

VISA PITKÄNEN

Competition and Public Procurements in Health Services

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in Health Services

ACADEMIC DISSERTATION

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ABSTRACT

This thesis studies competition and public procurements in health services. The thesis consists of four interrelated empirical articles examining competition in the Finnish rehabilitation markets and the efficiency of the repeatedly organized procurements by the country's largest service purchaser. The setting offers a unique possibility to examine competition *in* the market in the form of patient choice and competition *for* the market in the form of public procurements. The aim of the thesis is to analyze the functioning of market competition and the efficiency of the procurements. The articles use individual-level register data on patients and administrative data on service providers collected from the procurements. The results provide information to guide the design of the market competition and procurements in different health and social services.

The first article examines quality competition in the physiotherapy market in the form of patient choice policy. We analyze whether quality influences patients' choices and how this differs with respect to patients' experience. Our data and setting enables us to identify three different patient groups: new patients, active switchers and forced switchers. We estimate conditional logit models where patients' choices are explained by providers' quality, distance and free capacity. Our results show that all patients prefer high-quality providers within short distances, but forced switchers are the least willing to travel for higher quality. This suggest that forced switchers most likely choose their new provider in limited time, which may lead into poorer choices in terms of providers' quality.

The second article examines price competition for the physiotherapy market in the competitive biddings. We show that the procurer used an inefficient procurement practice where nearly all bidders were accepted in the pool of providers. Our empirical design utilizes differences in regional rejection rates and providers' distance to the quality–price acceptance threshold at previous procurements. The results show that rejecting at least one provider in the area decreased providers' prices in the next procurement round. We also find that providers that were further away from the rejection threshold offered higher prices in the next procurement

round. We also show that implementing a capacity-based acceptance rule would have resulted in large direct fiscal saving but forced many patients to switch their provider.

The third article examines the price effects of the 2018 procurement reform in the physio, speech and occupational therapy markets. The reform made the procurement more efficient, as providers were accepted based on the local demand and providers' capacity. I exploit the pre-reform variation in market competition in a difference-in-differences setting. The results show that the reform slowed down the increase of prices in all three services. The price effects were strongest in the most competitive local physiotherapy markets, which suggest that the procurements of the two other services could benefit if competition in the underlying markets would increase.

The fourth study examines the advantages and challenges of two commonly used procurement methods in health services: competitive bidding scoring auctions and fixed price procurements. We analyze a fixed price procurement that was piloted in the physiotherapy market in two areas in 2010. We review the literature on both procurement types and provide descriptive analysis from the studied procurements. The results show that efficiently organized procurement provides information about quality and prices of possible providers. Fixed prices may enable service continuity but it may be difficult for the procurer to determine the appropriate price-level.

The results of the articles highlight the importance of an efficient procurement practice in repeatedly organized procurements where multiple providers receive a contract. The challenge in health services is that patients may be forced to switch their provider because of efficiently organized procurements. A successful procurement also requires a competitive underlying market that produces competitive pressure. A fixed price procurement may be suitable especially when the underlying market is not competitive and the procurer can utilize its monopsony pricing power. Patient choice can be combined with procurements as a tool to promote quality competition in the health care markets.

Keywords: competition, public procurement, patient choice, prices, health care

TIIVISTELMÄ

Tässä väitöskirjassa tarkastellaan kilpailua ja julkisia hankintoja terveyspalveluissa. Väitöskirja koostuu neljästä toisiinsa liittyvästä empiirisestä osatyöstä, joissa tarkastellaan kilpailua Suomen kuntoutusmarkkinoilla ja tehokkuutta maan suurimman palveluiden rahoittajan säännöllisesti järjestämissä hankinnoissa. Kuntoutuspalvelut tarjoavat ainutlaatuisen mahdollisuuden tarkastella sekä kilpailua *markkinoilla* valinnanvapauden ansiosta että kilpailua *markkinoista* julkisissa hankinnoissa. Väitöskirjan tavoitteena on analysoida markkinakilpailun toimivuutta ja hankintojen tehokkuutta. Osatyöissä käytetään yksilötason rekisteritietoja potilaista ja hankinnoista kerättyjä hallinnollisia tietoja palveluntuottajista. Väitöskirja tarjoaa tietoa, jonka avulla sosiaali- ja terveyspalveluissa voidaan jatkossa paremmin hyödyntää markkinakilpailua ja julkisia hankintoja.

Ensimmäisessä osatyössä tarkastellaan laatukilpailua fysioterapiamarkkinoilla potilaiden valinnanvapauden muodossa. Tutkimuksessa tarkastellaan, vaikuttaako tuottajien laatu potilaiden tekemiin valintoihin, ja miten valinnat eroavat potilaiden aikaisemman kokemuksen perusteella. Aineiston ansiosta voidaan tunnistaa kolme erilaista potilasryhmää: uudet potilaat, aktiiviset vaihtajat ja pakotetut vaihtajat. Tutkimuksessa estimoidaan ehdollisia logit-malleja, joissa potilaiden valintoja selitetään tuottajien laadulla, etäisyydellä ja vapaalla kapasiteetillä. Tulokset osoittavat, että kaikki potilaat suosivat korkealaatuisia tuottajia lyhyiden etäisyyksien päässä, mutta pakotetut vaihtajat ovat vähiten halukkaita matkustamaan korkeamman laadun vuoksi. Tämä viittaa siihen, että pakotetut vaihtajat valitsevat todennäköisesti uuden tuottajan rajoitetussa ajassa, mikä voi johtaa huonompiin valintoihin tuottajan laadun kannalta.

Toisessa osatyössä tarkastellaan hintakilpailua fysioterapiamarkkinoiden tarjouskilpailuissa. Tutkimuksessa osoitetaan, että palvelun järjestäjä käytti hyvin tehotonta hankintakäytäntöä, sillä lähes kaikki tarjoajat hyväksyttiin tuottajiksi lähes jokaisella hankinta-alueella. Empiirisessä analyysissä hyödynnetään eroja alueellisissa hylkäysmäärissä ja tarjoajien etäisyyttä laadun ja hinnan perusteella asetettuun hyväksymisrajaan aikaisemmissa hankinnoissa. Tulokset osoittavat, että ainakin yhden tarjoajan hylkääminen alensi tuottajien hintoja seuraavalla hankintakierroksella. Tutkimuksessa myös havaitaan, että hylkäysrajasta kauempana

olleet tuottajat tarjosivat korkeampia hintoja seuraavalla hankintakerroksella. Tutkimuksessa myös osoitetaan, että kapasiteettiperusteisen hyväksymissäännön käyttöönotto olisi johtanut suuriin suoriin säästöihin julkisissa menoissa, mutta pakottanut monet potilaat vaihtamaan vakituista palveluntuottajaansa.

Kolmannessa osatyössä tarkastellaan vuoden 2018 hankintauudistuksen hintavaikutuksia fysio-, puhe- ja toimintaterapiamarkkinoilla. Uudistus tehosti hankintoja, kun tuottajat hyväksyttiin paikallisen kysynnän ja tuottajien ilmoittaman kapasiteetin perusteella. Tutkimusasetelmassa hyödynnetään uudistusta edeltävää paikallisten markkinoiden kilpailun vaihtelua erotus erotuksissa –menetelmää soveltaen. Tulokset osoittavat, että uudistus hidasti hintojen nousua kaikissa kolmessa palvelussa. Hintavaikutukset olivat voimakkaimmat kilpailluimmilla paikallisilla fysioterapiamarkkinoilla. Tämä viittaa siihen, että kahden muun palvelun hankinnoissa hyödyttäisiin, jos kilpailu taustalla olevilla markkinoilla lisääntyisi.

Neljännessä osatyössä arvioidaan hintaan ja laatuun perustuvan pisteytysluokituksen ja kiinteähintaisen hankinnan etuja ja haasteita. Kyseiset kaksi hankintatapaa ovat yleisessä käytössä terveystalouksissa. Tutkimuksen empiirisessä osiossa tarkastellaan fysioterapiamarkkinoilla kahdella alueella vuonna 2010 kokeiltua kiinteähintaista hankintaa. Tutkimuksessa käydään läpi molempien hankintatapojen kirjallisuutta ja analysoidaan tutkittavia hankintoja kuvaavien tilastojen avulla. Tulokset osoittavat, että tehokkaasti organisoidut hankinnat antavat tietoa mahdollisten toimittajien laadusta ja hinnoista. Kiinteät hinnat voivat mahdollistaa palvelun jatkuvuuden, mutta hankinnan järjestäjän voi olla vaikeaa määrittää sopiva hintataso.

Väitöskirjan tulokset korostavat tehokkaan hankintakäytännön tärkeyttä säännöllisesti järjestetyissä hankinnoissa, joissa useat tuottajat saavat sopimuksen. Terveystalouksissa hankintojen haasteena on se, että potilaat voivat joutua vaihtamaan tuottajaa sopimuskauden vaihtuessa. Onnistunut hankinta edellyttää myös kilpailukykyisiä taustamarkkinoita tuottaakseen riittävän kilpailun ja hintapaineen. Kiinteähintainen hankinta voi olla sopiva erityisesti silloin, kun taustalla oleva markkina ei ole kilpailukykyinen ja hankkija voi hyödyntää monopsoni-asemaansa perustuvaa hinnoitteluvoimaa. Valinnanvapaus voidaan yhdistää hankintoihin yhtenä keinona edistää laatukilpailua markkinoilla.

Avainsanat: kilpailu, julkiset hankinnat, potilaan valinta, hinnat, terveydenhuolto

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Helsinki, February 2023

Visa Pitkänen

CONTENTS

List of original publications	xi
1 Introduction	13
2 Theoretical and empirical framework	15
2.1 Competition in health services	15
2.2 Competition and efficiency in public procurements.....	19
2.3 Procurements in health services	22
3 Institutional setting	25
3.1 Finnish health care system	25
3.2 Kela's rehabilitation services	28
3.3 Patient choice	32
3.4 Procurements.....	34
3.5 Market characteristics.....	40
4 Research questions.....	43
5 Data	45
5.1 Provider data.....	45
5.2 Patient data.....	47
5.3 Study samples	48
6 Methods	50
6.1 Patient choice modelling.....	50
6.2 Competition, risk and efficiency in the procurements	53
7 Results	58
8 Discussion	61
9 Conclusion.....	64
References.....	65

List of figures

Figure 1. Annual number of patients in 2002–20.....29

Figure 2. Annual nominal costs in 2002–20.....30

Figure 3. Location of the pilot districts.....38

List of tables

Table 1. Pricing mechanism in the fixed price pilot in 2010.....37

Table 2. Market characteristics in the procurements.....41

Table 3. Summary of the Articles.60

List of abbreviations

DID	Difference-in-differences
EU	European Union
GDP	Gross domestic product
HHI	Herfindahl–Hirschman Index
Kela	Social Insurance Institution of Finland
NHI	National Health Insurance
NPM	New Public Management
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary least squares
RDD	Regression discontinuity design
UK	United Kingdom
US	United States of America
WHO	World Health Organization
WTI	Willingness-to-travel

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications:

- I Pitkänen V, Linnosmaa I. 2021. Choice, quality and patients' experience: evidence from a Finnish physiotherapy service. *International Journal of Health Economics and Management* 21(2): 229–245. <https://doi.org/10.1007/s10754-020-09293-z>
- II Pitkänen V, Jauhiainen S, Linnosmaa I. 2020. Low risk, high reward? Repeated competitive biddings with multiple winners in health care. *European Journal of Health Economics* 21(4): 483–500. <https://doi.org/10.1007/s10198-019-01143-1>
- III Pitkänen V. 2022. Competition and efficiency in repeated procurements: Lessons from the Finnish rehabilitation markets. *Health Economics* 31(5): 820–835. <https://doi.org/10.1002/hec.4485>
- IV Pitkänen V, Varkevisser M. 2022. Competitive biddings and fixed price procurements in health services: Evidence from a Finnish physiotherapy market. *Submitted*.

1 INTRODUCTION

Most western countries face the challenge of providing high-quality health care services for their aging populations while keeping the public expenditures under control. Many European countries have implemented policies that have increased competition among health care providers during the past three decades. The main purpose of the reforms has been to enhance efficiency, improve quality, stimulate innovation and eventually control costs of the services (Barros et al. 2016; Propper et al. 2008). The reforms have brought common elements of market competition, such as free choice of provider, to the health care services. Despite the clear importance, the competitive environment and functioning of health care markets has received relatively little attention in health policy spheres, even though it influences the public expenditures and quality of care (Gaynor et al. 2015). The amount of empirical research, for example from the Nordic countries' health care markets, has only increased in the very recent years.

One potential but perhaps underutilized element of competition are public procurements in the context of health care markets. The success of procurements is highly important to the public expenditures, as public authorities in the EU spend around 14% of the GDP on the purchase of services, works and supplies (European Commission 2022). In Finland, the total spending on all public procurements was estimated at 47 billion euros in 2018 (Merisalo et al. 2021), which represents around 20% of the national GDP. Even though public procurements are thought to produce economically efficient outcomes, they may not produce the desired benefits in practice. For example, the procurements often lack the required level of competition (Jääskeläinen & Tukiainen 2019) and commonly suffer from inefficient practices such as discretion or incompetent procurement officials (eg. Bandiera et al. 2009; Hyytinen et al. 2018). If competition in the health care markets has been studied only a little in economics, there is even less empirical research on public procurements especially in the context of health care services.

This thesis studies competition and public procurements in the health services. The thesis consists of four inter-related empirical articles examining competition in the Finnish rehabilitation markets and the efficiency of the repeatedly organized procurements by the Social Insurance Institution of Finland (Kela), which is the largest service purchaser in the country. The setting offers a unique possibility to examine competition *in* the market in the form of patient choice and competition *for* the market in the form of public procurements. The aim of the thesis is to analyze the functioning of market competition and the efficiency of the procurements. The articles use individual-level register data on patients and administrative data on service providers collected from the procurements.

This integrative chapter is structured in the following way: First, Chapter 2 reviews the theoretical and empirical framework on competition and public procurements in health services. Chapter 3 describes the institutional setting on the studied rehabilitation services, procurements and markets. Chapter 4 presents the research questions of each article while Chapter 5 presents the utilized data sources and study samples. Chapter 6 presents the research methods of the empirical analysis and Chapter 7 summarizes the results of the articles. Finally, Chapter 8 discusses the limitations, future research possibilities and policy implications of the results while Chapter 9 concludes the thesis.

2 THEORETICAL AND EMPIRICAL FRAMEWORK

2.1 Competition in health services

Many European countries have implemented policies that have increased competition among health care providers during the past three decades. Traditionally, competition was present among the developed countries only in the US where the health system relies on the private insurance model (Garattini & Padula 2019). In Europe, richer individuals were able to purchase the service through a small private sector (Propper 2012). Since the 1990s, different reforms that have stressed competition have been implemented in European countries with a *Beveridge*-type universal health care coverage such as the UK, Italy, Spain and Nordic countries, as well as in countries with the *Bismarck*-type social health insurance model such as the Netherlands, France and Germany (Garattini & Padula 2019; Propper 2012). The main purpose of the reforms has been to enhance efficiency, improve quality, stimulate innovation and eventually control costs of the services (Barros et al. 2016; Propper et al. 2008).

Competition in health services can be categorized in three different types: competition among providers *in* the market, competition among providers *for* the market and *yardstick* competition (Barros et al. 2016). The first type, competition *in* a market usually means that providers compete for patients, based on price or quality or both price and quality, and the public or private money follows a patient to the selected provider. For example, many European countries have extended patients' rights to choose their primary health care provider or hospital during the 2000's (Vrangbæk et al. 2012). The aim has been to encourage providers to compete for patients by improving quality (Besley & Ghatak 2003). A successful competition requires several alternative providers with an easy entry and exit in the market, and that patients have adequate information about the location, quality and prices of the providers (Barros et al. 2016).

The second type, competition *for* the market means that several providers compete for the right to provide an outsourced public service or public-private partnership,

for example in a competitive bidding. One or more providers will then be selected to provide the service in a geographical area. Similar to the first type of competition, a successful competition requires several providers, and that the public organizer is able to describe the service in an accurate and verifiable way. (Barros et al. 2016).

The third type, yardstick competition refers to incentive structures that are based on comparative information about similar providers. Yardstick competition rewards providers based on their standings against rival providers (Schleifer 1985). It is useful when there is limited number of providers that are geographically dispersed. In practice, these providers may be local monopolies in the areas, such as large regional hospitals. A successful yardstick competition requires good information about providers and clear definition of the different performance indicators that are used to compare providers (Barros et al. 2016). Articles in this thesis are related to competition *in* and *for* the market. Thus, I focus on the competition *in* the market in this chapter and on competition *for* the market in the form of public procurements in Chapters 2.2 and 2.3.

Health care services present typical textbook examples of common market failures in economics from both the demand and supply-sides, which is why the services are in many ways regulated and competition is not traditionally implemented in European countries (Garattini & Padula 2019). The demand side is characterized by well-known imperfect market conditions such as uncertainty and asymmetric information between patients and health care professionals (Arrow 1963). Theoretically, a functioning supply-side requires a reasonable number of providers that offer the same service, have easy entry and exit to the market and operate in similar conditions without incentives to collude (Barros et al. 2016). A key problem is that many health services are characterized by natural monopolies and high entry-costs, which limits competition and makes the markets less perfect than private markets (Gilmour & Jensen 1998).

Competition *in* the health care markets is typically based on quality, as prices are set administratively or patients do not have to pay out-of-pocket payments. A standard result in models with fixed prices is that higher competition increases quality, if the price is set above marginal cost. Providers that are facing tougher competition will increase their quality in order to attract patients (Gaynor et al. 2015). However, this prediction holds only if providers' objectives and incentives are set correctly. For example, competition may not promote quality if providers are not profit maximizers

but altruistic, face soft budgets, specialize to reduce the competitive pressure or have incentives for “cream skimming” the easiest patients (see Brekke et al. 2014).

Empirical literature on quality competition in European health care markets can be divided into two different strands. The first strand of the literature studies whether quality influences patient choices. This is an important question, as it is a prerequisite for competition to promote quality that patients are sensitive to quality differences among health care providers (Varkevisser et al. 2012). The studies typically estimate a discrete choice model to analyze how different determinants such as various quality measures, waiting times and distance or travel times to hospitals influence patients’ choices. Different quality measures have included mortality rates, readmission rates, hospital reputation or composite scores and patient reported outcome measures (Gutacker et al. 2016). Because patient choice policies have been implemented in many countries, the literature has grown in recent years and includes a number of studies from the UK (eg. Beckert et al. 2012; Gaynor et al. 2016; Gutacker et al. 2016; Santos et al. 2017), the Netherlands (eg. Beukers et al. 2014; Varkevisser et al. 2012), Italy (eg. Lippi Bruni et al. 2021; Moscone et al. 2012), Germany (eg. Avdic et al. 2019; Kuklinski et al. 2021) and Sweden (Dahlgren et al. 2021). Usually, the empirical studies have found a positive relationship between quality and patients’ choices regardless of the setting.

The second strand of the empirical literature examines whether providers’ quality has responded to competition that has been enhanced by the different reforms. The studies typically analyze whether providers’ quality has improved more in areas with greater choice possibilities and ground for competition. Early studies include examples on the effects of the 1990s internal market reforms in the UK, which allowed hospitals to compete on quality and price. Studies have found that prices fell but hospitals facing more competition focused on bringing down waiting times at the expense of quality (see Propper 2018; Propper et al. 2004; 2008). More recent studies from the UK have analyzed reforms in the early 2000’s that increased patient choice and hospital competition. These studies have found that higher competition decreased patients’ mortality without raising public expenditures (Cooper et al. 2011, Gaynor et al. 2013) and increased hospitals’ management practices (Bloom et al. 2015). Finally, similar research design was used to show that Swedish reforms that enabled patient choice increased the number of providers in more exposed markets but had only little effects on quality (Dietrichson et al. 2020).

It is generally thought that competition leads to lower prices and better quality. However, there are no clear predictions from the economic theory for the impact of competition on quality in health care markets, if both price and quality are determined simultaneously. The outcome on quality depends on various factors including the relative elasticities of demand with respect to quality and price for different patients and the nature of competition between providers (Gaynor 2006; Gaynor et al. 2015). Earliest evidence on both quality and price competition in health care markets comes from the US, which is the only western country where both price and quality competition has been present for a number of decades. The empirical literature from the US suggests that fixed price competition can prompt hospitals to improve their quality (eg. Kessler & McClellan 2000; Kessler & Geppert 2005). There is a large amount of literature on competition in the US hospital markets, which has generally found that prices are higher in less competitive or even monopolistic markets (see Gaynor et al. 2015). Most recent studies have shown that there has been a wave of mergers in the past couple of decades, leading to further price increases and mixed effects on quality in the hospital markets (Cooper et al. 2019; Gowrisankaran et al. 2015).

