij jullie voel ik me welkom, voel ik me thuis en voel ik me op mijn plek. Jullie staan altijd klaar om te helpen, met Lisa of op welke andere manier dan ook. Bij jullie kan ik altijd terecht om iets te bespreken of voor raad. Jullie zijn geweldige grootouders en net zo'n geweldige schoonouders. Jullie vervullen een belangrijke rol in mijn leven en ik hoop dat dat nog heel lang zo mag blijven.

Familie Westra, Oma, Manon, Kri en Mick, of het nu een etentje, een feestje of iets anders is, er is altijd wel wat te doen in de familie. Zodra het nodig is zijn we bij elkaar en staan we voor elkaar klaar. Het is super om te weten dat jullie er zijn als het nodig is en me op wat voor manier dan ook steunen. Els, dankzij jou kwam ik ooit in de zorgsector terecht en je hebt vanaf toen nog ontelbaar veel geweldige dingen gedaan. Je bent eigenlijk net familie.

Wout, broer(tje), trainingsmaatje en nu ook een van de paranimfen. Qua leeftijd ben je misschien het kleine broertje maar op veel gebieden ook niet, en dan bedoel ik niet alleen fysiek. In veel gevallen ben je juist ook een voorbeeld. Door jou kwam ik in aanraking met vechtsport en met het Braziliaans Jiu Jitsu, jij hebt een ongekennde rust en kalmte, je hebt gigantische discipline en jouw toewijding aan de dingen waar je voor gaat is bewonderenswaardig. Dat zijn stuk voor stuk dingen die ik van je probeer te leren. Sinds een

aantal jaren is Nicole een van die belangrijke dingen in je leven en hebben jullie een eigen plekje gecreëerd. Ik weet zeker dat er in de toekomst nog vele dingen zullen zijn waarin jij, of jullie, een voorbeeld bent, of zijn!

Pap, men zegt weleens dat ik sprekend op je lijk. Ik weet niet of dat altijd als een compliment bedoeld was, maar zo heb ik het wel opgevat. Zonder me te pushen of druk op me te leggen stimuleerde jij me toch om het beste uit mezelf te halen. Iets dat je heel knap hebt weten te balanceren. Je leerde me verantwoordelijk te zijn voor mijn eigen daden en dat vormt uiteindelijk de basis voor dit proefschrift. Bovenal ben je een voorbeeld dat ik ook graag voor mijn eigen kinderen zou zijn. Bedankt daarvoor, bedankt voor alles!

Mam, je had iets met boeken. Je las graag boeken. Je stimuleerde anderen om boeken te lezen. Boeken waren je werk. Boeken waren zelfs een tijdje ons werk. En je had zelf gewoonweg een hoop boeken. Misschien heb je wel onbewust het zaadje bij me geplant om een boek, dit boek, te schrijven. Misschien was je wel de enige die het van kaft tot kaft zou lezen. Hoe dan ook, je had het zeker aan je collectie toegevoegd. Ik wou dat dat kon. Ik wou dat je het eindresultaat kon zien. Zoals er wel meer dingen zijn waarvan ik wou dat je ze nog kon meemaken. Ik herinner me nog een moment vlak nadat ik aan dit traject begon. Je zei simpelweg; 'ik ben trots op je' en dat is uiteindelijk het enige dat telt. Mam, ik mis je!

Lieve Romy, lieve schat, om te zeggen dat de beste voor het laatst is bewaard is misschien een groot cliché maar het is o zo waar. Het promoveren zit erop en jij bent tijdens dit hele traject op alle gebieden mijn steun en toeverlaat geweest. Jij leerde me de afgelopen jaren op zaken (en vooral mezelf) reflecteren. Jij was mijn rots in de branding in zware tijden. Jij vierde de mooie momenten met me. Jij bood altijd en voor alles een luisterend oor. Jij was altijd in voor een goed gesprek. Ook voor jou moeten de afgelopen jaren soms zwaar zijn geweest maar ik had dit traject absoluut niet willen doorlopen zonder jou. Vele malen belangrijker dan de tijd die achter ons ligt vind ik echter de tijd die in de toekomst ligt. We hebben een geweldige dochter en krijgen er binnenkort een zoon bij. We zijn een gezin! Wie had dat gedacht toen we elkaar 16 jaar geleden voor het eerst leerden kennen? Ik kan onmogelijk omschrijven hoe erg ik me verheug op de tijd die nog komen gaat als gezin. Op samen onze kinderen zien opgroeien, op de ups en de downs, op de prachtige herinneringen, op de nieuwe uitdagingen en avonturen, op de mooie plekken en leuke mensen op ons pad, op alles zolang het maar samen is met jou. Met jou wil ik nog zo veel meemaken. Jij maakt me gelukkig. Ik hou ongeloofelijk veel van je!

Lisa en onze aanstaande zoon (je naam moest nog even geheim blijven van mama), jullie maken papa's leven compleet. Het gevoel van papa zijn is het mooiste dat er is. Uiteindelijk zijn jullie waar het allemaal om draait. Ik zou voor geen goud ook maar iets van jullie willen missen. Alles wat ik doe staat in het teken van jullie. Ik hou van jullie, onvoorwaardelijk en voor altijd.

About the author

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Daan Westra was born on November 24th 1987 in Maastricht, the Netherlands. After completing his secondary education in Downingtown, Pennsylvania (USA) as well as in Maastricht, he studied Industrial Engineering and Management at Zuyd University of Applied Sciences in Heerlen. Daan obtained his Bachelor of Engineering degree in 2009. His thesis on organizational change in hospitals, which he wrote during his internship at Atrium Medical Center, was nominated for best engineering thesis of the year. In 2011 Daan obtained his Master of Science degree in International Business with a specialization in Strategy and Innovation from Maastricht University's School of Business and Economics, where he also followed an extracurricular course in Leadership. During his studies Daan was a member of the education committee, held various positions within the student association 'Management Society Heerlen', and worked as a tutor for middle school students. He furthermore held a 'topsport status' and competed in various European and World championships in Brazilian Jiu Jitsu. After obtaining his master degree Daan was employed as a business analyst at Atrium Medical Center.

In 2013 Daan became a PhD candidate at the department of Health Services Research of Maastricht University. His PhD research focused on the competitive and cooperative dynamics in health care and inter-organizational networks between healthcare organizations. Since 2014 Daan has been simultaneously affiliated to Vektis, where he has worked as a data analyst of the national database of insurance claims data. The results of Daan's PhD research have been presented at various scientific conferences and have been published in book chapters as well as in several well-respected national and international academic journals. In 2016 one of the papers of Daan's PhD research won the 'Best International Paper Award' of the Health Care Management division of the Academy of Management. In 2017 he furthermore won the 'Outstanding Reviewer Award' of the same division. During the course of his PhD trajectory, Daan has been a member of the Young Advisory Committee of the European Healthcare Management Association, which aims to facilitate early career researchers in the field of healthcare management. Additionally, he has initiated several inter-disciplinary and inter-departmental research projects which have received funding from internal as well as external sources. Lastly, Daan served as a lecturer, trainer, and/or tutor in the full spectrum of courses in the Healthcare Policy, Innovation and Management master program and he has supervised numerous bachelor and master thesis students.

Daan is currently employed at Maastricht University's Health Services Research department. His research is focused on the organization and management of healthcare services and is part of the 'Creating Value-Based Healthcare' research line. He continues to fulfill various teaching roles within the Healthcare Policy, Innovation and Management program, one of which is coordinating the 'Strategic Management, Leadership, and Organizational Change in Health care' course.