Empirical evidence especially from the recent European health care reforms suggests that policies that have increased patient choice have improved quality of care and encouraged patients to choose high-quality providers. Using competition as an instrument to improve the efficiency of health care services has large potential, but the simultaneous challenge is to ensure the other broad goals such as ensuring that all individuals are able to use the cost-effective and high-quality services they need (Barros et al. 2016). It is often feared that competition *in* the health care markets may produce unintended consequences, such as increased inequality with respect to access to care. Current empirical evidence has shown that increased hospital competition did not undermine socio-economic equity in the UK (Cookson et al. 2013). However, it is widely acknowledged that competition-enhancing reforms often require additional policy actions, for example, ensuring that the market functions properly and that there is a careful and constant evaluation of outcomes (Barros et al. 2016).

2.2 Competition and efficiency in public procurements

Several public sector reforms across OECD countries from the 1980s, labelled by the umbrella term New Public Management (NPM), have included outsourcing and decentralization of various public services (Alonso et al. 2015; Hood 1991). The distinctive feature of contracting out is the element of *ex-ante* competition – competition *for* the market as opposed to competition *in* it (Domberger & Jensen 1997). Theoretical claims on the positive effects of outsourcing public services arise from public choice and property rights theories, and are based on arguments that highlight the importance of competition and ownership (Alonso et al. 2015; Petersen et al. 2018). The *competition argument* states that private firms are forced by competitive pressure to optimize efficiency, whereas the *ownership argument* states that public organizations lack incentives to perform efficiently, are less innovative and have no budget constraints (Petersen et al. 2018).

Public procurements are the most common mechanism to acquire private providers to produce the publicly funded outsourced services. The procurements provide information on firms that can provide the services at the best value for money, which means lowest prices or highest quality or the combination of low prices and high quality. The standard auction theory and everyday intuition say that competition is an important requirement for a successful public procurement (Bajari et al. 2008; Bulow & Klemperer 1996; Wilson 1977). The presumption that higher competition, commonly measured as the number of bidders, leads to better procurement outcomes such as lower prices and higher quality, is commonly labelled in the literature as *competition effect*.

However, the benefits of competition may be limited or even reversed if the *common values effect*, *affiliation effect* or *entry effect* dominates the *competition effect* (see Jääskeläinen & Tukiainen 2019). Both the *common values effect* and the *affiliation effect* refer to a problem that is caused by the *winner's curse*, which means that the actual value of the contract is often less than the winner estimated. Rational bidders note that the false estimations of the true value may become more severe as the number of bidders increases (see Hong & Shum 2002; Pinkse & Tan 2005). The *entry effect* refers to a situation where an increase in the number of potential bidders leads to a decrease in the number of actual bidders, as it may be less profitable to enter the procurement due to the increased competition (Li & Zheng 2009). These adverse effects of increased competition on prices have also been found in empirical studies (Hong &

Shum 2002; Li & Zheng 2009; Pinkse & Tan 2005). Thus, it is an empirical question whether competition has the desired effects in different public procurements (Jääskeläinen & Tukiainen 2019).

Even though the importance of competition in public procurements is widely acknowledged, lack of competition is perhaps the most common problem in the procurements. Jääskeläinen and Tukiainen (2019) study competition, bidding and entry, using data from Finnish public procurements in 2010–2017. They show that that competition is very low in Finnish public procurements with a median bidder count of only two. The lack of competition is an issue across all industries and different contracting authorities. They also show that a higher number of potential and actual bidders decreases price measures such as win margins and the difference between the expected and realized prices (Jääskeläinen & Tukiainen 2019).

Another common problem in public procurements are different inefficient practices that are used across the OECD countries. Several studies have provided empirical evidence on the effects of lowering discretion and increasing competence of procurement officials. Tas (2020) finds that a high-quality procurement practice increased the number of bidders and the probability that prices are lower than originally estimated in public procurements in the EU. Bandiera et al. (2009) show that some public purchasers pay systematically more for standardized goods, and that these differences are explained by inefficient purchasing procedures in Italy. Hyytinen et al. (2018) study a change from discretionary beauty contests to a more rule-based procurement environment and show that it resulted in cost savings in Swedish cleaning service procurements. Cameron (2000) shows that limiting purchaser's discretion reduced prices in the US electricity markets, while Coviello et al. (2018) find that greater discretion causes a significant increase in the probability that Italian purchasers will contract the same bidders repeatedly. Decarolis et al. (2020) show that an increase in US federal procurement officials' competence decreased expenditure, time delays and number of renegotiations. Buccioli et al. (2020) also show the importance of competence and discretion in a recent study on procurements of medical devices in Italy.

The success of a public procurement may also depend on the nature of the outsourced service in addition to competition, market characteristics and efficient procurement practice. *Transaction cost* approach hypothesizes that the benefits are easiest to achieve if the procurer can unambiguously describe and measure quantity

and quality of the service, because otherwise the administrative costs of the procurement and monitoring service delivery are likely to be high. This suggests that a public procurement may best achieve its objectives in technical services compared to health and social welfare services. (Petersen et al. 2018.)

2.3 Procurements in health services

Procurements often work very well, but their design must always be sensitive to the institutional context (Klemperer 2002). As discussed earlier, health services present typical textbook examples of common market failures (Garattini & Padula 2019), which is why the objectives of the procurements may not be easily achieved in health care (Petersen et al. 2018). For example, it is typical to organize the procurements in a repeated manner and select multiple service providers for each contract period (Barros et al. 2016). The procurements provide information both about the prices of the services and about which providers can deliver those services at the lowest price (Chalkley & Malcomson 1996).

Besides prices, procurers as well as patients and providers are also often interested in the quality of the services, even though health care quality is multidimensional and measuring is particularly challenging (Tay 2003). Purchasers typically use a *scoring auction* where providers compete for the market on both price and quality (see Asker & Cantillon 2008). The main problem of the procurer is then to ensure that quality incentives and cost reduction incentives do not work in opposite directions (Mougeot & Naegelen 2003). This makes contracting health services a good example of what Holmström and Milgrom (1991) call *multitask agency problem*. In practice, providers may have only little incentives to improve especially their non-contractible quality (Hart et al. 1997). However, it is challenging to use different outcome measures of quality in procurements of health services. The simple reason is that providers should not be rewarded based on their previous experiences with the same public procurer, because it may reduce the willingness of new bidders to participate in procurements (Butler et al. 2020).

Characteristics of different types of procurements have been examined in the relatively small previous literature on health service procurements. McCombs and Christianson (1987) analyze the main issues concerning the design, implementation and administration regarding procurements of health services. For example, they discuss the advantages and challenges of selecting multiple service providers in the procurements. The main advantages are greater market flexibility and potentially higher competition in the procurement, whereas one of the main disadvantages is that providers may have only weak incentives to submit bids if they expect to receive only small number of patients after getting a contract. McCombs and Christianson

(1987) also argue that a clear acceptance rule should be used in the procurements, as otherwise providers have very low incentives for price competition.

Hoerger and Waters (1993) present a simple conceptual model of providers' behavior in markets where providers first compete *for* the market by participating in a competitive bidding, and then compete *in* the market for patients with the other selected providers. In this case, the procurement has two purposes: selecting contracted providers and determining how much they are paid. Providers consider following issues when they calculate their optimal bids. First, providers consider how their bid influences their probability of getting a contract. Second, providers consider how much the bid affects the price they receive when getting a contract. Third, providers consider how much competition they face in the market after getting the contract. (Hoerger & Waters 1993.)

When multiple providers are selected in a procurement, providers are typically ranked in order, depending on their price, quality or both quality and price, and providers above a pivotal rank are offered a contract. The acceptance cut-off is often based on required capacity in a geographical area. An important question is then how the selected providers are compensated. A *discriminatory auction* refers to a procurement where the selected providers are paid based on their own bids, similarly as in *first-price auctions* with only one winning provider. Another option would be a *uniform pricing auction* where the selected providers receive the same price. Hoerger and Waters (1993) argue that a uniform pricing where winning bidders receive the next highest bid above the pivotal bid, similarly as in *second-price auctions*, would induce providers to submit bids equal to their marginal cost. They argue that a discriminatory auction leads to bids that exceed providers' marginal costs. Finally, their results also show that selecting multiple providers in the procurement enhances quality competition. (Hoerger & Waters 1993.)

Empirical evidence on competitive bidding in health care services is scarce. Song et al. (2012; 2013) study the implementation of a competitive bidding system to determine plan payments in Medicare in the US. Their results show that insurers can use their market power for higher bids at the expense of the beneficiaries. Ferraresi et al. (2021) show that the introduction of centralized procurement within the regional health care systems reduced per capita health expenditures in the early 2000's in Italy. There is some empirical literature on public procurements also in other health care sectors. For example, competitive bidding is used in some

European countries to lower prices in pharmaceutical markets both in inpatient (Siikanen 2019) and in outpatient settings (Boonen et al. 2010). Several studies also examine competitive bidding for various health technologies (eg. Buccioli et al. 2020; Ji 2021). In conclusion, relatively little is still known about public procurements in the context of health services. This thesis fills in one missing piece of the puzzle.

3 INSTITUTIONAL SETTING

3.1 Finnish health care system

Finland is a high-income Nordic welfare state where social security is very comprehensive. Finnish health care system is based on tax-funded universal public services to which everyone residing in the country is entitled (Keskimäki et al. 2019). The aim of health care in Finland is to maintain and improve people's health, wellbeing, work and functional capacity and social security, as well as to reduce health inequalities (Ministry of Social Affairs and Health 2021). The expenditure on health care services in Finland was 22 billion euros in 2019, representing around 9% of the GDP (SVT 2021). Like many western countries, Finland is facing a challenge of aging population, which may further increase the expenditures in the coming years.

Finland has a health system with a highly decentralized administration and multi-channel funding system. Municipalities, the private sector, the national health insurance (NHI) scheme and employers were the main actors in the health system during the study period of this thesis. Municipalities were responsible for organizing and financing primary and specialized health care to their residents prior to the reform that took place in January 2023. Municipalities were able to provide services alone or form joint municipal authorities. They could also purchase health care services from other municipalities, organizations, or private service providers. Primary health care was provided at municipal health centers, whereas specialized medical care was provided by hospital districts. The provision of the most demanding medical operations is centralized on the national level to the university hospitals. (Keskimäki et al. 2019.)

All permanent residents in Finland are covered by the NHI, which is defined in the health insurance act (1224/2004). NHI covers all residents in Finland and includes outpatient drug reimbursement, reimbursement of medical costs in the private sector, compensation of travel costs to health care units, sickness allowance, maternity leave allowance, reimbursement for part of the costs of occupational health services and compensation for some rehabilitation services (Keskimäki et al.

2019). Kela runs the statutory NHI scheme, which financed 12.9% of the total costs of health services in 2019 (SVT 2021). The popularity of voluntary private health insurance, which complements the cover by the NHI, has also grown significantly in recent decades in Finland (Alexandersen et al. 2016). In 2019, the share of public financing of health care expenditures was 76.8% and the share of private financing was 23.2% (SVT 2021).

The private health care sector, which includes private health care companies and a broad spectrum of non-governmental organizations, supplements public health services. The share of health services offered by private service providers has increased throughout the 21st century and is around 25% of the entire health and social care market (Ministry of Social Affairs and Health 2022a). Private health care providers offer services that are funded by various different sources. For example, private providers provide employer sponsored occupational health care services to which every employee is entitled to, based on the occupational health care act (1383/2001). Some municipalities and joint municipal authorities have outsourced the entire primary health services to private health care companies, using competitive elements such as competitive biddings. Municipalities also often acquire some outpatient specialist services and dental care services from the private markets. Naturally, the private providers also offer services to patients who pay out-of-pocket or are covered by their voluntary health insurance. Similar to many other western countries, the private health care market has experienced a wave of consolidation during the 21st century, and only a few large providers dominate in many service markets (Nurminen & Saxell 2020; Vilppo 2020).

Competition in the form of free choice of provider has traditionally been very limited in the Finnish municipal health services (Tynkkynen 2016). The health care act (1326/2010) extended the freedom of choice in both primary and hospital care to the whole country in 2014 (Keskimäki et al. 2019). In 2009, the use of service vouchers was expanded from municipal social care also to non-acute health services, based on the act on service vouchers in social and health care (569/2009). The aim of service vouchers is to promote patients' freedom of choice and opportunities to obtain the health services they need from private service providers (Ministry of Social Affairs and Health 2022b). In practice, service vouchers are often used to shorten queues in the municipal health care, and they have provoked discussion about equity, as patients often need to pay a deductible. Under the NHI, patients can choose any private provider without referral, but patients are typically only subsidized a small

fraction of the costs. The employer chooses the health care provider in the occupational health care. Patients with a private health insurance can often choose the provider of outpatient care, but for costly treatments and hospitalizations the insurer usually chooses the provider. (Keskimäki et al. 2019.)

Several Finnish governments aimed to reform the health care system during the early 2000s. The challenges of the prior system included, for example, a unique multi-channel funding system, very fragmented service organization, municipalities' often inadequate resources and competence in organizing services as well as poor access to and inequity in the use of services (Aalto et al. 2018). For example, only every fifth municipality had a balanced economy in 2019 (SVT 2021). The main goal of all the reform intentions was to centralize the organization of the services by transferring the responsibility from more than 300 municipalities to larger units. The Finnish Parliament adopted the legislation on establishing wellbeing services counties and reforming the organization of health care, social welfare and rescue services in June 2021 (Finnish Government 2022). The 21 new wellbeing services counties and the city of Helsinki have been responsible for providing the services since January 2023. However, the reform did not include elements that would have directly increased competition in publicly financed health services.

3.2 Kela's rehabilitation services

WHO defines rehabilitation as “a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment”. Rehabilitation helps an individual to be as independent as possible and enables participation in education, work, recreation and other everyday activities. It is an essential part of universal health coverage along with promotion of good health, prevention of disease, treatment and palliative care. Globally around 2.4 billion people are living with a condition that benefits from rehabilitation, and WHO predicts that this need will increase due to aging populations with more chronic diseases and disabilities. (WHO 2021.)

Several independent organizations, such as municipalities, Kela, the State Treasury, employers, pension institutes and insurance companies, are responsible for financing and organizing different rehabilitation services in Finland (Rissanen & Pulkki 2013). This thesis focuses on services that are organized by Kela and financed by the NHI. Kela is the single largest organizer of rehabilitation services in Finland. It is responsible for organizing vocational rehabilitation, intensive medical rehabilitation, rehabilitative psychotherapy and discretionary rehabilitation services. Kela's responsibilities are defined in the Act on Social Insurance Institution of Finland's rehabilitation benefits and rehabilitation allowance benefits (566/2005). In 2019, Kela organized rehabilitation services for 134 010 patients and the total rehabilitation expenditure was around 374 million euros (SVT 2020), which represents little less than 2% of the entire health care expenditure in Finland (SVT 2021).

This thesis focuses on Kela's intensive individual outpatient medical rehabilitation services, which are provided free of charge for all patients. The services are intended for disabled individuals (henceforth, patients) that are under 65 years of age and have a diagnosed illness or impairment that significantly limits their functioning and complicates their daily life. The purpose of intensive medical rehabilitation is to help patients to continue working despite of an illness or impairment or to improve their ability to manage daily activities. The rehabilitation requires a rehabilitation plan, which is drawn up by patients' primary care doctor for one to three years at a time. The services are not offered for patients that are in long-term care in a public institution. (Kela 2022a.)

Kela provides various types of intensive medical rehabilitation therapies, such as physiotherapy, occupational therapy, speech therapy, music therapy, psychotherapy and neuropsychological rehabilitation. This thesis concentrates on physio, speech and occupational therapy services and markets. The three services are the most common types of individual outpatient therapies. In 2019, total costs for all Kela’s intensive medical rehabilitation services were 202,6 million euros, of which the three services covered 161,9 million euros (~80%) (SVT 2020).

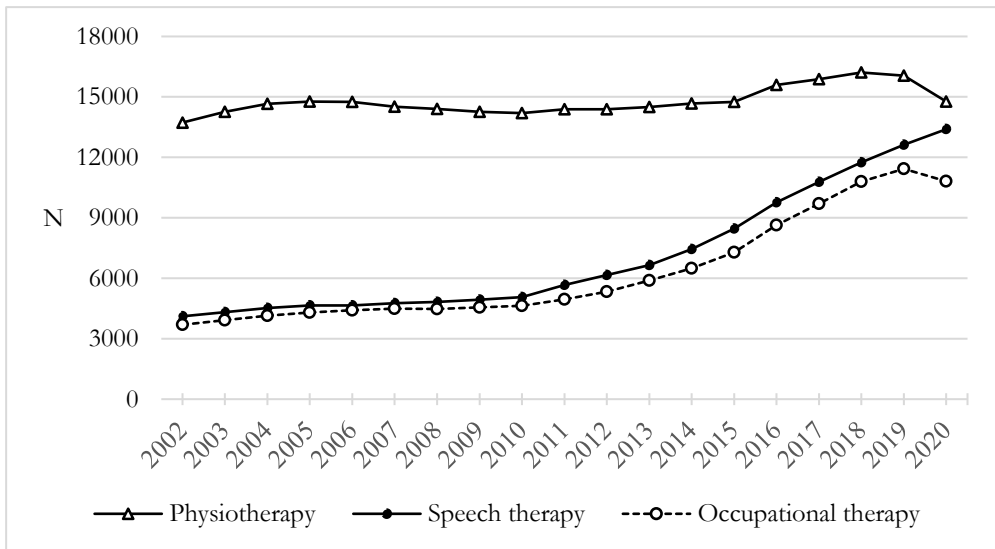


Figure 1. Annual number of patients in 2002–20.

Data: Kela (2022b).

Figure 1 illustrates the trends in the number of patients in the three services in 2002–20. Number of physiotherapy patients has remained relatively stable during the 2000’s, whereas the number of patients in speech and occupational therapies has tripled. Physiotherapy was received by 16053 patients, speech therapy by 12619 patients and occupational therapy by 11429 patients in 2019. The number of patients has increased rapidly in speech and occupational therapies because of two main reasons: First, the need for the therapy is recognized earlier than before, and second, a law reform eased access to the services starting in 2016 (Heino et al. 2020). The global Covid–19 pandemic caused a decline in the number of patients in 2020 in physio and occupational therapies, as these two services more or less require physical presence of the therapists, whereas speech therapy can be more easily implemented as a remote service.

Kela grants patients’ access to therapy for one to three years at a time, but especially many physiotherapy patients receive the service for several years. Patients typically receive the therapy in sessions that last 45 or 60 minutes, once or twice a week, depending on each patient's individual rehabilitation plan. Therapies can be provided in the providers’ facilities or in the patients’ daily environment such as home, school or day care. A vast majority of speech and occupational therapy patients are children, whereas physiotherapy is more commonly received by patients of all ages (Heino et al. 2020).

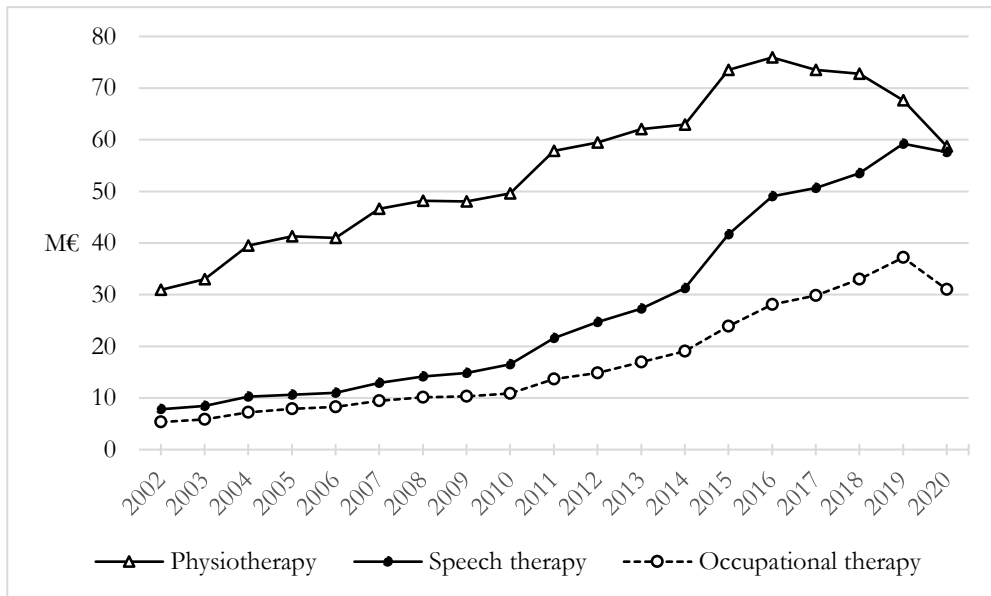


Figure 2. Annual nominal costs in 2002–20.

Data: Kela (2022b).

Figure 2 shows the annual nominal costs of the three services in 2002–20 in millions of euros. In 2019, the physiotherapy costs were 67,7 million euros, speech therapy costs 59,2 million euros and occupational therapy costs 37,2 million euros. In principle, the costs are a function of number of times patients receive the service times providers’ prices. Therefore, the increase in the number of patients is reflected as a multiplication of costs of speech and occupational therapies. In turn, the effect of prices on service costs is illustrated the most clearly in physiotherapy service, where the service costs jumped to a new level in 2004, 2007, 2011 and 2015 despite the number of patients staying at the same levels. These years were the first in the new contract period when the new higher prices of contracted providers came into

force after the public procurements, which are discussed more thoroughly in Chapter 3.4 and analyzed in Articles II–IV. Kela has also declined the number of annual therapy sessions per patient, which has an influence on costs in the most recent years.

Patients' rehabilitation is individual and based on their own rehabilitation plan. Naturally, there are some differences with respect to quality and specialization among providers, as well as differences among the severity of patients' disabilities. Some providers or therapists have specialized in certain treatments or different therapy forms while the clientele of some therapists can consist mainly of children and adolescents. However, regardless of the provider or the patient, ultimately the service is rather homogeneous by nature within all the studied services. Kela also regulates the content of the rehabilitation and the minimum quality in its rehabilitation service descriptions, which all providers need to fulfill in the procurements.

In addition to Kela, several different public health care organizations organize various different rehabilitation services. For example, municipalities also finance and organize all the three services for patients with less severe disabilities. Usually, patients do not receive the same service funded by different organization at the same time. Some patients may also receive therapy organized by their municipality before Kela accepts their rehabilitation plan or after they turn 66 years and are not entitled to the service organized by Kela. Naturally, patients can also visit private therapists by paying out-of-pocket payments. If physiotherapy patients have a referral from the doctor, they are entitled to a small reimbursement paid by Kela from the NHI. The reimbursement has been cut during the 2000's and was only six euros for a 45-minute session in 2022. In the end, the reimbursement was completely discounted in January 2023.

3.3 Patient choice

Patients have freedom to choose their service provider among providers that have a contract with Kela. Kela has emphasized patients' choice since 2011, but it was a common practice in most districts already before. The aim of patient choice has been to promote competition and involve patients in decisions related to their rehabilitation process. We conducted a survey in 2015, which showed that 82% of physiotherapy patients found free choice of provider important or very important (Pitkänen & Pekola 2016).

Especially many physiotherapy patients receive the service for many years, and they can freely switch their provider at any time during of the rehabilitation process. However, switching always results in some costs, such as searching and switching costs. In Kela's medical rehabilitation services, patients have to inform the local insurance district about their new provider. Switching is also associated with the discontinuation of established relationships especially when patients have repeated visits with the same provider (Anell et al. 2021). Most physiotherapy patients do indeed commit themselves to one provider for a long time.

The switching behavior in the physiotherapy service can be divided into two different categories: First, patients can initiate the switch of providers themselves. However, previous literature has shown that, usually, patients do not actively search for information nor switch providers (Victoor et al. 2012). Second, patients have been forced to switch their provider when their previous provider was no longer included in the pool of providers after the procurement or ended their contract during the contract period. Often the forced switch comes as a surprise and patients need to make a new choice in relatively short time period. The previous provider is often involved in the choice of the new provider and they are also required to inform the new provider about the patient's rehabilitation needs and process. Thus, forced switchers can be considered as a random sample of experienced patients who had to choose a new provider, whereas other switchers are most likely a selective group of the most active experienced patients.

Contracts with service providers have been made at the insurance district level. Currently, patients can choose a provider that has indicated that it provides services in the patient's municipality. Patients that travel to the provider's facilities get reimbursements from Kela for their travel costs. The reimbursement is calculated

based on travel costs to the nearest alternative provider, and these costs have an annual deductible. Patients can apply to receive the rehabilitation at their home if their capability to travel is limited and the facility is suitable for the rehabilitation. Kela also pays providers extra, based on the length of their travel and the given session. In recent years, the popularity of remote therapy has also grown, especially in speech therapy, partly because of the Covid-19 pandemic.

Patients do not have direct access to comparable quality information about providers, even though Kela collects quality information and compares providers in the procurement. This means that patients may have problems finding information on different alternatives. In addition, Kela's officials cannot directly recommend one provider over another. In the survey, we found that every fifth physiotherapy patient indeed had trouble on finding information and selecting a provider (Pitkänen & Pekola 2016). In 2011, Kela established a website that lists contracted providers in a municipality or district (see Kela 2022c). We also found that when patients compare different alternatives, they gather information from many formal and informal sources, such as health care professionals, friends and relatives, peer groups and provider websites (Pitkänen & Pekola 2016).

In Article I, we examine how providers' quality influences patients' choices. The physiotherapy service offers a unique opportunity to examine patients' choices for several reasons. First, patients do not pay any out-of-pocket payments and even some of their travel costs are covered. Second, patients receive the service often for several years, and some of them actively switch their provider during the rehabilitation process. Third, some patients are forced to switch their usual provider because the provider was not included in the new pool of providers. Fourth, the Finnish physiotherapy market is very competitive, and most patients have several providers nearby from which they can freely choose the best alternative. Fifth, even though patients do not have access to comparable quality information on providers, they might learn some quality aspects related to the service as they gain more experience on the service. Sixth, patients receive the service once or twice a week, which means that the service is an important part of their weekly routines and makes the choice of provider a vital decision.

3.4 Procurements

Kela can either produce the rehabilitation services itself or purchase them from the private sector, as defined by law (566/2005). Currently, Kela acquires all rehabilitation services from private providers through public procurement. The procurements are organized repeatedly every four years in most rehabilitation services. Kela's purchasing history dates back to early 1990s, and the rehabilitation services were one of the earliest publicly financed health services that were purchased from private markets in Finland (Tynkkynen et al. 2013). Depending on the rehabilitation service, Kela has used several different procurement mechanisms, such as scoring auctions, price-only auctions, beauty contests and direct bargaining.

Kela is a public institution, and its procurement activities are regulated by the law. Legal background to public procurements in the EU countries are based on the directive on public procurement (2014/24/EU), which is implemented in Finland by the act on public procurement and concession contracts (1397/2016). According to the regulation, all publicly financed purchases need to follow a predetermined procurement procedure. Exceptions are purchases that are under certain minimum threshold values. Since 2017, the threshold has been 60 000 euros for most goods and services, 150 000 euros for construction works and 400 000 euros for social and health care services. The aim of both the national and EU regulation is to increase the efficiency of the use of public funds and to enhance the competitiveness of European businesses (Ministry of Economic Affairs and Employment 2023).

The procurements for the studied medical rehabilitation services have been organized traditionally every four years as scoring auctions, where providers are evaluated based on their quality and price. The procurements were usually organized by Kela's insurance districts, which are responsible for the implementation of the services in their area. The articles in this thesis concentrate on competition in five different procurements rounds that were held in 2003, 2006, 2010, 2014 and 2018. Prior to 2003, the districts used various procurement mechanisms, including direct negotiations with service providers, and the procurements were often organized at separate times in different districts. Unfortunately, no material was found regarding these older procurements, despite comprehensive searches in Kela's and the districts' archives.

Since 2003, the procurements have been organized in a similar manner at the same time in all insurance districts, with an exception of 2010, when two insurance districts piloted a fixed prices in the 2011–14 contract period in the physiotherapy service. The procurement process has been as follows: Kela publishes a request for tenders, after which the providers give information on their quality and annual capacity and set a price for a 45-min rehabilitation session in their sealed bids. The bids are submitted to the district in which providers are based or in which they wish to operate remotely. The districts evaluate the tenders and rank the providers that meet the minimum criteria based on their quality–price scores. Each district decides an acceptance threshold, which should be based on the estimated demand for the service and the capacity of the providers. Providers above the threshold are offered a contract and providers who sign the contract form the pool of providers. This type of contract is also known as a framework agreement. Providers are paid for patients' visits based on their own accepted price bid. Since 2006, the districts have sent the quality–price rank lists to each provider that submitted a tender in that district, which has enabled providers to evaluate their tenders afterwards. It is also important to notice, that being accepted into the pool (or framework) does not necessarily mean that the provider will receive patients, as patients can choose their provider from all the accepted providers.

Prior to the 2018 procurement, the districts did not apply systematic acceptance criteria or rules in the competitive biddings, and the most common acceptance threshold was below the provider ranked last. Therefore, very few providers that fulfilled the minimum requirements failed to receive a contract offer in each of the three services. For example, out of 25 districts in the 2010 procurement, only three rejected at least one provider in physiotherapy and occupational therapy services, and only two in speech therapy service. Most of the rejected providers were single outliers, which means that they either offered a significantly high price or had a very low quality. For most of the providers the risk of being rejected was very low, which enabled them to raise prices after realizing this institutional practice. All districts acquired multiple times their required capacity in every competitive bidding. For example, in 2014 the total capacity of the accepted physiotherapy providers was 50917 whereas only 14671 patients received the service.

In Article II, we examine the influence of this inefficient procurement practice on providers' prices and expenditure of the physiotherapy service in the 2010 and 2014 procurements. I conducted interviews with Kela's procurement personnel about the

reasons for the inefficient procurement practice for Article II. Based on these interviews, there were four main reasons why the districts did not reject more providers: First, Kela is obliged by law to organize the service nationwide for all eligible patients, and the districts have needed to ensure the availability of the service also in rural parts of the country. Second, the district managers did not have a budget constraint or price limit when they decided on the threshold. Third, Kela has emphasized patients' freedom to choose from a large pool of providers. Fourth, the districts have wanted to avoid a situation where a large number of patients are forced to switch providers because their previous provider was not accepted in the new pool of providers. In conclusion, the district managers did not have proper incentives to reject providers because no financial pressure existed, and rejections would have likely resulted in an increase in administrative work and negative feedback.

I examine the price effects of the 2018 procurement reform in physio, speech and occupational therapy markets in Article III. In 2018, Kela made two notable public changes, and one internal practical change to its procurement practices. First, Kela introduced systematic acceptance criteria based on providers' capacity and the current number of patients in each insurance district. All providers were accepted for inclusion on the quality–price rank list until the required capacity in the area was covered, and some additional providers were allowed in, based on their location and language skills. In practice, providers were required to list all municipalities to which they would provide the service, and, in each municipality, at least three providers were accepted for physiotherapy and one provider for speech and occupational therapies. Some providers were accepted also in larger cities to ensure that local demand for the service would be fulfilled. In addition, many Swedish-speaking providers were accepted in the western and southern districts. All accepted providers were offered a contract for 1 year with options for three additional years, all of which were eventually used.

Second, Kela decreased the quality weight to 20% and increased the price weight to 80% in 2018. Previously, the quality–price scoring rule was a simple quality/price assessment in 2006, which changed to quality being weighted at 60% and price at 40% in 2010, and both weighted at 50% in 2014. Although the quality weight decreased, the minimum quality standards to which all providers must adhere to were increased. Providers' only had a few months to react to the new quality weight. To

avoid potential quality reductions during the contract period, Kela requires all providers to commit to maintaining quality at the level of their bid.

Kela also centralized the procurement procedure away from the insurance districts, which did not have much procurement expertise or education, to a specialized procurement department in its central administration. This change separated officials who work with patients from the procurement process, and decreased the discretion related to selecting accepted providers. Based on interviews with Kela's procurement officials, the aim of the reform was to increase price competition, while ensuring the availability of the services throughout the country. The acceptance criteria were specified in the request for tenders, and Kela publicly informed the providers through a variety of channels that not all providers would be offered a contract as had been the case in previous procurements.

In Article IV, we extend the analysis to the two insurance districts that piloted a fixed price procurement in 2010 and throughout the 2011–14 contract period in the physiotherapy service. Figure 3 shows the geographical location of the two districts, South Ostrobothnia and Päijät-Häme, where the pilot took place. In the 2003, 2006, 2014 and 2018 procurements, the two districts organized a similar scoring auction as the other districts. The aim of the pilot was to decrease the administrative burden related to procurement process and to enable flexible market entry for providers throughout the contract period. Kela used price information from the competitive biddings in the neighbouring districts to determine the fixed prices. The main challenge was to set the prices low enough to prevent excessive profits, and at the same time high enough to attract a sufficient number of willing providers to meet patient demand.

Table 1. Pricing mechanism in the fixed price pilot in 2010.

	Facilities <20m ²	Facilities >20m ²
Higher education and experience	45 €	50 €
Standard education and experience	38 €	43 €

Source: Kela's procurement documents.

In practice, the districts used four “quality–price baskets” to reward higher quality with a higher price. All providers that fulfilled the minimum quality standards were placed into one of the four baskets based on their facilities, experience and additional education of the personnel. The purpose was to reward similar quality aspects that

were scored in the competitive biddings. Table 1 illustrates the pricing mechanism. Providers were also incentivized to increase their quality by allowing them to resubmit their procurement documents every four months during the contract period. New documents were also required after changes in provider’s personnel.

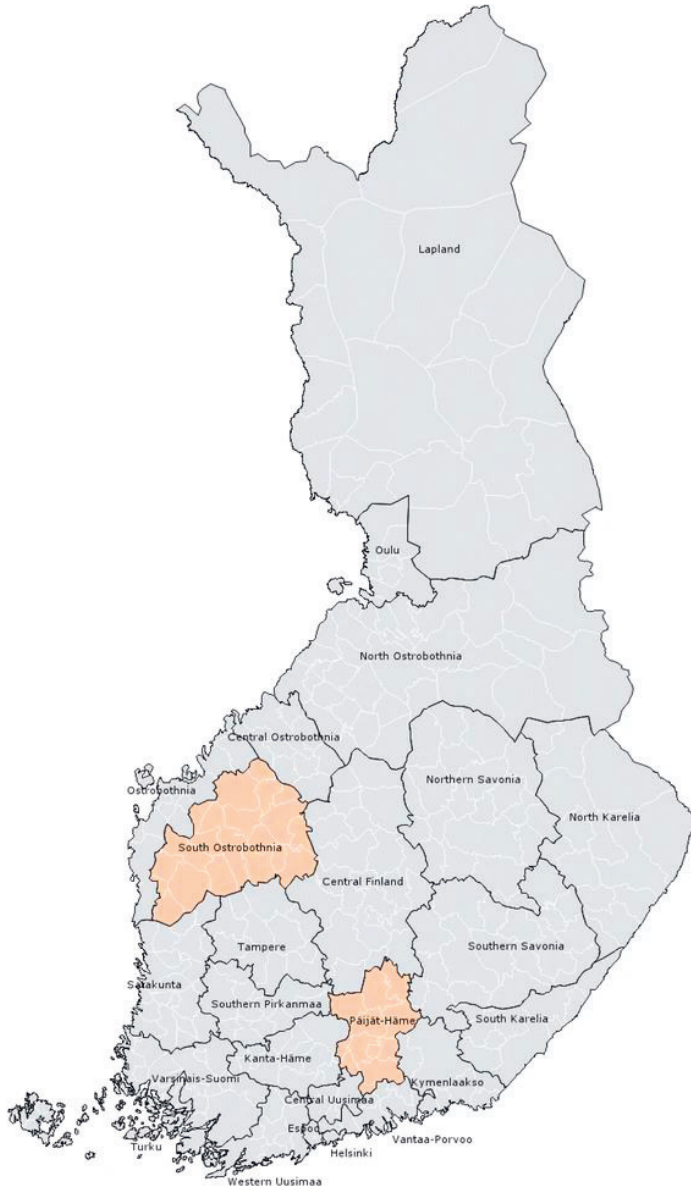


Figure 3. Location of the pilot districts.

Source: Pekola et al. (2017a).

This thesis draws lessons from procurements that were organized in 2003, 2006, 2010, 2014 and 2018. After the 2018 procurement, Kela received a lot of negative feedback from patients, because many of them were forced to leave their usual provider, and from providers, because the quality weight was decreased. Several rejected providers made an official complaint to the Finnish Market Court, which is an independent special court that deals with procurement, competition and supervision matters, market law matters and intellectual property rights matters. The change in procurement practice also gained some attention in the media from patients that were forced to change their incumbent provider.

The public and partly political pressure and the complaints to the Market Court led to the following two new different procurement processes during the 2019–22 contract period: First, Kela arranged additional procurements in the winter of 2019 in all five insurance districts to acquire more providers to offer the service specifically for patients under the age of 18. The unusual feature in these additional procurements was that all providers were able to participate in the procurement, including those who had already received a contract in the actual procurement in 2018. In practice, these contracted providers faced no risk when they participated in the procurement, and they were able to increase the price they receive for patients under the age of 18.

Second, the Market Court decided that the invitation for tenders document was not explicit enough in the southern and eastern districts regarding providers' selection criteria. Kela arranged new procurements in these two districts in the autumn of 2019, and new contracts were made from 2020 onwards with accepted providers. These additional and renewed procurements are not in the scope of this thesis but certainly in future empirical studies. Nevertheless, the procurements show that in addition to the public procurer, there are several stakeholders' such as patients and providers, who are interested in the results of the procurements in health care services.

3.5 Market characteristics

There are some notable differences between the markets for the different medical rehabilitation services that are studied in this thesis. Physiotherapy markets are among the most competitive health services in Finland, both in terms of the number of providers and their capacity: Based on Statistics Finland registries there were 2632 physiotherapy firms in 2015, 1253 of which had a contract with Kela. Kela is the single largest financer of physiotherapy services, accounting for around a quarter of the entire sector's revenue. The competitiveness and wide participation in Kela's procurements makes the physiotherapy market very attractive for empirical research, which is why the focus in Articles I, II and IV is solely in the physiotherapy market.

Similar statistics on number of firms and their revenues are, unfortunately, not available for the speech and occupational therapy markets. However, it is known that these two markets are not nearly as competitive as the physiotherapy market. Based on interviews with some providers and Kela's procurement officials, speech and occupational therapy firms rely significantly more on the services financed by Kela. This means that Kela's procurements are relatively more important for these two industries than for the physiotherapy industry. Speech and occupational therapy patients may also need to wait for available providers or therapists for several weeks or even months in some areas, which reflects the lack of competition and capacity.

Table 2 presents characteristics of the three rehabilitation markets in the 2006, 2010, 2014 and 2018 procurements. The number of bidders, accepted providers and their capacity, as well as the number of patients are much higher in physiotherapy than in speech or occupational therapy services. The table illustrates how small the number of rejected providers was in 2006, 2010 and 2014, and shows how the procurement reform influenced the share of accepted providers in the three markets in 2018: In physiotherapy markets, the number of rejected providers increased from 28 in 2014 to 313 in 2018. While the number of accepted providers decreased, the total capacity of these providers was still more than double the number of patients. Similar effects are present in the occupational therapy market, where the number of rejected providers also increased significantly from only four in 2014 to 52 in 2018. However, in speech therapy the number of rejected providers increased only little from four in 2014 to nine in 2018.

Table 2. Market characteristics in the procurements.

	2006	2010	2014	2018
Physiotherapy				
Bidders	1407	1327	1293	1193
Accepted providers	1392	1320	1265	880
Rejected providers	15	7	28	313
Capacity	~38000	44162	50917	38541
Patients	14784	14203	14671	16212
Speech therapy				
Bidders	486	488	581	589
Accepted providers	480	481	577	580
Rejected providers	6	7	4	9
Capacity	~8000	8590	11990	13842
Patients	4651	5057	7439	11757
Occupational therapy				
Bidders	330	396	485	517
Accepted providers	325	388	481	465
Rejected providers	5	8	4	52
Capacity	~8000	10556	16168	15701
Patients	4407	4628	6491	10793

Data: Pitkänen (2022) and Pitkänen & Varkevisser (2022).

There are also some other notable differences between providers in the three markets. For example, it is more common that physiotherapy firms have their own permanent premises compared to speech and occupational therapy providers. The reason is that remote services are more common in speech and occupational therapies, even though most providers with premises also offer services remotely. Physiotherapy providers are also, on average, larger than speech and occupational therapy providers in terms of their capacity and number of therapists. A sole proprietor is the most common business type of speech therapy firms, whereas limited liability company is the most common business type in physio and occupational therapies. In principle, all providers are private firms that operate on a for-profit basis, but some providers may also have altruistic purposes. A very small number of providers in all three markets are associations or foundations that are technically non-profit organizations, but often operate profitably in the rehabilitation markets to cover their other operating costs.

The number of bidders has decreased in physiotherapy procurements, but has increased in speech and occupational therapy procurements. One potential explanation for the decrease of bidders in physiotherapy procurements is the active

consolidation of the market. This hypothesis is supported by the fact that the capacity of an average bidder has increased while the number of bidders has decreased. The majority of providers in all three markets are still independently operating firms, but around a third of providers are part of a larger chain. Some of these chains operate regionally, for example, within one district, but some operate nationwide. In turn, a potential explanation for the increase in the number of bidders in speech and occupational therapy markets is that as the number of patients has increased. This may also have encouraged more therapists to establish their own firms and enter the market by leaving either the public sector or another provider.

The market differences in degree of competition are largely attributable to the supply of the education required to enter these professions, as the annual number of graduating speech and occupational therapists is much smaller than that of physiotherapists. In 2019, there were 15 polytechnics providing physiotherapy education, five polytechnics providing occupational therapy education and five universities providing speech therapy education in Finland. The polytechnics accepted a total of 427 new physiotherapy students and 142 new occupational therapy students, whereas the universities accepted 116 new speech therapy students in 2019. One additional Finnish university started speech therapy education in the autumn of 2021, which may ease the shortage of speech therapists and increase market competition in the future.

4 RESEARCH QUESTIONS

All four articles in this thesis present a research question that arises from standard economics and health economics theory. The research questions also share a common pragmatic goal for improving and evaluating competition and different procurement mechanism in the studied rehabilitation markets. The original publications in this thesis are presented chronologically in the order in which they were conducted. This reflects my scientific thinking and progress during the research work. The chronological order also highlights the possible areas of development regarding the competition based on patient choice and public procurements in the studied markets.

In Article I, we examine patient choice and quality competition *in* the physiotherapy market. Patients are free to choose and actively switch their provider at any time. However, some patients are also forced to switch their provider in case if their incumbent provider does not receive a contract in the public procurement or the provider exits the market for some other reason. We examine choices of new patients and experienced patients who were either forced to switch or actively switched their provider. Because patients do not pay any out-of-pocket payments, prices should not influence patients' choices. Therefore, we answer the following straightforward research question: Does providers' quality have an influence on patients' choices? We analyze this question separately for new patients, forced switchers and active switchers in the 2011–14 contract period.

Article II examines competition *for* the market in the physiotherapy procurements in 2003, 2006, 2010 and 2014. Kela applied a very inefficient procurement practice in these procurements, as nearly all providers in all insurance districts were offered a contract. For example, out of 25 insurance districts that organized the procurement in 2010, only three rejected at least one provider in physiotherapy service. In this study, we analyze the following broad research question: How did the inefficient procurement practice influence providers' prices and expenditure of the service? We answer this question by analyzing whether prices increased more or less in 2010 and 2014 procurements in those insurance districts that had rejected at least one provider

in the previous procurements. We also perform counterfactual analysis regarding the effects of implementing a capacity-rule for acceptance in the 2014 procurement.

Article III examines the importance of an efficient procurement practice and competition utilizing the procurement practice reform in 2018. The most important change to the procurement practice was that the providers were systematically accepted based on their capacity and the local demand in the 2018 procurement. I analyze the effects of the procurement reform in physio, speech and occupational therapy services and answer the following research question: What were the price effects of the procurement reform in 2018? In addition, I analyze whether the price effects vary based on markets' underlying competitiveness and between the three different rehabilitation services.

In Article IV, we compare competitive biddings and fixed price procurements in the physiotherapy market. The study focuses on the two Kela's insurance districts, South Ostrobothnia and Päijät-Häme, which piloted a fixed price procurement in 2010 and throughout the 2011–14 contract period. In the 2003, 2006, 2014 and 2018 procurements, the two districts organized a similar scoring auction as the other districts. We answer the following research question: What are the advantages and challenges of competitive bidding scoring auctions and fixed price procurements in health services?

5 DATA

5.1 Provider data

This thesis is based on two main data sources: procurement data on providers and individual-level register data on patients. All four articles use the provider data, which is based on the quality–price score lists gathered from Kela’s insurance district and central administration that organized the medical rehabilitation service procurements in 2006, 2010, 2014, and 2018. The data includes information on all providers that met the minimum criteria and were ranked based on their quality–price scores. The quality–price score lists include providers’ quality scores, price for a 45-minute therapy session and reported annual capacities. Importantly, the data includes information on the rejection threshold that each insurance district decided upon. The data also includes information on providers’ address, postcode and business type, gathered from Kela’s internal registry.

The data also includes providers’ prices in the 2003 procurement for the 2004–2006 contract period, based on a list of contracted providers and their prices in November 2006. The 2003 competitive bidding was the first procurement that was organized similarly in all districts, which is why I considered it as a good starting point for the empirical analysis. The 2003 provider data is used in Articles II, III and IV. The price list data may not include all bidders that were not offered or did not sign a contract after the 2003 procurement. However, it is very likely that there were only very few bidders that were not offered a contract, similarly as in the 2006 and 2010 procurements. In addition, the price lists may include a small number of providers that did not participate in the procurement, but received a contract during the contract period.

Kela’s insurance districts had organized public procurements regarding the rehabilitation services already prior to 2003. According to Kela’s procurement experts, some of these procurements were scoring auctions and some were based on straight negotiations between the districts and providers. These procurements would have offered potentially very interesting research settings and questions. However,

after careful examination of the archives of Kela's insurance districts, it became clear that more detailed and complete data on the 2003 or previous procurements was no longer available for this thesis. The retention period for tenders and other procurement documents is 10 years, so Kela's insurance districts had already destroyed most of the material when I started to collect the data.

The quality scores that Kela evaluates in the procurements include providers' work experience and investments in their additional education, facilities and equipment. Because Kela has used different scales for quality scores in different procurement years, the quality scores are not comparable between the procurement years. The quality scores also differ between the rehabilitation services, as equipment and facilities are not included in the quality scores for example in speech therapy service. All of the quality categories are evaluated in a similar manner throughout the country, except in the two districts that piloted the fixed prices in 2011–14. The two insurance districts were therefore excluded from the data in Articles I–III.

Empirical analysis of quality competition in health care markets is challenging, because quality is multidimensional. Different quality measures can be based on inputs or outcomes (Tay 2003). The outcome measures were typically based on crude measures such as mortality rates, readmission rates or hospital reputation scores, whereas most recent studies have used patient-reported outcomes (Gutacker et al. 2016). Different quality input measures include, for example, number of staff per patients or detected deficiencies (Harrington et al. 2000). The input measures are typically used in health and social services where the service is continuous and the quality of a specific treatment is difficult to measure, such as in nursing homes. Quality measures that are based on inputs, such as the ones used in Kela's rehabilitation service procurements, can be considered as a proxy for providers' underlying performance quality or utility gain construct (Forder & Allan 2014).

5.2 Patient data

In articles I, II and IV, we have merged the provider data with individual-level data on physiotherapy patients in 2006–2015. The patient data is extracted from Kela’s registers on rehabilitation applications and invoices. The applications data includes the patients’ age, sex, municipality, postcode and ICD-10 codes of primary, secondary and tertiary illnesses. The data also includes information on whether the patient had the right to receive the service at home, the number of annual physiotherapy sessions, the length of the sessions in minutes, and the number of years the patient had received the physiotherapy service since 2000.

The invoice data includes, on average, 10 observations for each patient per year, because providers are instructed to invoice Kela once a month. The data does not specify the date of each invoice or the number of visits each invoice holds, so we have calculated the annual number of invoices for each patient at every provider, and we consider the provider with the most invoices as the selected provider for each year. The invoice data also includes information on whether the patient received the service at home, based on whether the provider was paid extra for travelling. Because the extracted data does not include information on costs of the rehabilitation sessions, we have calculated an annual cost per patient in Article II based on the selected provider’s price, the number of annual sessions and whether the service was received at home or at the provider’s facilities.

5.3 Study samples

In Article I, we analyze how providers' quality influences patients' choices. Answering this empirically requires several choices not only from patients' but also from the researcher. We focus on choices in the 2011–2014 contract period by patients who were aged 16–65. The unique feature of the institutional setting and our data is that it enables us to identify new patients and those experienced in the service. We can also identify forced and active switchers based on patients' previous choices. Therefore, we focus on choices that were made by new patients, active switchers and forced switchers. Active switchers decided to switch voluntarily, whereas forced switchers had to switch because their previous provider was not included in the pool of providers.

In the studied physiotherapy service, patients can choose their provider from all accepted providers during the contract period. We merged the patient data with contract providers from the 2010 procurement to create the choice sets for each patient. The distance calculations between patients providers we done using straight-line distances between the center points of postcodes with an open data source from Statistics Finland. We decided to use choice sets that include all providers in the patient's own insurance district and all other providers within 80 km.

In Article II, our focus is on competition *for* the market in the 2003, 2006, 2010 and 2014 physiotherapy procurements. Similar to Article I, we use both the provider and patient data in our analysis. In practice, our data in this study consists of physiotherapy provider data in 2003, 2006, 2010 and 2014, and of patient data in years 2010, 2011, 2014 and 2015. We also use the following three other smaller-scale register data sets: First, we use postcode-level data on average rents in the 2010 and 2014 procurement years. This data is based on Kela's housing benefit registers for free market rents. Second, we use municipal-level register data on the number of individuals who were eligible for Kela's rehabilitation services for disabled persons in 2006–2015. Third, we utilize Statistics Finland's register data on the number of private physiotherapy firms in each postcode in 2006–2015. This data is used only to gain some background information related to the Finnish physiotherapy markets.

Article III continues the analysis of competition *for* the rehabilitations markets. I examine the price effects of the procurement practice reform in 2018 using data from physio, speech and occupational therapy procurements in 2003, 2006, 2010,

2014 and 2018 in Article III. Physiotherapy providers and patients in the two districts that organized the fixed price pilot in 2010 procurement were excluded from the analysis similarly as in Articles I and II. Patient volumes and costs for each year were used for descriptive information regarding the three markets. This data was obtained from Kela's open statistical database called Kelasto (see Kela 2022b).

I decided to expand the analysis from physiotherapy markets to other Kela's rehabilitation services in Article III, because I wanted to evaluate whether the procurement reform had similar effects in different markets. I examined physio, speech and occupational therapy markets, because these three services are the largest individual rehabilitation services that are organized by Kela. In practice, the reason for this is the extent of the data from other rehabilitation markets. For example, data from music or pool therapy services would not have included enough providers to perform a solid empirical analysis. In Articles I–III, data on physiotherapy patients and providers was excluded regarding the two insurance district that implemented fixed prices during the 2011–14 contract period.

In Article IV, we extend the analysis to the two districts that piloted fixed prices in the 2011–14 contract period. Our study sample is based on the procurement data in 2003, 2006, 2010, 2014 and 2018 in these two districts. The 2010 procurement data also includes those providers who joined the pool of providers during the contract period. This was possible during the pilot, whereas in other districts that organized a regular scoring auction the market entry is restricted to the procurement. We also use register data on patients to calculate the number of patients both in the districts and with each provider during the procurements.

6 METHODS

6.1 Patient choice modelling

Discrete choice models are commonly used in empirical economics to describe decision-makers' choices among alternatives (Train 2003). In health economics, researchers use patient choice modelling to evaluate how much different variables, such as quality, distance or waiting times, influence patients' choices of hospitals, general practitioners or other service providers. In Article I, we analyze how physiotherapy providers' quality influences patients' choices and how this differs with respect to patients' experience. We also perform patient choice modelling in Article II to calculate measures of physiotherapy markets' local competitiveness and simulate the economic benefits of implementing a capacity-based rule of acceptance in the procurements already in the 2014 procurement.

Discrete choice analysis consists of two interrelated tasks: specification of the behavioral model and estimation and estimation of the parameters of that model (Train 2003). The starting point regarding the specification of the behavioral patient choice model is the random utility model by McFadden (1974). The models are usually derived under an assumption of utility-maximizing behavior by the patient in the following way: Patient i faces a choice among alternative providers. The patient would obtain a certain level of utility from each provider. The utility that the patient i obtains from provider j is $U_{ij}, j = 1, \dots, J$. This utility is known to the patient but not to the researcher. The patient chooses the provider that provides the greatest utility. The behavioral model is therefore: Patient i chooses alternative y over j if and only if $U_{iy} > U_{ij} \forall y \neq j$. (Train 2003.)

The researcher observes some attributes of the alternative providers that are faced by the patient i , labeled $x_{ij} \forall j$, and some attributes of the patient i , labeled s_i , and can specify a function that relates these observed factors to the patient's utility. The function is denoted $V_{ij} = V(x_{ij}, s_i) \forall j$. This is often called representative utility. Because there are various aspects of patient i 's utility that the researcher does not or cannot observe, $U_{ijt} \neq V_{ijt}$. (Train 2003.)

In Articles I and II, we assume that patients are rational and maximize their utility when choosing from a set of alternative providers N_{jt} . Provider j is chosen if it results in the highest utility in the choice set. In the studied physiotherapy service, patients weigh the travel time, measured as distance to the provider from the patient's home, against the providers' quality and available times, measured as providers' capacity or calculated free capacity. In our analysis, we also allow patients' preferences to vary according to observed characteristics such as patients' age, gender and rehabilitation background.

In practice, we estimate conditional logit models where the dependent variable is a dummy variable that receives a value 1 when patient i has chosen provider j and 0 for all other providers in the patient's choice set. The alternative-specific variables in the choice sets are distance to each provider and their quality as well as capacity measures. In Article I, we also estimate the patients' willingness to travel (WTI), which is the number of extra kilometers that a patient located at the average distance from a provider would be willing to travel if the provider's quality measure increased by one point (Santos et al. 2017).

The choice models in Articles I and II differ slightly from one another. In Article I, we have calculated providers' free capacity based on number of patients at each provider in previous year. In Article I, we also take into account that some patients receive the service at their home and expect that the demand for the service is inelastic with respect to distance for these patients. These differences are due to the fact that in Article I we strictly focus on examining patient choices, while in Article II the simplified choice model is utilized as the first step to measure market competition. In both Articles I and II, we assume that the patient's utility from provider j is based on its quality in the most recent procurement, because all providers adhered to maintain their quality at the level of their tender for the entire contract period.

In Article I, we discuss whether our estimation produces causal estimates or simple correlations between patients' choices and provider quality. Previous literature has pointed the following four reasons why this might not hold: Reverse causation between choices and quality, capacity constraints of providers, systematic selection of patients that is not controlled for, and unobserved provider characteristics that influence choices and quality (see Gaynor et al. 2016; Gutacker et al. 2016; Santos et al. 2017). We argue that our setting enables to control at least the first three of these

issues. Regarding the unobserved provider characteristics, some of the previous studies have used a control group of urgent patients who should be less responsive to quality differences (Gutacker et al. 2016; Pope 2009). Unfortunately, our setting does not have such a control group, even though many forced switchers had only little time to choose their provider. This is the reason why we hesitate to interpret our results as pure causal estimates.

6.2 Competition, risk and efficiency in the procurements

The unifying theme of Articles II–IV is the influence of competition, risk and efficiency on providers' prices in the procurements. In Article II, we analyze how the inefficient procurement practice influenced prices and expenditure of the service. In the main analysis, we study the effects of providers' risk of rejection on prices. We also perform counterfactual policy analysis and examine the direct fiscal effects of implementing a systematic capacity-based rule of provider acceptance.

The starting point of Article II is the idea that each provider faces a risk of rejection in a competitive bidding when the procurer uses systematic acceptance criteria that spurs competition among providers. However, Kela's insurance districts did not apply such a systematic acceptance rule prior to the 2018 procurement. We measure the risk of rejection using variation across the insurance districts' rejections in the previous competitive biddings with two different measures: First, we create a binary variable for rejections in provider j 's district in previous procurements. The first measure indicates whether the providers have learned to anticipate the possibility of rejections in their district. Second, we calculate provider j 's distance to the rejection threshold in the previous procurement, measured in quality–price scores. The intuition behind the second measure is following: Providers that were highly ranked could have offered a higher price, and therefore might be able to take more risk in the next round. The aim is to investigate whether providers learned that they could have offered higher prices when the procurement practice was inefficient and nearly all bidders received a contract.

In Article II, we estimate two ordinary least squares (OLS) linear regression models. In the first model, the dependent variable is a natural logarithm of providers' prices. In this model, the key variable of interest is the binary risk measure for rejections in provider j 's district in previous procurements. In the second model, the dependent variable is the difference in providers' prices between two procurements. In this model, the risk measure is the provider j 's distance to the acceptance threshold in the previous procurement round. In both of the models we control for competition, which is calculated using predicted patient flows. We also control for providers' characteristics such as quality and capacity, as well as for number of potential patients in municipality as demand-side indicator and prices of rents as supply-side indicator. These supply and demand-side factors have been shown to influence prices in previous empirical literature (Cooper et al 2019; Gaynor et al. 2005).

Does the relationship between the two risk measures and prices represent a causal connection or merely a correlation? We argue that both measures are exogenously determined for a single provider for two main reasons: First, local Kela officials made the decisions on the acceptance thresholds in each district. A potential source of endogeneity could be that Kela officials in geographically small districts with a large number of potential service providers could have rejected providers more easily. However, based on the data, there seems to be no systematic difference between the districts that rejected bids and those that did not. Second, a provider's rank in the quality–price table is influenced by all other bids in the district. Thus, providers could not have known their ranking in the procurement's quality–price rank list in advance.

The first measure of risk partially resembles a difference-in-differences (DID) setting, where a researcher studies the effects of a policy change comparing treated and untreated regions (see Angrist & Pischke 2009). However, we did not perform such analysis in the Article II, because the aim was also to analyze the relationship of competition and prices simultaneously. Analysis that is more ambitious would have naturally increased the credibility of the results. The second measure of risk resembles a regression discontinuity design (RDD), where a researcher uses some known threshold or cut-off that divides observations into treatment and control groups (Angrist & Pischke 2009). However, because most of the Kela's insurance districts did not apply the systematic acceptance rule, and those that did only rejected a few providers, there were very few providers on both sides of the acceptance cut-off in the procurements prior to 2018. Naturally, utilizing the RDD and analyzing the effects of (not) receiving a contract on providers' future prices and quality, is very attempting in subsequent studies.

In Article II, we are also interested in the relationship between competition and prices, because greater competition might decrease prices in the procurements. There are several ways to measure competition in the health care markets. These measures range from *ad-hoc* measures based on geographical boundaries to structural measures derived from economic models of provider-payer bargaining (Dranove & Ody 2015). In Article II, we follow Kessler and McClellan (2000) and use patient choice modelling to calculate Herfindahl–Hirschman Indexes (HHI) that are based on providers' predicted market shares within their insurance district.

Again, the question is whether the relationship between the competition measure and prices represent a causal connection or merely a correlation? Different measures

of market structure and competition suffer from well-known endogeneity issues in price regressions. For example, the location of the providers and of new market entrants might be associated with prices. Also, higher quality providers may attract more patients and have higher market shares, resulting in a higher HHI for their market. Because these providers usually also have higher prices, this can lead to an estimated positive relationship between price and concentration measure driven by omitted quality scores rather than by market power (Cooper et al. 2019). We argue that this should not be a problem in our setting, as we are able to control for providers' quality in our price regressions. Naturally, there might also be other issues that are related to both competition and prices that cannot be fully controlled. Using the predicted market shares should also reduce this endogeneity bias (Cooper et al. 2011; Cookson et al. 2013).

Article III continues the analysis of competition *for* the market and providers' prices. I examine the effects of the 2018 procurement reform on prices in physio, speech and occupational therapies. The empirical approach follows Propper et al. (2008), who analyze the impact of competition on quality in the English National Health Service. They exploit policy reforms in the 1990s and use the fact that the pre-reform degree of competition differed between geographical areas. I use the same approach and exploit the pre-reform variation in market competition in a DID setting. The approach is based on the intuitive idea that the reform would have the most impact on providers located in areas with greater market competition, and the least impact in areas with less competition and idle capacity.

I use two different institutional features to define the primary treatment and control groups. First, I account for regional differences in rejections in the pre-reform procurements, and focus on providers that are located in districts where all providers were offered a contract in the 2006, 2010 and 2014 procurements. Second, I use the acceptance criteria of the 2018 procurement. In 2018, Kela accepted at least one bidder per municipality in speech and occupational therapy services, and at least three bidders per municipality in physiotherapy service. This criterion was spelled out in the request for tenders and known to the bidders in 2018, but was not an acceptance criterion in the pre-reform procurements.

Based on these two features, the treatment group consists of providers that are located in municipalities where all providers were offered a contract prior to 2018 and the number of bidders in 2014 was at least two in speech and occupational

therapy services, and at least four in physiotherapy. The control group then consists of providers located in municipalities where all providers were offered a contract prior to 2018 and the number of bidders in 2014 was smaller or the same as mentioned in the acceptance criteria in 2018. In practice, neither providers in the treatment group nor those in the control group had experienced an efficient procurement practice prior to 2018, but the treatment group consists of providers that are located in initially more competitive areas where the reform can be thought to have had a greater impact.

I estimate separately for the three services a DID model, where the dependent variable is a natural logarithm of provider j 's price. The main variable of interest is the DID coefficient, which is an interaction between a dummy variable for the treatment group and a dummy variable for the procurement reform in 2018. The coefficient measures the price effect of the reform in the treatment group relative to the control group. It is important to notice, that the empirical approach does not identify the effect of the reform *per se*, but can be thought capable of identifying the differential effects of the reform between initially more and less competitive areas (Roos et al. 2020). As in all DID settings, the traditional common trends assumption must hold for causal interpretation. In addition, the sign of the effect should be the same both in treatment and control groups (Fricke 2017). Then, this approach identifies a lower bound for the effect of the reform in more competitive markets compared with the continuation of the inefficient procurement practice.

Defining markets with geographic boundaries often has its problems as postcodes are likely to be too small and some other boundaries too large (Dranove & Ody 2015). In Article II, our market definition is the insurance district, because it was responsible for organizing the service for the local population and accepting the providers in the procurements prior to the procurement reform in 2018. In Article III, my market definition is the municipality, because the number of providers in a municipality was a selection criterion in the 2018 procurement. Even though these definitions have a solid ground in the institutional setting, they are both based on somewhat artificial boundaries that are not visible especially to patients. From the patients' perspective, their choices are not entirely limited to providers within these boundaries, which is reflected in patients' choice sets in Articles I and II.

In Article IV, we compare competitive bidding scoring auctions with fixed price procurements. First, we review the literature on both procurement types. Second,

we present descriptive analysis of the market and providers' prices in the two procurement types utilizing the fixed price procurement that took place in two districts in 2011–14 contract period in the physiotherapy service. The main contribution of the study is the literature review combined with a comprehensive evaluation of the fixed price procurement that Kela piloted in 2010. In the empirical part of the Article IV, our focus is solely on the two districts and we only present descriptive analysis regarding the procurements. Because of publication technicalities and simplicity, we excluded the comparison of the fixed prices with the prices of the procurements in 2010 in other districts. Naturally, the fixed price pilot could offer possibilities for even more ambitious research design.

7 RESULTS

In Article I, we analyze whether providers' quality influences patients' choices, and the differences between choices of new patients, active switchers and forced switchers. The descriptive evidence shows that all patients have on average more than 15 providers within a 10 km radius, and that majority of the patients bypass their nearest alternative provider. On average, all patients choose a provider with higher quality than the average quality of the accepted providers. The choice models' results show that all patients prefer high-quality providers within short distances. Patients are also more likely to choose providers with greater free capacity. We also find that the willingness to travel for quality is highest among new patients and active switchers. This suggest that new patients and active switchers compare different alternatives more thoroughly, whereas forced switchers most likely choose their new provider in limited time, which may lead to poorer choices in terms of quality.

Articles II and III provide partially similar descriptive findings regarding the 2003, 2006, 2010 and 2014 procurements. The evidence shows that prices rose rapidly between 2003 and 2014 in all three studied services. For example, in physiotherapy service the average price rose by as much as 74%, while the Finnish Consumer Price Index increased only by 21% from 2003 to 2014. The price dispersion of the bids also increased, which suggest lack of competition and inefficiency. The descriptive findings also show that even though Kela's insurance districts did not implement a systematic capacity-rule for acceptance, the average price of the rejected providers was higher and quality lower compared to the accepted providers in each procurement prior to 2018. This suggests that the districts rejected only the very few high-price but low-quality bids that they received.

In Article II, we examine how the inefficient procurement practice prior to 2018 influenced providers' prices and expenditure of the service. We find that rejecting at least one provider in the area decreased prices by more than 5% in the next procurement round. We also find that providers that were further away from the rejection threshold offered higher prices in the next competitive bidding. These results suggest that providers learned about the inefficient procurement practice and

that they could have offered higher prices. Our results also show that prices were lower in the more competitive areas. Patient choice models also show that all patients prefer high-quality providers within a close distance, confirming the results of Article I. Finally, our counterfactual simulations show that implementing the capacity-rule would have resulted in large direct fiscal savings and higher average quality of contracted providers in the 2015–2018 contract period, but forced many patients to switch their provider.

I examine the price effects of the 2018 procurement reform in physio, speech and occupational therapy markets in Article III. The descriptive evidence shows that the strong growth rate of prices declined sharply in 2018, and providers who participated in subsequent procurements increased their prices significantly less than in previous procurements. The descriptive statistics also confirm the simulations in Article II, by showing that accepted providers had significantly lower prices and higher quality than rejected providers in the 2018 procurement. The regression results show that the reform had a greater negative effect on prices in initially more competitive areas especially in the physiotherapy market. Similar statistically significant effects are not found in speech and occupational therapy markets, which may be due to the differences in the degree and nature of competition in the two markets compared to the physiotherapy market. These results suggest that the procurer would probably benefit from more competition especially in the speech and occupational therapy markets.

In Article IV, we compare competitive bidding scoring auctions with fixed price procurements. Our analysis suggests that the fixed price procurement encouraged more providers to join the pool of providers than the competitive bidding. However, the analysis shows that it is very likely that some providers would have offered a lower price in a competitive bidding, and were therefore overcompensated during the fixed price pilot. The results also suggest that some providers would most likely have offered a higher price in a competitive bidding, but now accepted the fixed price and registered in the pool. The results show that it is challenging to determine the appropriate level of fixed prices, whereas an efficiently organized competitive bidding provides information about the quality and prices of available providers.

Table 3 summarizes the research questions, study samples, methods and results of all four Articles.

Table 3. Summary of the Articles.

Article	Research question	Study sample	Methods	Main result
I	Does the providers' quality have an influence on patients' choices, and does it differ by patients' experience?	Physiotherapy providers in the 2010 procurement, and new patients, active switchers and forced switchers in 2011–14.	Conditional logit models where patients' choices are explained by providers' quality, distance and free capacity.	All patients prefer high-quality providers within short distances, but forced switchers are the least willing to travel for higher quality.
II	How did the inefficient procurement practice influence providers' prices and expenditure of the service?	Physiotherapy providers in the 2003, 2006, 2010 and 2014 procurements, and patients in 2010, 2011, 2014 and 2015.	OLS models where prices and price differences are explained by the risk of rejection in the previous round and local market competition.	Rejecting at least one provider in the area decreased prices by more than 5% in the next procurement round.
III	What were the price effects of the procurement reform in 2018, and do they vary based on the markets' competitiveness?	Physio, speech and occupational therapy providers in the 2003, 2006, 2010, 2014 and 2018 procurements.	DID models where prices are explained by differences in local market competition and the procurement reform.	The reform slowed down the increase of prices in all three services, but the effects were strongest in the most competitive local physiotherapy markets.
IV	What are the advantages and challenges of competitive bidding scoring auctions and fixed price procurements in health services?	Physiotherapy providers in the 2003, 2006, 2010, 2014 and 2018 procurements in the two districts that organized fixed price pilot in 2011–14.	Review of the literature and descriptive analysis of the market and providers' prices in the two procurement types.	Efficiently organized procurement provides information about the prices, whereas it may be difficult to determine the fixed price-level.

8 DISCUSSION

This thesis examines competition *in* the market and *for* the market in the Finnish rehabilitation markets. Article I studies quality competition in the physiotherapy market. We show that all patients prefer high-quality providers within a close distance. Similar results are found in the choice models in Article II, but also in the comprehensive previous international empirical literature (eg. Gutacker et al. 2016). These results are important, as the aims that are often set for patient choice policies, such as improving the efficiency of services, require that choices are responsive to quality differences. Article I also adds to the previous literature on choice modelling by differentiating between choices made by new patients, active switchers and forced switchers. In addition, the study adds to the literature on how patient choice can be combined with competition for the market after a public procurement.

Article II examines competition for the physiotherapy market in the procurements prior to 2018, when the procurement practice was inefficient as nearly all bidders received a contract. We show that this inefficient practice increased prices as providers learned that they were able to offer higher prices. The results also show that prices were lower in more competitive areas, which is in line with both economic theory as well as previous empirical literature in health care markets (eg. Gaynor et al. 2015). The study also illustrates the simple trade-off between an efficient procurement practice and continuity of care at the patients' usual provider because several patients may be forced to switch their provider if many of the incumbent providers do not receive a contract. Implementing a capacity-based rule for providers' acceptance would have resulted in large direct fiscal savings and higher average quality of contracted providers already in the 2015–2018 contract period.

Article III studies price effects of the procurement reform in 2018 in physio, speech and occupational therapy markets. The reform increased the efficiency of the procurement as providers who were ranked based on their quality–price score were selected based on the local demand and providers' capacity. The results show that the reform slowed down the increase of prices in all studied services. These results

add to the previous empirical literature, which also shows that a change to a more efficient procurement practice has led to better procurement outcomes (eg. Bandiera et al. 2009). In addition, the results support the theoretical prediction that more intense competition leads to lower prices in public procurements (see Jääskeläinen & Tukiainen 2009).

Finally, Article IV examines the advantages and challenges of two commonly used procurement methods in health care: competitive bidding scoring auctions and fixed price procurements. The study connects the previous theoretical literature on procurements and empirical literature on competition in the health care markets with an empirical illustration utilizing a fixed price procurement pilot. Our results show that the competitive bidding provides information about the quality and prices of available providers, whereas it may be difficult to determine the appropriate level of fixed prices, because some providers may be overcompensated, and some may not accept the fixed price-level.

The administrative procurement data on providers, the individual level register data on patients and the institutional setting enabled various research questions and different empirical methods for this thesis. Nevertheless, all four articles have their own limitations. Article I lacks a credible control group whose choices should be less responsive to providers' quality, even though forced switchers most likely had only little time to choose their provider. The research design of Article II utilizes plausibly exogenous variation in the insurance districts' previous rejection rates and in providers' distance to the acceptance threshold, but the setting does not enable credible causal inference with the state-of-the-art empirical methods. Article III examines the effects of the 2018 procurement reform in three different service markets. The empirical design utilizes differences in the degree of competition within the three markets. Because the reform was implemented in all these markets simultaneously, the study does not examine the effects of the reform *per se*. Such an analysis would have required a credible control market. Finally, the fixed price pilot that is studied in Article IV could offer possibilities for a more rigorous empirical analysis than was conducted in the study.

The thesis answers many important questions regarding competition and procurements in the studied rehabilitation markets, but also leaves several possibilities for future research. Only the first article studies quality competition in the market, while the focus of articles II–IV is on the price competition in the

procurements, even though providers compete with quality also in the procurements. For example, the focus of Article III is on the price effects of the procurement reform. Because providers' quality is measured as their investments in factors such as education and facilities, providers only had limited time to react to the procurement reform in 2018 with their quality. However, the more efficient procurement practice may influence providers' quality especially in the future procurement rounds. In addition, it is important to study the long-term price effects and monitor that the competitive pressure in the procurements remains. The procurements may also have spillover effects on procurers, providers and patients of other Finnish rehabilitation markets, such as municipal and private markets. These issues will be left as topics for future empirical studies.

The results of this thesis show that patient choice policy can successfully be combined with public procurements as a tool to promote quality competition *in* the health care markets. Quality competition in the market means that it is not necessary for the procurer to emphasize quality competition *for* the market in the procurements. The procurement could even be simplified to pure price competition, even though many health service purchasers may prefer to use scoring auctions. To promote quality competition among providers in the market further, the procurers should publish comparable quality information on different providers. Naturally, the easiest way is to publish the quality data that is collected in the procurements.

The procurements studied in this thesis developed greatly during the research process. The results highlight the importance of an efficient procurement practice in repeatedly organized procurements where multiple providers receive a contract. The practical challenge in health services is that patients may be forced to switch their provider because of the procurements. There are no simple ways to solve this issue, as there is a trade-off between keeping competitive pressure and contracting many providers beyond the required capacity. A successful procurement also requires a competitive underlying market that produces competitive pressure. A fixed price procurement may be suitable especially when the underlying market is not competitive and the procurer can utilize its monopsony pricing power. For example, the studied Finnish speech therapy market is not very competitive and the procurement may not always produce competitive prices. Another option is to use a uniform price procurement, which could promote price competition. However, it is an open question whether this would also lead to a decrease in the total expenditures of the services.

9 CONCLUSION

Public procurements are an important part of the economy and a potential tool to achieve the goals of controlling public spending in the health care sector. However, only very little empirical research has been conducted regarding public procurements in the context of health care services. This thesis studies competition in the Finnish rehabilitation markets and the efficiency of the repeatedly organized procurements by the country's largest service purchaser. The setting offers a unique possibility to examine quality competition *in* the market in the form of patient choice and competition *for* the market in the form of competitive biddings. The results highlight the importance of an efficient procurement practice in repeatedly organized procurements in health services, and show that patient choice can successfully be combined with the procurements.

The results of this thesis provide information to guide the design of the market competition and procurements in different health and social services. Several public purchasers may use some inefficient practices without meaning to. For example in Finland, very little is known about the markets and design of public procurements regarding different social services for the elderly population, despite the economic relevance, media attention and aging population. The Finnish health and social services reform transferred the responsibility of organizing the services from more than 300 municipalities to 22 counties, including the city of Helsinki, in January 2023. As a result, the purchasing bodies are now larger, which may increase the expertise, enhance the practices and foster competition in the procurements. Finally, recent developments in opening the data on public authorities' purchasing and procurement activities may also reveal information on how to improve the design of the procurements and open possibilities for future empirical research.

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Choice, quality and patients' experience: evidence from a Finnish physiotherapy service

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Abstract

We study the relationship between patient choices and provider quality in a rehabilitation service for disabled patients who receive the service frequently but do not have access to quality information. Previous research has found a positive relationship between patient choices and provider quality in health services that patients typically do not have previous experience or use frequently. We contribute by examining choices of new patients and experienced patients who were either forced to switch or actively switched their provider. In the analysis, we combine register data on patients' choices and switches with provider quality data from a competitive bidding, and estimate conditional logit choice models. The results show that all patients prefer high-quality providers within short distances. We find that the willingness to travel for quality is highest among new patients and active switchers. These results suggest that new patients and active switchers compare different alternatives more thoroughly, whereas forced switchers choose their new provider in limited time leading into poorer choices.

Keywords Choice · Quality · Competition · Demand · Health care

JEL classification C25 · D12 · I11

Introduction

Patient choice policies have been implemented in many health care services with an aim to promote quality, responsiveness and efficiency (Brekke et al. 2014; Propper et al. 2006). A necessary condition for successful competition is that patients are sensitive to quality differences among providers (Varkevisser et al. 2012). However, it is not

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self-evident that demand increases with quality in health care services, where choices are often made under asymmetric information (Arrow 1963). Even when patients are well informed, they face costs in switching providers (Gravelle and Masiero 2000). Patients also face a trade-off between quality and travel costs (Beukers et al. 2014) and they usually bypass the nearest provider only for a particular reason (Varkevisser and Van der Geest 2007).

The empirical literature on patient choice has grown in recent years because of widespread choice policies and the availability of quality indicators regarding health care providers. Previous studies have usually found a positive relationship between patient demand and quality in primary and specialized health care services (Beckert et al. 2012; Gaynor et al. 2016; Gutacker et al. 2016; Moscelli et al. 2016; Santos et al. 2017; Smith et al. 2018; Varkevisser et al. 2012). However, the positive relationship has also been found in services where no public information is available, perhaps due to previous experiences shared within patient networks (Gutacker et al. 2016; Moscone et al. 2012).

In this paper, we examine the relationship between patient choices and provider quality in a health service that is provided to patients on a weekly basis for several years. Patients can choose from a very large set of alternative providers but they do not have access to comparable quality information regarding the providers. The providers are selected every four years in a competitive bidding based on their price and quality. Our data allows us to examine the choices of patients choosing a provider for the first time (henceforth, *new patients*), as well as choices of experienced patients who either initiated the switch (*active switchers*) or were forced to switch their provider (*forced switchers*) because their initial provider was no longer available in the pool of providers.

There are three theoretical aspects related to patient choice and provider quality in health services where patients receive the service frequently but do not have access to quality information. First, experienced patients may learn about certain quality aspects when they receive the health service frequently for many years (Biørn and Godager 2010). Second, even if providers' quality is not observable to patients prior to their first visit, providers have strong incentives to produce high quality to maintain their reputation with their usual patients (Kranton 2003). Third, providers have an incentive to give signals about their true quality, in an attempt to reduce errors made by patients (Gravelle and Masiero 2000).

Previous literature has studied the choice of hospital in treatments such as hip replacement (Gutacker et al. 2016) or angioplasty (Varkevisser et al. 2012), treatments from which the patients do not usually have any previous experience. We are the first to analyze differences between the choices of new and experienced patients, who are presumably, informed differently about the quality and characteristics of the service and alternative providers. We also study the difference between patients who travel and those who receive the service at their home. We estimate conditional logit choice models using register data on choices in the 2011–2014 contract period.

We find that, in general, all patients prefer high-quality providers within short distances. The results show that the willingness to travel for quality is highest among new patients and active switchers. These results suggest that new patients search for very experienced providers, active switchers have learned about certain quality aspects and forced switchers might have had only limited time to choose their new provider. We also find that patients who travel prefer shorter distances and high-quality facilities compared to patients who receive the treatment at home.

Institutional setting

The institutional context of our study is an intensive medical rehabilitation service financed by the Social Insurance Institution of Finland (Kela), which is the largest single financier of rehabilitation services in Finland. The focus of our study is the individual outpatient physiotherapy service, which is the most common form of medical rehabilitation. The physiotherapy was organized for 14,756 patients and the costs were 73.5 million euros in 2015 (SVT 2016). Kela is obliged by law to arrange the service for severely disabled persons under 65 years of age who face problems managing daily activities and fulfil the eligibility criteria defined in the Rehabilitation Act (566/2005). The physiotherapy is based on a written rehabilitation plan drawn up with a physician for one to three years at a time. Patients typically receive the physiotherapy in sessions of 45 or 60 min, once or twice a week, for several years. The aim is to promote the patients' autonomy and improve or maintain their work capacity and functioning. The service is provided free of charge for all patients.

Kela's insurance districts are responsible for organizing the service for the local population. The districts acquire the service from private physiotherapy providers using a competitive bidding every 4 years. Providers give information on their quality, set a price for a 45-min session and report their annual capacity when they participate in the procurement. This study concentrates on patients' behavior in the 2011–2014 contract period, for which the procurement was organized in 2010. Each insurance district organized the procurement in a predefined and similar manner.¹ Providers that fulfilled the minimum requirements were ranked based on their quality-price ratio, and the districts offered a contract to a number of providers based on local demand. Providers that signed the contract formed the pool, from which the patients were able to choose. Providers send their invoice directly to Kela, which pays for each visit based on each provider's accepted price. After the 2010 procurement, the pool included a total of 1297 providers.

In the 2010 procurement, the districts evaluated providers in six quality categories that were education, experience, facilities, equipment, language skills and Kela's quality standard. The overall maximum score for quality was 105.² In practice, the providers filled procurement forms that included questions about the quality aspects. Providers were also required to attach certified copies of their physiotherapists' education. Even though Kela audits some providers occasionally, it did not monitor contracted providers' reported quality during the contract period. However, all providers adhered to maintain their quality at the level of their tender for the entire contract period.

Kela has emphasized the free choice of providers in all of its rehabilitation services since 2011.³ The aim has been to promote competition and involve individuals in decisions related to their rehabilitation. Patients are free to choose from all accepted providers. Although the districts collect quality information in the competitive bidding, this information is not available to patients. Also, Kela officials can neither recommend nor favor any provider. Thus, patients may have problems finding information about high-quality

¹ In 2010 there were 29 insurance districts that organized the competitive bidding but the number was reduced to 25 for the 2011–2014 contract period.

² The maximum score was 20 for education, 30 for experience, 6 for facilities, 6 for equipment, 2 for language skills and 41 for Kela's quality standard, which includes issues such as assessment of the rehabilitation process.

³ Free choice of providers was first mentioned in 2011 in a Kela service standard document. However, it was a common practice in medical rehabilitation services in the insurance districts already before 2011.

providers. However, Kela's local offices have provided lists of alternative providers in the district and in 2011 Kela also established a website⁴ that lists the providers in a municipality or district. Thus, patients are likely to be aware of alternative providers in their area. They also gather information from many formal and informal sources, such as health care professionals, Kela officials, peer groups and provider websites⁵ (Pitkänen and Pekola 2016).

Patients can switch providers at any time during their rehabilitation process. However, switching always results in some costs. In this service, patients have to inform the local insurance district about their new provider. Switching is also associated with the discontinuation of established relationships especially when patients have repeated visits with the same provider (Anell et al. 2017). Most physiotherapy patients do indeed commit themselves to one provider for a long time. The switching behavior in this service can be divided into two different categories: first, patients can initiate the switch of providers. However, previous literature has shown that, usually, patients do not actively search for information nor switch providers (Victoor et al. 2012). Second, patients have been forced to switch their provider when their previous provider was no longer included in the pool of providers or ended their contract during the contract period.⁶ Often the forced switch comes as a surprise and patients need to make a new choice in relatively short time period. The previous provider is often involved in the choice of the new provider and they are also required to inform the new provider about the patient's rehabilitation needs and process. Thus, forced switchers can be considered as a random sample of experienced patients who had to choose a new provider, whereas other switchers are most likely a selective group of the most active experienced patients.

Patients receive the physiotherapy either at home or at the provider's facilities.⁷ Patients can apply to receive the service at their home if their capability to travel is limited and their home is suitable for the physiotherapy sessions. If the service is received at home, patients are indifferent about travel costs and time. Kela also pays providers extra based on the length of their travel and the given session.⁸ Patients that travel to the provider's facilities also get reimbursements from Kela for their travel costs. The reimbursement is calculated based on travel costs to the nearest alternative provider, and these costs have an

⁴ See <https://asiointi.kela.fi/palvelutuottajarekisteri/> (Accessed: 30.3.2020).

⁵ 86% of the providers had an informative website in December 2016.

⁶ This is a common issue also in other health and social services, because it is typical to organize the procurements repeatedly for example every four years.

⁷ The sessions can also take place for example at the patient's school.

⁸ Payments for providers regarding home visits are calculated in the following way: For a travel distance under 36 km the payment is the minute-based price added by 50%, for a distance between 36 and 70 km added by 70%, and for a distance longer than 70 km added by 100%. Also, a separate travel cost is paid if the distance in one direction is more than 100 km. Thus, providers are compensated generously for their travel costs to patient's home.

annual deductible.⁹ Therefore, it is likely that patients who travel prefer shorter distances than patients who receive the service at home.

Data

We have constructed our data by linking patient-level register data on rehabilitation applications and invoices from the years 2010–2014 with provider quality data that was collected in the 2010 competitive bidding. In our analysis we focus on choices in the 2011–2014 contract period for four main reasons. First, free choice of provider has been emphasized in the service since 2011. Second, the eligibility criteria for the service and the insurance districts remained the same during the contract period. Third, providers adhered to maintain their quality at the same level for this entire period and therefore choices across these years should be comparable. Fourth, Kela evaluated providers' quality in a different manner in the previous and next procurements in 2006 and 2014. Thus, concentrating on choices and switches from one contract period simplifies the empirical analysis.

Patient data

Our patient data is based on rehabilitation applications and invoices from the years 2010–2014. The applications data contains the patients' age, sex, municipality, postcode and ICD-10 codes of primary, secondary and tertiary illnesses. The data also includes information on whether the patient had the right to receive the service at home, the number of annual physiotherapy sessions, the length of the sessions in minutes, and the number of years the patient had received the service since 2000. We have merged these applications with invoices based on the patient's encrypted social security number. Providers were instructed to invoice Kela once a month, and therefore the data includes, on average, 10 annual observations for each patient. The data does not specify the date of each invoice or the number of visits each invoice holds, so we have calculated the annual number of invoices for each patient at every provider, and we consider the provider with the most invoices as the selected provider for each year.¹⁰ The invoice data also includes information on whether the patient received the service at home, based on whether the provider was paid extra for travelling. Unfortunately, we cannot observe the choice of a single physiotherapist or their flow between different providers.

⁹ The reimbursement for patients' travel costs has a co-payment for single one-way trips and an annual out-of-pocket maximum. Kela reimburses all costs that exceed the co-payment. The co-payments changed during the study period in the following way: In 2011–2012 the single trip co-payment was 9.25€ and the annual out-of-pocket maximum was 157.25€, whereas in 2013–2014 the single trip co-payment was 14.25€ and the annual out-of-pocket maximum was 242.25€. Travel costs exceeding the deductible must be reasonable, which in practice means that visits to providers in the same insurance district or within a close distance in other districts are covered. Travel costs are covered for the cheapest means of transport. For example, in 2015 Kela covered 88.4% of all patients' travel expenses in medical rehabilitation and the most common means of transportation was taxi (63.7%).

¹⁰ Most patients commit themselves to one provider for a long time. However, some patients have single invoices from providers other than their permanent provider. According to Kela officials, most of these visits take place during vacation periods. In most cases the permanent provider has made this arrangement with another provider, and therefore we do not consider these visits patient choices.

Overall our data includes 17,963 patients and 64,252 different patient-provider observations in 2011–2014. We have excluded all patients who were under the age of 16 for three reasons: first, the eligibility criteria for the service are different for persons under the age of 16 than for those aged 16–65. Second, in empirical studies it is always very difficult to determine who makes the actual decisions (Beckert et al. 2012). However, it is likely that parents make choices for their children. Finally, this also improves the precision of the analysis because children are more likely to receive the service at school or kindergarten rather than at provider or home. We have also excluded all patients who either lived or visited a provider in an insurance district that implemented fixed prices during 2011–2014 as well as patients who travelled more than 100 km.

Our data enables us to identify new patients and those experienced with the service. We can also identify forced and active switchers based on patients' previous choices. Active switchers decided to switch voluntarily, whereas forced switchers had to switch because their previous provider was not included in the pool of providers. Our main sample includes 2983 new patients, 555 patients who were forced to switch a total of 559 times, and 1679 active switchers who made 1,955 switches. Thus, in total we examine 5497 choices made by 5217 patients.

Provider data

Our provider data includes all providers that met the minimum criteria in the 2010 competitive bidding ($N=1325$). The data includes providers' quality scores, their price for a 45-min physiotherapy session, reported annual capacity, address and information on whether the provider had the premises to provide the service.

Quality is multidimensional in health services and different quality measures can be based on inputs or outcomes (Tay 2003). Besides the providers' overall quality score, the main quality attributes in this study are providers' investments in their experience, education, facilities and equipment. These type of quality inputs can be considered as a proxy for providers' underlying performance quality or utility gain construct (Forder and Allan 2014). Patients also listed these issues among the most important factors for their choice of provider in a survey (Pitkänen and Pekola 2016). Many of these quality aspects, such as physiotherapists' additional training and professional experience, are also visible to patients if they compare alternative providers for example on the internet. Unfortunately, Kela does not collect comparable data on the individuals' rehabilitation outcomes.

All of the quality categories were evaluated and scored in a similar manner in each insurance district, except in the two districts that piloted fixed prices for the contract period 2011–2014. We have excluded all 123 providers from these two districts from the data, as well as seven providers who were rejected based on their quality-price ratio and 21 providers that did not sign the contract. Our final pool of providers includes 1174 providers. There were 67 providers that ended their contract during the contract period. We have excluded these providers from the years that followed their market exit, and the annual data on available providers includes only providers with a written contract. We have also calculated providers' annual observed volume and the free capacity. The free capacity at a given year is calculated based on providers' observed volume at previous year.

Table 1 describes the data on providers in the pool after the 2010 procurement. Providers scored an average of 80.5 points for total quality. The lowest quality score was 31 points and the highest score 104, the maximum score being 105. Providers' average price was 47.5 euros, ranging from 28 to 99 euros. Because providers were accepted based on

Table 1 Descriptive statistics of the providers

Variable	Obs	Mean	SD	Min	Max
<i>Quality scores</i>					
Education	1.174	13.43	6.08	0	20
Experience	1.174	21.54	6.68	0	30
Facilities	1.174	3.63	1.67	0	6
Equipment	1.174	5.41	1.32	0	6
Standard	1.174	35.96	4.84	0	41
Language skills	1.174	0.57	0.72	0	2
Total	1.174	80.54	13.63	31	104
<i>Characteristics</i>					
Price	1.174	47.48	7.59	28	99
Observed volume	1.174	10.92	14.59	0	153
Capacity	1.174	33.89	43.48	1	420
Free capacity	1.174	23.64	34.39	- 46	301
Premises	1.174	0.92	0.27	0	1
New	1.174	0.15	0.35	0	1

their quality-price ratio, the quality scores are correlated with prices ($r=0.37$). However, the prices do not fully represent competitive prices, because the procurement mechanism was rather inefficient as only very few providers were not offered a contract (Pitkänen et al. 2020).

Table 1 also shows that on average, providers had an annual capacity for around 34 patients and an observed volume of nearly 11 patients in 2010. Thus, providers' average free capacity at the beginning of the contract period was nearly 24. The total annual capacity of the accepted providers was around 39,800, which was almost three times the number of patients who received the service. The data also shows that some providers had more patients than their reported capacity. On the other hand, the reported capacity did not bind providers to take that number of patients. Providers were also not guaranteed to receive any patients, because patients were freely able to select their provider. Finally, 92% of the providers had their own facilities and 15% were new service providers.

Choice sets

Patients can choose their provider from all accepted providers during the contract period. Thus, we have merged our 2010 provider data with the patients in 2011–2014. We have calculated straight-line distances between each patient and all providers using the centre points of postcodes with an open data source from Statistics Finland.¹¹ In order to create realistic choice sets based on the institutional features and to ease the computational burden, the choice sets include all providers in the patient's own insurance district and all other providers within 80 km.¹²

¹¹ We use a distance of 0.5 kms when the patient and provider were located in the same postcode. The smallest distance between two independent postcodes in the data was 0.93 kms.

¹² An experienced Kela official recommended these choice sets.

Methods

Choice model

We use a random utility choice model by McFadden (1974). We assume that patients are rational and maximise their utility when choosing a provider. Patients weigh the distance against the providers' quality and available times, measured as providers' free capacity. Thus, the utility for a patient i at provider j at time t is:

$$U_{ijt} = V_{ijt} + e_{ijt} = \beta_q Q_{jt} + \beta_c C_{jt-1} + \beta_d D_{ij} + \beta_{d^2} D_{ij}^2 + e_{ijt}, \quad (1)$$

where V_{ijt} represents the observable utility, which depends on the provider's quality Q_{jt} , free capacity C_{jt-1} and distance D_{ij} to alternative providers. However, we expect that the demand for the service is inelastic with respect to distance for patients who receive the service at their home. The error term e_{ijt} includes unobserved provider characteristics, random utility, and the difference between perceived and true quality that is caused by asymmetric information. We assume that the patient's utility from a provider is based on its quality in the 2010 competitive bidding, because all providers adhered to maintain their quality at the level of their tender for the entire contract period.

Patients choose from a set of alternative providers N_{jt} . Provider j is chosen if it results in the highest utility in the choice set. This indicates that active switchers decided to switch because their new provider resulted in a higher utility than their previous provider. We assume that the error term e_{ijt} is independently and identically distributed (IID) with a type-1 extreme value distribution. This leads to a conditional logit model where the probability that a patient i selects provider j is:

$$Pr_{ijt} = \frac{\exp(V_{ijt})}{\sum_{j' \in M_{it}} \exp(V_{ij't})}. \quad (2)$$

Methods

We estimate discrete choice models where the dependent variable is a dummy variable that receives a value 1 when patient i has chosen provider j and 0 for all other providers in the patient's choice set. The alternative-specific variables in the choice sets are distance to each provider, their quality measures and free capacity. We estimate conditional logit models specified in (1) separately for new patients, forced switchers and active switchers. We allow a non-linear effect of distance on utility in all models by including linear and squared terms. The estimated coefficients are marginal utilities. All of our choice models are estimated using Stata 13 with the command *clogit*.

The estimated marginal utilities only provide information about the sign of the utility, whereas the ratio of marginal utilities provides quantitative information on patient's preferences (Gutacker et al. 2016). These ratios of marginal utilities are also invariant with respect to the scale of the utility, and therefore a simple comparison of the ratios for different patient samples also gives us valuable information about the differences in their preferences (Santos et al. 2017). Thus, following this previous literature we estimate the patients' willingness to travel (WTT) as:

$$WTT = \frac{-\beta_q}{\beta_d + 2\beta_{d^2}\bar{d}}, \quad (3)$$

where \bar{d} is the average distance to the chosen provider. WTT is the number of extra kilometres that a patient located at the average distance from a provider would be willing to travel if the provider's quality measure increased by one point (Santos et al. 2017). We follow Hole (2007) and use the delta method (*ncom*) to calculate the standard errors for the WTT estimates.

Endogeneity

To interpret β_q as a causal relationship, the error term should be uncorrelated with the independent variables. Previous literature has pointed four potential reasons why this might not hold in patient choice models (see Gutacker et al. 2016). First, providers with higher demand are more likely to make greater investments in their quality, which induces reverse causation. This concern is similar to the hospital choice models, where hospitals might learn by doing so that higher volume providers have higher quality (Gaynor et al. 2005). In this study, the provider quality data comes from the 2010 procurement, whereas all choices occurred in 2011–2014. Intuitively, these choices in the contract period cannot affect providers' quality in the past procurement, but the future. Thus, we believe that the simultaneity arising from the effect of demand on quality is not a problem with our data and modelling approach.

Second, because providers have capacity constraints, high-quality providers might have less free capacity if demand is responsive to quality. This concern is similar to the endogeneity of waiting times in models for hospital demand (Gaynor et al. 2016). Again, we tackle this concern using lagged measure of free capacity that based on providers' observed volume in the previous year. This approach of using lagged measures of both quality and capacity is similar to the previous studies (Gutacker et al. 2016; Santos et al. 2017; Varkevisser et al. 2012).

Third potential reason for endogeneity arises if there is systematic selection of patients that is not controlled for in the providers' observed quality (Gutacker et al. 2016). However, the quality aspects used in our study reflect providers' long-term quality investments and do not measure outcomes that patients' choices or characteristics would have a direct influence. Thus, we believe that even if such systematic selection would occur, it does not influence the quality scores used in our study.

Fourth, unobserved provider characteristics that affect patient's choices and provider quality may also contribute to endogeneity (Gutacker et al. 2016; Santos et al. 2017). Some of the previous studies have used a control group of urgent patients who should be less responsive to quality differences (Gutacker et al. 2016; Pope 2009). Unfortunately, our setting does not have such a control group, even though many forced switchers had only little time to choose their provider. The relationship between quality and demand may be of interest even without a strict causal interpretation, as it shows whether patients favor high-quality providers (Gutacker et al. 2016). In this study, we focus on the differences between experienced and new patients, and between those who receive the service at home and those who travel. Thus, our findings may reveal some important aspects of patient behavior in health care services.

Table 2 Descriptive statistics of new patients, forced switchers and active switchers

Variable	New patients				Forced switchers				Active switchers						
	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max
<i>Patient characteristics</i>															
Age	2,983	50.20	12.58	16	65	559	45.81	14.47	16	65	1,955	40.52	16.08	16	66
Male	2,983	0.54	0.50	0	1	559	0.50	0.50	0	1	1,955	0.46	0.50	0	1
Right to sessions at home	2,983	0.50	0.50	0	1	559	0.54	0.50	0	1	1,955	0.56	0.50	0	1
Received sessions at home	2,983	0.35	0.48	0	1	559	0.38	0.49	0	1	1,955	0.38	0.49	0	1
Number of annual sessions	2,983	57.69	27.53	2	150	559	64.05	25.14	8	150	1,955	62.09	26.44	7	150
Length of a session (in min)	2,983	57.84	7.19	45	90	559	58.98	8.46	45	120	1,955	59.36	7.55	45	120
Years of rehabilitation	2,983	0	0	0	0	559	8.55	3.49	1	14	1,955	8.97	4.16	1	14
Number of illnesses	2,983	1.80	0.84	1	3	559	1.68	0.81	1	3	1,955	1.76	0.84	1	3
<i>Choice characteristics</i>															
Provider's quality	2,983	86.89	10.69	31	104	559	86.19	11.74	44	104	1,955	86.77	11.35	31	104
Previous quality	-	-	-	-	-	-	-	-	-	-	1,603	86.28	11.38	43	104
Distance to provider (in km)	2,983	10.31	13.24	0.5	99.51	559	11.81	12.33	0.5	99.11	1,955	13.29	15.97	0.5	99.59
Previous distance (in km)	-	-	-	-	-	559	10.25	12.09	0.5	95.11	1,955	15.08	17.96	0.5	99.51
Provider in same district	2,983	0.93	0.26	0	1	559	0.86	0.35	0	1	1,955	0.84	0.36	0	1
Distance to closest provider	2,983	4.10	7.59	0.5	99.11	559	4.69	8.16	0.5	95.11	1,955	3.40	6.42	0.5	62.80
Providers in 10 km radius	2,983	15.24	21.74	0	105	559	23.15	30.20	0	105	1,955	19.76	24.63	0	105
Providers in same district	2,983	57.41	16.53	4	84	559	58.80	17.68	4	84	1,955	57.49	16.02	4	84
Providers in choice set	2,983	127.10	80.70	4	327	559	155.78	88.68	4	330	1,955	142.67	86.43	4	328
Number of patients	2,983					555					1,679				

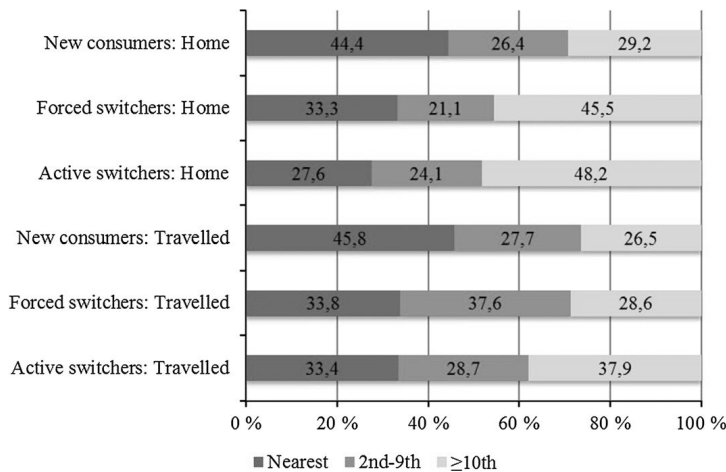


Fig. 1 Percentage of patients who chose their nth nearest provider

Results

Descriptive evidence

Table 2 shows the descriptive statistics of new patients, forced switchers and active switchers. New patients are on average 50 years old, 54% of them are male and they receive 58 sessions in a year. Forced switchers are on average 46 years old and 50 percent of them are male. They receive 64 sessions annually and have received the service for nearly 9 years since 2000. Active switchers are the youngest group, the average age being 41, and 46 percent of them are male. They receive 62 sessions in a year and have received the service for 9 years since 2000. Over 50 percent of the patients in all these groups had the right to receive the service at home, but less than 40 percent actually received the service at home.

Patients in all groups have on average more than 15 providers within a 10 km radius and over 125 providers in their choice sets. On average, patients in all three groups choose a provider with higher quality than the average quality (80.5) of the accepted providers. However, there is no significant difference between the selected provider's average quality among the three patient groups. We also compared the quality of the new and previous provider regarding 1,603 active switches that were made in 2012–14. On average, active switchers choose equally high quality providers as their previous ones. Thus, this evidence does not indicate that active switchers would systematically aim for a higher quality provider.

Table 2 also shows that the average distance from home to the chosen provider is 10.3 km for new patients, 11.8 km for forced switchers and 13.6 km for active switchers. Forced and active switchers are also more likely to choose the provider from another insurance district than new patients. Forced switchers choose a provider located 1.5 km further than their previous provider, whereas active switchers choose a provider 1.9 km closer. A potential explanation could be that many forced switchers were forced to travel further than previously, whereas many active switchers decided to switch to a closer provider.

Figure 1 shows that a majority of all patients bypass the nearest provider: 46 percent of new patients who need to travel choose their nearest provider, whereas only 34 percent of forced switchers and 33 percent of active switchers choose their nearest alternative. Our

Table 3 Estimated marginal utilities: conditional logit models

Variable	New patients		Forced switchers		Active switchers	
	Est	SE	Est	SE	Est	SE
<i>Main effects</i>						
Quality	0.074	0.011***	0.051	0.022*	0.043	0.011***
Distance	- 0.136	0.013***	- 0.091	0.042*	- 0.085	0.011***
Distance ²	0.0003	0.0001***	- 0.001	0.001	0.0001	0.0001
Free capacity	0.006	0.002***	0.011	0.003**	0.009	0.002***
<i>Interaction with quality</i>						
x Age	- 0.001	0.0002**	- 0.0004	0.0003	- 0.0003	0.0001*
x Male	- 0.010	0.004*	0.006	0.009	- 0.002	0.005
x Number of annual sessions	0.0001	0.0001	- 0.0005	0.0002**	0.0001	0.0001
x Number of illnesses	0.002	0.002	0.013	0.006*	- 0.0002	0.003
x Sessions at home	- 0.020	0.004***	0.008	0.009	0.003	0.005
<i>Interaction with distance</i>						
x Age	- 0.001	0.0002***	- 0.001	0.001	- 0.001	0.0002***
x Male	0.015	0.005**	- 0.038	0.020	- 0.012	0.005*
x Number of annual sessions	0.0001	0.0001	0.0001	0.0003	0.0001	0.0001
x Number of illnesses	0.001	0.003	0.014	0.012	0.0003	0.004
x Sessions at home	0.015	0.005**	- 0.004	0.021	0.020	0.005***
<i>Interaction with free capacity</i>						
x Age	0.0001	0.0001	- 0.0001	0.0001	0.0001	0.0002
x Male	0.0001	0.0001	- 0.001	0.001	0.0001	0.0001
x Number of annual sessions	0.0001	0.0001	0.0001	0.0001	- 0.0001	0.0001
x Number of illnesses	0.0001	0.0003	- 0.001	0.001	- 0.001	0.001
x Sessions at home	- 0.0007	0.0007	- 0.0001	0.001	- 0.002	0.001*
WTT (quality)	0.549	0.090***	0.546	0.335	0.513	0.139***
Number of patients	2,983		551		1,679	
Number of choices	2,983		555		1,955	
Number of observations	379,141		87,082		278,914	
BIC	16,253		3,812		13,493	
Pseudo R ²	0.425		0.346		0.293	

Conditional logit models of choice of physiotherapy provider for patients' choices in years 2011–2014. Estimated coefficients are marginal utilities. Interactions on patient characteristics with distance² are not reported (available from the authors). WTT is the coefficient on quality divided by the marginal utility on distance ($\beta_d + 2\beta_{d^2}$) evaluated at the average distance to the chosen provider. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

data also reveals that patients who receive the service at home select a provider further (12.1 km) than patients who need to travel (11.2 km), and they are also more likely to bypass the nearest provider regardless of their previous experience.

Regression results

Table 3 presents our baseline estimation results from the conditional logit model of choice specified in Eq. (1) for new patients, forced switchers and active switchers during the

2011–2014 contract period. Quality of the provider is measured as the total quality score of each provider that is a lagged value from 2010. The main effects also include distance measured in kilometres between the postcodes of the patient and provider, a squared term of the distance and the free capacity for each provider that is based on previous year's patient volume. Table 3 shows that, in general, all patients are more likely to choose high-quality physiotherapy providers and prefer short distances. Patients are also more likely to choose providers with greater free capacity. The estimated WTT for a one point increase in the total quality score is little over 0.5 kms for both new patients and active switchers. However, there is no similar statistically significant effect regarding the WTT for quality among forced switchers.

We also estimate a choice model with four separate quality measures that are the providers' quality scores for experience, education, facilities and equipment. Table 4 presents the results of these regressions. We find that new patients prefer providers with better education and experience. These results suggest that new patients search for providers already experienced in treating many disabled individuals for a long time. The results show that active switchers prefer providers with better experience and equipment. We do not find any statistically significant specific preferences for forced switchers. The results show that new patients are willing to travel 0.5 km for a one-point increase in the education score and 0.9 km for an increase in experience. Active switchers are also willing to travel 0.6 km for a one-point increase in experience and 6.3 km for an increase in the equipment score. Potential explanations for these results are that active switchers have learned about certain important quality features whereas forced switchers might have had only limited time to choose their new provider and have not thoroughly compared different alternatives.

We examine potential patient heterogeneity that is captured through the interaction terms in the models. Like previous studies (Beckert et al. 2012; Beukers et al. 2014; Gutacker et al. 2016) we find that among new patients and active switchers, older individuals prefer shorter distances. We find no systematic difference between the preferences of female and male patients or patients who receive more annual sessions or have more illnesses. We find that those among new patients and active switchers who receive the sessions at their home are less likely to choose providers in close distance with high-quality facilities and equipment. These results are rather intuitive, as these patients are indifferent towards travel costs and time, and would not benefit from high-quality facilities.

Conclusion

We are the first to study patients' choices and switches of providers in a health service that is received frequently for a long time. Similar to previous studies, we find that patients prefer high-quality providers within short distances. Patients are also more likely to choose providers with greater free capacity. In addition, the results show that the willingness to travel for quality is highest among new patients and lowest among forced switchers. The results show that new patients especially prefer providers with better quality scores in education and experience. This indicates that new patients search for very experienced providers. Active switchers choose providers with high experience and equipment scores, whereas forced switchers seem to prefer experience and equipment. However, we find that especially new patients and active switchers are willing to travel for an increase in quality scores, whereas the effect is not statistically significant for forced switchers.

Table 4 Estimated marginal utilities: conditional logit models

Variable	New patients		Forced switchers		Active switchers	
	Est	SE	Est	SE	Est	SE
<i>Main effects</i>						
Education	0.065	0.022**	0.034	0.047	0.011	0.023
Experience	0.124	0.022***	0.074	0.044	0.050	0.022*
Facilities	- 0.091	0.075	- 0.113	0.175	0.042	0.081
Equipment	0.275	0.147	0.799	0.431	0.535	0.165**
Distance	- 0.136	0.013***	- 0.010	0.042*	- 0.084	0.011***
Distance ²	0.0003	0.0001***	- 0.001	0.001	0.0001	0.0001
Free capacity	0.007	0.002***	0.011	0.003**	0.009	0.002***
<i>Interaction with education</i>						
x Age	- 0.001	0.0003**	- 0.001	0.001	0.0001	0.0003
x Male	- 0.012	0.009	- 0.014	0.018	- 0.032	0.010***
x Number of annual sessions	0.0001	0.0001	- 0.001	0.0004	- 0.0001	0.0001
x Number of illnesses	0.003	0.005	0.034	0.012**	0.002	0.006
x Sessions at home	- 0.014	0.009	0.008	0.019	0.005	0.010
<i>Interaction with experience</i>						
x Age	- 0.0005	0.0003	- 0.001	0.001	- 0.001	0.0003**
x Male	- 0.007	0.009	0.025	0.018	0.025	0.010**
x Number of annual sessions	- 0.0002	0.0002	- 0.0004	0.0004	0.0003	0.0002
x Number of illnesses	- 0.003	0.005	0.006	0.012	0.003	0.006
x Sessions at home	- 0.013	0.009	0.0002	0.019	0.020	0.010
<i>Interaction with facilities</i>						
x Age	0.004	0.001**	0.002	0.002	0.002	0.001
x Male	0.017	0.031	0.031	0.070	0.054	0.035
x Number of annual sessions	0.001	0.001	0.001	0.001	0.001	0.001
x Number of illnesses	- 0.017	0.018	0.008	0.044	- 0.035	0.021
x Sessions at home	- 0.112	0.031***	- 0.035	0.073	- 0.178	0.036***
<i>Interaction with equipment</i>						
x Age	0.0005	0.002	0.002	0.006	- 0.005	0.002*
x Male	- 0.054	0.058	0.386	0.193*	- 0.055	0.071
x Number of annual sessions	- 0.0001	0.001	- 0.007	0.003*	0.0002	0.001
x Number of illnesses	0.034	0.034	- 0.120	0.100	- 0.006	0.043
x Sessions at home	- 0.303	0.060***	- 0.025	0.170	- 0.197	0.073***
<i>Interaction with distance</i>						
x Age	- 0.001	0.0001***	- 0.001	0.001	- 0.001	0.0002***
x Male	0.015	0.005**	- 0.041	0.020*	- 0.012	0.005*
x Number of annual sessions	0.0002	0.0001*	0.0001	0.0003	0.0001	0.0001
x Number of illnesses	0.001	0.003	0.016	0.012	0.0003	0.004
x Sessions at home	0.015	0.005**	- 0.005	0.021	0.020	0.005***
<i>Interaction with free capacity</i>						
x Age	0.0001	0.0001	- 0.0001	0.0001	0.0001	0.0001
x Male	- 0.0001	0.0001	- 0.001	0.001	- 0.0001	0.001
x Number of annual sessions	0.0001	0.0001	0.0001	0.0001	- 0.0001	0.001
x Number of illnesses	0.0001	0.0001	- 0.0002	0.001	- 0.001	0.001

Table 4 (continued)

Variable	New patients		Forced switchers		Active switchers	
	Est	SE	Est	SE	Est	SE
x Sessions at home	- 0.0001	0.001	0.0004	0.002	- 0.001	0.001
WTT (education)	0.487	0.163**	0.322	0.485	0.131	0.269
WTT (experience)	0.917	0.182***	0.725	0.531	0.593	0.265*
WTT (facilities)	- 0.663	0.558	- 1.353	1.862	0.496	0.960
WTT (equipment)	2.028	1.096	8.003	5.485	6.345	2.095**
Number of patients	2,983		551		1,679	
Number of choices	2,983		555		1,955	
Number of observations	379,141		87,082		278,914	
BIC	16,290		3,957		13,575	
Pseudo R ²	0.432		0.357		0.300	

Conditional logit models of choice of physiotherapy provider for patients' choices in years 2011–2014. Estimated coefficients are marginal utilities. Interactions on patient characteristics with distance² are not reported (available from the authors). WTT is the coefficient on quality measure divided by the marginal utility on distance ($\beta_d + 2\beta_{d^2}$) evaluated at the average distance to the chosen provider. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

A potential explanation for our results is that new patients and active switchers have compared different providers more thoroughly than forced switchers. Active switchers may have learned about certain important quality aspects, as some of them have received the service for many years. However, our descriptive evidence does not indicate that patients who actively switch their provider systematically aim for a higher quality provider. Meanwhile, forced switchers may have had only limited time to compare different alternatives and choose their new provider. We also find a very intuitive result that patients who travel prefer shorter distances and high-quality facilities compared to patients who receive the sessions at their home.

Our findings show that patients are sensitive to quality differences among providers even when they are disabled and choose from a large set of alternative providers without quality information. The aim of the rehabilitation services is to promote the individuals' autonomy and improve or maintain their work capacity and functioning. From a policy perspective it is important that patients are sensitive to quality and receive effective physiotherapy during the entire rehabilitation process. However, we find that forced switchers are not as responsive to quality as new patients or active switchers. Support for their choices through quality information or the use of separate contracts with previous providers could be useful. Overall, information about providers' location and quality in an easily accessible form is a necessary condition for successful provider competition (Barros et al. 2016). Information would support all disabled individuals in their choice of physiotherapy provider and possibly encourage more patients to switch their provider.

Procurements for many health services are often organized in a repeated manner. This might cause challenges especially in services where patients receive the service frequently and have established a relationship with their usual provider. The repeated competitive bid-dings organized by Kela for this particular service were organized inefficiently, because nearly all providers were offered a contract (Pitkänen et al. 2020). This enabled choices from a large pool of providers and only a few patients needed to switch their usual provider. However, Kela changed its procurement practice in 2018, when nearly a third of the

providers did not receive a contract. Thus, all of their usual patients were forced to switch to another provider. On the other hand, an efficient procurement ensures that the pool of providers consists of mainly high-quality providers, and that all patients receive the service cost-effectively.

Finally, our study has some limitations. We observe choices regarding providers and do not know the role and potential flow of individual physiotherapists working in these firms. Neither do we observe the actual decision-maker or the role of the physician as the referring agent, which is a common problem in empirical research (Beukers et al. 2014). Unfortunately we do not have quality information regarding individual rehabilitation outcomes. Also, the quality scores that we analyze were not publicly available for patients, and we do not have information regarding the providers' specialization or their gender, which are also important factors behind choices. Finally, our study setting does not enable the use of a control group and the results should, therefore, be treated as relationships rather than causal effects.

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Compliance with ethical standards

Conflict of interest The corresponding author receives a salary from the Social Insurance Institution of Finland, which is one of the main financer of rehabilitation services in Finland.

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PUBLICATION
II

Low risk, high reward? Repeated competitive biddings with multiple winners in health care

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Low risk, high reward? Repeated competitive biddings with multiple winners in health care

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Abstract

We study physiotherapy providers' prices in repeated competitive biddings where multiple providers are accepted in geographical districts. Historically, only very few districts have rejected any providers. We show that this practice increased prices and analyze the effects the risk of rejection has on prices. Our data are derived from three subsequent competitive biddings. The results show that rejecting at least one provider decreased prices by more than 5% in the next procurement round. The results also indicate that providers have learned to calculate their optimal bids, which has also increased prices. Further, we perform counterfactual policy analysis of a capacity-rule of acceptance. The analysis shows that implementing a systematic acceptance rule results in a trade-off between direct cost savings and service continuity at patients' usual providers.

Keywords Health care · Competitive bidding · Competition · Choice modelling · Prices

JEL Classification C57 · H51 · I11 · I18

Introduction

Public authorities in the European Union spend around 14% of the GDP on the purchase of services, works and supplies using public procurement [1]. There is an increasing trend also among health and social care organizers to use competitive elements such as competitive biddings [2]. Well-known imperfect market conditions such as uncertainty and asymmetric information characterize health care markets [3]. Therefore, several issues need to be considered when competitive biddings are used in health care. For example, it is typical to organize the competitive biddings in a repeated manner and select multiple service providers for each contract period. Meanwhile, many patients may receive the service continuously and prefer to visit their usual provider. Competitive biddings give information about the

right price-level, but the procurement may also change service providers and end long-lasting relationships between patients and providers. Even though these properties are well-known, only very few studies have analyzed the properties of competitive biddings in health care.

In this study, we analyze competitive biddings that were organized by the insurance districts of the Social Insurance Institution of Finland (Kela) in 2003, 2006, 2010, and 2014 to acquire providers for physiotherapy service for disabled individuals. The districts were responsible for acquiring multiple providers based on their quality–price ratio and the local demand for the service. However, the districts did not have strict budget constraints and historically only very few districts rejected any providers. This setting provides an interesting opportunity to examine the properties of repeated competitive biddings with multiple winners in health services. In the main analysis, we study the effects of the risk of rejection on prices. We also perform counterfactual policy analysis, to examine the direct fiscal effects of implementing a systematic capacity-based rule of provider acceptance.

First, we present descriptive evidence and show that the overall price-level of the bids for a 45-min physiotherapy service increased from an average of 33 euros in 2003 to 58 euros in 2014. Meanwhile, the highest bid increased from 55 to 116 euros. Then, we examine more closely the

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effects that the risk of rejection had on prices in the 2010 and 2014 competitive biddings. Our main data sources are quality–price scoring tables collected from the insurance districts, merged with patient-level register data on patients' choice of provider in 2006–2015. We measure the risk of rejection using geographical variation in the insurance districts' rejection rates in previous competitive biddings. We also analyze whether providers' previous distance to the rejection threshold had an effect on their prices. In our analysis, we control for market competition, using measures that are based on the value that each provider brings into the insurance district's network, as well as several other provider and area-level factors.

The results show that rejecting at least one provider decreased prices by more than 5% in the next competitive bidding. The effect is stronger in 2014 than 2010, which suggests that the providers learned the institutional practices of the procurement procedure. We also find that providers which were located further from the rejection threshold increased their prices more heavily in the next competitive bidding. This indicates that providers learned to calculate their optimal bids, which further increased the overall price-level. These results suggest that implementing a systematic capacity-rule of acceptance in each district would have lowered the overall price-level of the service. We simulate the effects of counterfactual scenarios where providers are accepted based on their annual capacity and the local demand for the service. The analysis shows that the regulation would have decreased the costs especially in the 2014 procurement. However, many patients would have been forced to switch their usual provider, which is problematic in a service that is based on continuous relationships between patients and providers.

The study is related to several distinct strands of literature. First and foremost, the study is related to the use of competitive biddings in health care. We are the first to provide empirical analysis regarding competitive biddings in a health service, which patients receive continuously and for which multiple service providers are acquired in repeatedly organized procurements. Theoretical literature suggests that competitive bidding can be a powerful mechanism to decrease the health care expenditure, but their design and implementation must be done carefully [4, 5]. Empirical literature on competitive biddings in health services is very scarce and comes mainly from the analysis of competitive biddings in the US. Studies have shown that insurers can use their market power for higher bids in the competitive biddings of Medicare [6, 7]. Similarly, the results of this study show that price bids have been higher in less competitive areas.

The study also contributes to the literature on the effects of competition on prices in health care. For this purpose, the Finnish physiotherapy markets offer an excellent setting

because the market consists of a large number of small private providers. Most of the previous literature has documented that competition decreases prices in hospital services [8]. Pekola et al. [9] analyzed the effects of competition on quality and prices using the same setting with a sample of providers in the 2010 competitive bidding. They found that competition had a weak negative effect on quality but no effect on prices. This study extends their work by taking more precisely into account the historical and institutional setting as well as using a much richer provider and patient-level data.

The study also relates to provider contracting in health care and the side-effects of narrowing the network from which patients can choose their provider. Higuera et al. [10] show that narrowing the network can reduce costs, but patients are willing to pay for a wider network that includes their usual provider. Similarly, our study illustrates the simple trade-off between economically efficient procurement and continuity of care at the patients' usual provider. Finally, the study provides evidence regarding patient choices and provider quality. Our results are similar to previous literature [11–12], showing that physiotherapy patients choose large, high-quality providers within short distances.

Competitive biddings in health care

Many countries have implemented policies that increase competition among health care providers [13]. The main purpose of the reforms has been to improve the efficiency and quality of the services. Three main types of provider competition have been presented in the health economics literature: competition in a market, competition for a market and yardstick competition [2]. This paper considers a case where competition both in and for a market is present. Competition in a market usually means that providers compete with quality attributes to attract patients, and the money follows the patients to their selected provider. In this case, prices are often fixed, and the organizer needs to determine the appropriate price-level. To choose, patients should have several alternative providers and access to quality information. Nevertheless, patient choice has become very common in primary health services in European countries [14], and there is increasing empirical evidence showing that quality influences patient choices [11, 15].

Competition for a market means that several potential providers compete for the right to provide services or goods. The purchaser selects one or more providers in, for example, a geographical area. Common examples include the purchasing of pharmaceutical products or hospitals competing to be included in an insurer's network of providers. Competition for a market requires that the service organizer can describe the services or goods in an accurate and verifiable way [2].

Providers and their prices can be determined, for example, using competitive bidding or bargaining between the purchaser and provider. Compared to fixed prices, competitive bidding provides information about both the prices and the providers that deliver the services at the lowest prices [16]. Therefore, competitive biddings have gained an increasingly important role in discussions about the future financing of health care services [7, 17].

Public procurements and auctions often work very well, but their design must be sensitive to the details of the institutional setting [18]. According to McCombs and Christianson [19], competitive bidding where multiple providers are selected has following four main advantages: first, selecting more than one provider gives flexibility and ensures service availability in cases where a provider exits the market or the demand suddenly increases during the contract period. Second, it might encourage more providers to participate in the procurement, because it increases the probability of being included in the pool of providers. Third, it provides patients a larger degree of choice from the pool of providers, which in turn might increase quality competition in the market among providers. Fourth, accepting multiple providers might ensure market competitiveness in subsequent competitive biddings by preserving viable competitors.

McCombs and Christianson [19] also point out three potential disadvantages: first, in areas where the number of potential providers is very small, there are only weak incentives to submit low bid prices, because the probability of losing is very low. Second, adverse selection problems under a per-episode reimbursement scheme may occur, because the price does not vary but some patients may require more intensive care. Therefore, some providers might try to avoid taking the most demanding patients. Third, accepting a large number of providers might decrease providers' expectations of number of potential patients and gains from economies of scale, reducing the number of low price bids.

McCombs and Christianson [19] also discuss how the line between accepted and rejected providers should be drawn. A potential procedure is to use a capacity-based rule of acceptance, which requires that all providers submit a maximum capacity of service they can provide during the course of their contract. Accepted providers are then selected in an ascending order of bids, based on the possible quality–price rule, until the target capacity is reached. Under these conditions, the procurement results in a number of providers that ensures access to the services and the long-run market competitiveness. However, if a strict and clear rule of acceptance is not used, providers have strong incentives to “game” the system by submitting bids that are higher than their costs but lower than their estimate of the lowest possible rejected

bid.¹ McCombs and Christianson [19] hypothesize that the “gaming” will eventually increase the overall price-level of the bids. Our study empirically tests this hypothesis.

Institutional setting

The institutional setting of the study is an individual outpatient physiotherapy service, which is part of the intensive medical rehabilitation services financed and organized by Kela. The physiotherapy is intended for disabled persons under 65 years of age, who face problems managing daily activities and fulfill the criteria defined by law. The basis of the service is a written rehabilitation plan that is drawn up with a physician for 1–3 years at a time. Patients do not pay any out-of-pocket payments and have a free choice of provider from the pool of accepted providers. Typically, patients receive sessions that last for 45 or 60 min, a couple times a week for several years. The physiotherapy is received either at the provider's facilities or at patient's home. 14,756 patients received the service in 2015, and the total costs were 73.5 million euros [21].

Kela acquires the service from private physiotherapy providers. Physiotherapy markets are among the most competed health services in Finland. Based on Statistics Finland's registers there were 2632 independent physiotherapy providers that had 3655 employees and annual turnover of 302 million euros in 2015. Meanwhile, Kela purchased the service from 1253 different providers in 2015. Thus, around 48% of all physiotherapy providers in Finland are Kela's service providers and the service covers around 24% of the sector's annual turnover. Overall, Kela is the largest single financier of different rehabilitation services in Finland. Other large purchasers of physiotherapy services for different patient groups are municipalities, the occupational health care sector and insurance companies. Compared to the physiotherapy services organized by municipalities and other financiers, patients who receive the service organized by Kela have more severe disabilities and require more intensive therapy.² Individuals can also visit private physiotherapists by paying out-of-pocket payments.³ Usually patients do not simultaneously receive the rehabilitation services that are financed by different organizations.

Kela's insurance districts are responsible for organizing the service for the local population. The districts acquire the

¹ This behavior is similar to tacit collusion in repeated auctions [20].

² Some patients may have received physiotherapy organized by their municipality before Kela accepts their rehabilitation plan or after they turn 66 years and are not entitled to the service organized by Kela.

³ If patients have a referral from the doctor, they are entitled to a small reimbursement paid by Kela from the National Health Insurance.

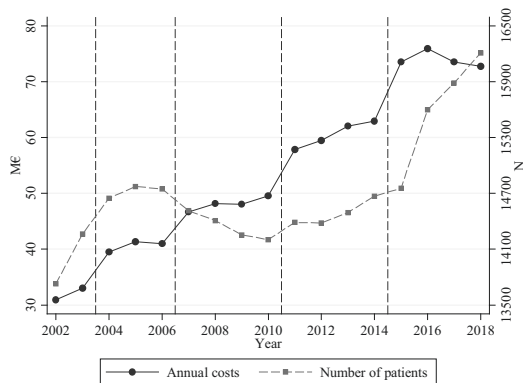


Fig. 1 Number of patients and annual costs of the service in 2002–2018. Vertical dashed lines present a change in the contract periods. Presented costs are nominal

service from private physiotherapy providers using a competitive bidding,⁴ which they have organized in a similar and predefined manner since 2003.⁵ Most of the districts negotiated prices directly with the providers prior to 2003.⁶ The three latest competitive biddings were organized in 2006, 2010 and 2014 for the contract periods 2007–2010, 2011–2014, and 2015–2018. Figure 1 presents the annual nominal costs of the service and the number of patients in 2002–2018. The figure shows that while the number of patients remained relatively stable before the latest contract period, the annual nominal costs more than doubled. The largest cost increase took place in the first year of each contract period, when new prices were set. The number of patients has increased by around 10% during the latest contract period. However, there has been no increase in total costs. This indicates that the annual number of physiotherapy sessions per patient has decreased, most likely as a result of financial pressures caused by the rising costs.

The procurement process begins with a request for tenders. Providers provide information on their quality, annual capacity and set a price for a 45-min physiotherapy session in their tenders. The tenders are submitted to the insurance district where the providers are based. The districts evaluate the tenders and rank the providers that meet the minimum

criteria based on their quality–price scores.⁷ Each district decides a rejection threshold based on the capacity of the providers and estimated local demand for the service. The district manager approves this threshold. Providers above the threshold are offered a 4-year contract, and providers that sign the contract form a pool of providers from which patients can freely choose their provider. However, quality information on the providers is not publicly available. Providers are paid for patients' visits based on their accepted prices. Since the 2006 competitive bidding, the districts have sent the quality–price ranking lists to each provider that submitted a tender in that district.⁸ Providers were also always given information about the quality score rules, and they were able to calculate their points from the information they provided to the district. Figure 3 (in the Appendix) presents an example of the quality–price score table that was used in the Espoo district in 2014.

Even though the districts were expected to accept providers based on local demand and providers' capacity, the most common rejection threshold has been below the provider ranked last. Figure 2 shows the districts that rejected at least one provider in 2006, 2010 and 2014. In 2006 there were five districts that rejected 11 providers, in 2010 only three districts that rejected seven providers and in 2014 six districts that rejected 28 providers. Altogether only 1.2% of the providers got rejected in the three studied competitive biddings (46 out of 3769). Most of the rejected providers were single outliers, which means that they either offered a significantly high price or had a very low quality. For most of the providers the risk of being rejected was very low, which enabled them to raise prices after realizing this institutional practice. All districts acquired multiple times their required capacity in every competitive bidding. For example, in 2014 the total capacity of the accepted providers was 50,917 whereas only 14,671 patients received the service.

Based on interviews with Kela procurement personnel, there were four main reasons why the districts did not reject more providers: first and foremost, Kela is obliged by law to organize the service nationwide for all eligible patients, and the districts have needed to ensure the availability of the service also in rural parts of the country. Second, the district managers did not have a budget constraint or price limit when they decided on the threshold. Third, Kela has emphasized patients' freedom to choose from a large pool of providers. Finally, the districts have wanted to avoid a situation where a large number of patients are forced to switch

⁴ Other large physiotherapy purchasers such as municipalities also use repeated competitive biddings, and there may be spillover effects in the procurements between the different markets because many providers are present in the different markets. However, we do not have data on other procurements and the focus is therefore in the markets organized by Kela.

⁵ Exceptions are South Ostrobothnia and Päijät-Häme districts that implemented a fixed price pilot in the 2011–2014 contract period.

⁶ Unfortunately, data on prices prior to 2003 was not available.

⁷ In 2006, the quality–price scoring rule was quality/price, in 2010 quality was weighted 60% and price 40%, whereas in 2014 quality and price were both weighted 50%.

⁸ The quality–price score tables have been available from the districts also later on.

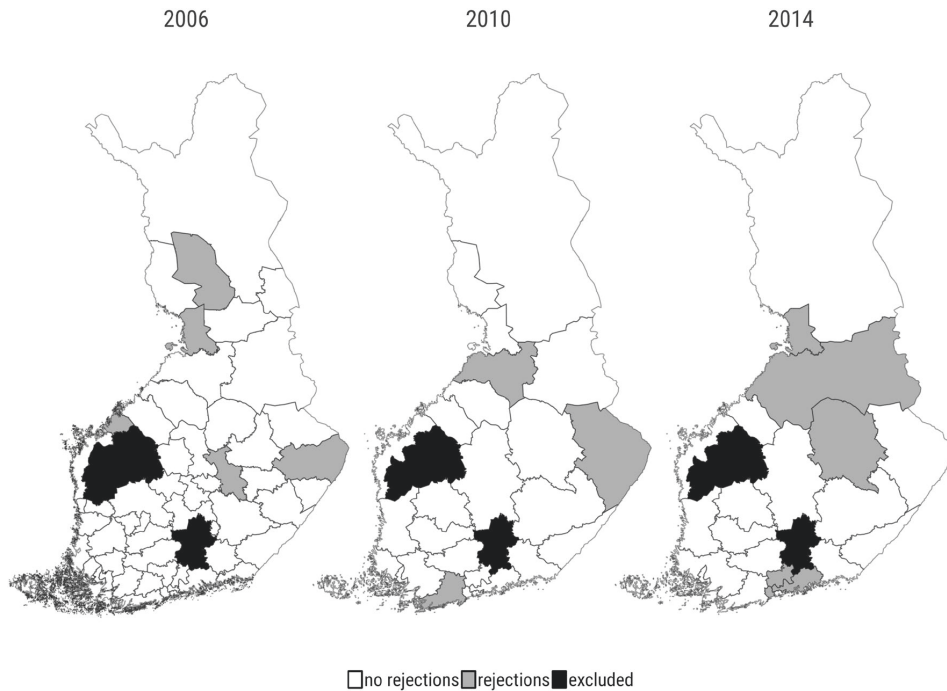


Fig. 2 Rejections across the districts in the 2006, 2010 and 2014 competitive biddings. A price regulation pilot took place in South Ostrobothnia and Päijät-Häme districts in the 2011–2014 contract

period. Therefore, providers in these districts did not participate in the 2010 competitive bidding and have been excluded from our analysis

providers because their previous provider was not accepted in the new pool of providers. In conclusion, the district managers did not have proper incentives to reject providers because no financial pressure existed, and rejections would have likely resulted in an increase in administrative work and negative feedback.

Data

Provider-level data

Our main provider-level data sources are quality–price score lists that were collected from insurance districts that organized the competitive biddings in 2006, 2010 and 2014. The lists include quality scores, price bids for 45-min service and annual capacities of all providers that fulfilled the minimum requirements and were ranked based on their quality–price scores.⁹ The data include information on the

rejection threshold that each insurance district decided upon. We also have data on providers' accepted prices in the 2003 competitive bidding, which was the first procurement organized similarly in all districts.¹⁰ Our data also include the providers' address, postcode and business type information.

Measuring provider quality is challenging because quality is very multidimensional in health care [22]. Quality measures are often based on inputs such as number of staff per beds, or outcomes such as 30-day mortality. The districts measured physiotherapy providers' quality through their investments in three main categories: education, experience and facilities. Certain other minor issues, such as language skills, also factored in. As in Forder and Allan [23], our measure of quality can be seen as a proxy for providers' underlying performance quality or utility gain construct.

Kela implemented a fixed-price pilot in two insurance districts (South Ostrobothnia and Päijät-Häme) in the 2011–2014 contract period. We have excluded these two districts from our data and analysis. This should not result

⁹ Unfortunately we do not have data about bids that did not meet the minimum requirements.

¹⁰ The 2003 data is based on a list of providers' accepted prices in November 2006.

Table 1 Descriptive statistics of the providers in 2003, 2006, 2010 and 2014

Variable	Accepted providers					Rejected providers				
	<i>N</i>	Mean	SD	Min	Max	<i>N</i>	Mean	SD	Min	Max
2003										
Price (€)	1364	33.41	4.52	20	55	–	–	–	–	–
2006										
Price (€)	1369	39.13	5.82	21	71	11	41.95	8.00	30	55
Quality	1283	67.13	12.06	28	103	11	58.18	16.58	24	78
Quality–price score	1283	77.07	8.46	44.38	100	11	71.83	12.58	54.71	100
Capacity	530	17.50	20.19	1	200	–	–	–	–	–
Premises	1369	0.91	0.29	0	1	11	0.73	0.47	0	1
New provider	1369	0.18	0.39	0	1	11	0.55	0.52	0	1
Patients	1369	8.81	12.86	0	152	11	2.45	4.16	0	13
ΔPrice (€)	1119	5.50	3.49	–21	32.9	5	6.1	6.19	2	17
2010										
Price (€)	1195	47.54	7.62	28	99	7	54.07	10.22	35	68.5
Quality	1195	80.46	13.63	31	104	7	68.29	16.01	44	84
Quality–price score	1195	79.15	8.14	40	100	7	70.37	5.86	59.7	76.4
Capacity	1195	33.77	43.40	1	420	7	40.14	67.95	5	192
Premises	1195	0.92	0.27	0	1	7	0.86	0.38	0	1
New provider	1195	0.14	0.35	0	1	7	0.57	0.53	0	1
Patients	1195	10.19	14.10	0	161	7	1.14	2.61	0	7
ΔPrice (€)	1013	8.12	5.05	–27.5	32	2	10	4.24	7	13
2014										
Price (€)	1159	57.83	9.43	34	102.5	28	70.38	16.80	45	116
Quality	1159	37.41	7.45	9	55	28	26.57	7.39	14	43
Quality–price score	1159	73.45	7.69	41.88	100	28	57.15	5.45	39.68	67.17
Capacity	1159	40.99	53.73	1	450	28	13.64	13.83	2	70
Premises	1159	0.92	0.27	0	1	28	0.71	0.46	0	1
New provider	1159	0.18	0.38	0	1	28	0.61	0.50	0	1
Patients	1159	10.85	16.08	0	179	28	1.29	2.73	0	12
ΔPrice (€)	923	10.07	5.80	–16	54.5	11	15.62	12.80	1.58	40

ΔPrice includes providers that submitted a bid also in the previous round. Providers in the districts where a price regulation pilot took place in 2011–2014 are excluded from the data

in any bias because the districts are responsible for organizing the service only for the local population and they can be considered as independent geographical entities. In total, our final data include information about 5133 bids from four consecutive competitive biddings. The descriptive statistics of the accepted and rejected providers in the studied competitive biddings are presented in Table 1.

Patient-level data

The patient-level data are based on Kela's registers on rehabilitation applications and invoices regarding patients who received the service in 2006–2015. The applications data contain patients' age, sex, municipality, postcode and ICD–10 codes of primary, secondary and tertiary illnesses. The data also include information on whether the patient had the right to receive the service at home, the number

of annual physiotherapy sessions and the length of the sessions in minutes. We have merged the applications data with invoices. Providers were instructed to invoice Kela once a month, and therefore the data include on average 10 invoices for each patient. The invoice data also include information on whether the patient received the service at home, based on whether a provider was paid extra for travelling. We have calculated an annual cost per patient based on the selected provider's price, the number of annual sessions and whether the service was received at home or at the provider's facilities. Similar to our provider-level data, we have excluded all patients who resided in the two districts where the fixed-price pilot was implemented in the 2011–2014 contract period. Table 2 presents the descriptive statistics of the patients and their choice sets in 2011 and 2015.

Table 2 Descriptive statistics of patients in 2011 and 2015

Variable	2011					2015				
	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Age	12,728	38.61	20.35	0	66	13,045	37.42	20.42	0	66
Male	12,728	0.51	0.50	0	1	13,045	0.51	0.50	0	1
Sessions at home	12,728	0.40	0.49	0	1	13,045	0.54	0.50	0	1
Number of sessions	12,728	56.80	25.83	5	150	13,045	54.19	25.55	5	150
Length of a session (min)	12,728	57.47	7.22	30	120	13,045	57.61	7.10	30	90
Number of illnesses	12,728	1.69	0.81	1	3	13,045	1.89	0.85	1	3
Provider's quality	12,728	87.69	10.69	31	104	13,045	41.50	5.98	9	55
Distance to provider (km)	12,728	11.18	13.65	0.5	177.29	13,045	12.21	15.69	0.5	190.18
Provider in same district	12,728	0.91	0.28	0	1	13,045	0.90	0.29	0	1
Providers in same district	12,728	50.23	16.96	4	84	13,045	56.46	17.66	4	96
Providers in choice set	12,728	125.88	86.87	4	335	13,045	128.08	78.36	4	359
Annual costs (€)	12,728	4139	2358	275	17,280	13,045	5124	3034	287.5	25,888
Total costs (€)	52,676,311					66,847,118				

Patients in the districts where a price regulation pilot took place in 2011–2014 are excluded from the data

Other data sources

We use open postcode data from Statistics Finland and have calculated straight-line distances between patients' and providers' postcodes. The calculations are based on the distances between the centre points of the postcodes.¹¹ We also use Statistics Finland's postcode-level register data that include the number of private physiotherapy providers in each postcode in 2006–2015, as well as data on average rents in each postcode in 2010–2015 that is based on Kela's housing benefit registers for free market rents. Finally, we also have municipal-level register data on the number of individuals who were eligible for Kela's rehabilitation services for disabled persons in 2006–2015.

Empirical approaches

Measures of risk

Each provider faces a risk of rejection in a competitive bidding when the procurer uses systematic acceptance criteria, for example based on local demand and providers' capacity. However, as explained in Chapter 3 and illustrated in Fig. 2, Kela insurance districts did not apply a systematic acceptance rule. This institutional feature gives us a possibility to

use the variation across the insurance districts' rejections in the previous competitive biddings, to measure the risk of rejection. We introduce two different measures of risk. First, we create a binary variable "rejections", which receives a value 1 if the provider is located in a district that rejected at least one bid in the previous competitive bidding, and 0 otherwise. The measure indicates whether the providers have learned to anticipate the possibility for rejections in their district, as previous quality–price scoring tables were publicly available. At least one provider was rejected only in five districts out of the 53 districts in 2006, whereas in 2010 rejections were made only in three districts out of the 27 districts.

When a profit-maximizing provider decides on the price it bids, the provider will most likely make some assumptions about the highest price it could bid, considering its quality score, and still be accepted.¹² The provider can learn its optimal price afterwards, when it receives the quality–price score table from the district. As our second measure of risk, we exploit this feature and calculate providers' distance to the rejection threshold in the previous competitive bidding, measured in quality–price scores.¹³ The distance to the threshold is measured to the lastly accepted provider, also in the districts where all providers were accepted. The intuition

¹¹ We use a distance of 0.5 kilometres when patient and provider were located in the same postcode. The smallest distance between two independent postcodes in our data is 0.93 kilometres. Unfortunately, we did not have access to data on actual travel times between postcodes.

¹² We acknowledge that the physiotherapy market has many not-for-profit providers.

¹³ The quality–price score was calculated simply as quality/price in 2006. We have transformed this into a similar quality–price measure as in 2010 and 2014 using weights of 50% for both quality and price. This does not change the original order of the providers in the districts' score tables and makes the results comparable in the different competitive biddings.

Table 3 Measures of risk and competition in the 2010 and 2014 competitive biddings

Variable	2010					2014				
	<i>N</i>	Mean	SD	Min	Max	<i>N</i>	Mean	SD	Min	Max
Measures of risk										
Rejections	1202	0.12	0.32	0	1	1187	0.09	0.29	0	1
Distance to threshold	964	12.76	7.40	0	42.64	934	18.31	9.51	-9.10	49
Measures of competition										
Predicted HHI	1202	455.38	274.93	233.72	2608.42	1187	413.51	308.74	165.79	3208.39
Actual HHI	1202	537.62	248.43	239.78	1840.90	1187	552.07	348.66	203.58	3310.22

Measures of risk are based on lagged values from the previous competitive bidding

behind the measure is following: providers that were highly ranked (far above the threshold) could have bidden a higher price, and therefore might be able to take more risk in the next competitive bidding. In turn, providers that had a relatively low rank (near the threshold) or were rejected might take less risk in their next price bid.¹⁴ This measure only applies to providers who also participated in the previous competitive bidding, as they were able evaluate their optimal bids compared to other providers.

The decisions about the acceptance thresholds in each district are made by local Kela officials. Also, a provider's rank in the quality-price table is influenced by all other bids in the district. Therefore, we consider both the "rejections" as well as the "distance to the threshold" variables to be exogenously determined for a single provider. One potential source of endogeneity could be that Kela officials in geographically small districts with a large number of potential service providers could have rejected providers more easily. Table 8 (in the Appendix) shows descriptive statistics regarding the districts with and without rejections in the 2006 and 2010 competitive biddings. Based on the data, there seems to be no systematic difference between the districts that rejected bids and those that did not. In particular, the statistics prove that there was no systematic quality-price threshold used in the districts. In addition, correlations between rejections and geographical size ($r = 0.02$) or the number of bidders ($r = 0.13$) are very small at the district-level.

Descriptive statistics regarding the two measures of risk are shown in Table 3. In the 2010 competitive bidding 12% of the providers were located in an area where at least one rejection was made previously, and in 2014 the proportion

was 9%. The average distance to the rejection threshold was 12.7 quality-price points in 2010 and 18.3 points in 2014.

Measures of competition

Greater competition might decrease prices also in competitive biddings. Because there is no generally agreed measure of market structure, we use two measures to show that our results are robust across the main approaches used in the previous empirical literature. We calculate Herfindahl-Hirschman Indexes (HHI) that are based on providers' actual and predicted market shares within their insurance district. We transform both indexes into a negative natural logarithm, which eases the interpretation of the results, as $-\ln(\text{HHI})$ increases with more competition. The index is calculated in a district d at year t in the following way:

$$-\ln(\text{HHI}_{dt}) = -\ln \sum_{j=1}^j \left(\frac{n_j}{N_d} \right)^2, \quad (1)$$

where n_j is the number of actual or predicted patients at provider j and N_d is the number of patients in a district d .

Defining markets with geographic boundaries often has its problems as postcodes are likely to be too small and some other boundaries too large [24]. Our preferred definition of the relevant market is the insurance district, because they were responsible for organizing the service for the local population and accepting the providers in the competitive biddings. However, measures of market structure based on concentration and geographical boundaries suffer from well-known endogeneity issues in price regressions. For example, the location of the providers and of new market entrants might be associated with prices. Also, higher quality providers may attract more patients and have higher market shares, resulting in a higher HHI for their market. Because these providers usually also have higher prices, this can lead to an estimated positive relationship between price and concentration measure driven by omitted quality scores rather than by market power [25]. This should not be a problem in our

¹⁴ Figure 3 (in the Appendix) illustrates the intuition: The highest ranked provider received 45 quality points and offered a price of 58 euros. The provider receives the quality-price scoring table after the procedure and notices that many providers with the same or lower quality points offered a higher price and received a contract. Thus, it is likely that this provider will bid a higher price in the next round compared to a provider with lower rank.

setting, as we are able to control for providers' quality in our price regressions.

There might be also other issues that are related to both competition and prices that we cannot fully control. Kessler and McClellan [26] have provided the most common strategy to mitigate the endogeneity bias. They estimate a choice model to predict patient flows among providers, and calculate market concentrations using these predicted rather than actual patient flows. We follow their strategy and calculate $-\ln(\text{HHI})$ that is based on providers' predicted market shares in their insurance districts. This approach to measuring competition has also been used previously [27, 28]. Descriptive statistics regarding the competition measures are also presented in Table 3. In the price regressions we prefer to use the measure of competition based on predicted flows, and the results based on actual flows are shown in the Appendix.

Patient choice modelling

We begin the calculations of predicted patient flows by estimating choice models on patient choices in 2011 and 2015. We use a standard random utility choice model by McFadden [29] and assume that patients are rational and maximize their utility when choosing a provider. The relative utility for a patient i at provider j at time t is described as:

$$U_{ijt} = V_{ijt} + e_{ijt} = \beta_q Q_{jt} + \beta_d D_{ij} + \beta_{(d^2)} D_{ij}^2 + \beta_c C_{jt} + e_{ijt}, \quad (2)$$

where V_{ijt} represents the observable utility, which depends on the provider's quality Q_{jt} , distance D_{ij} , squared term of distance D_{ij}^2 , and capacity C_{jt} . We allow patients' preferences to vary according to observed characteristics such as their age, gender and rehabilitation background. The marginal utility of quality for patient i is:

$$\beta_{qi} = \beta_q + \beta_q X_i', \quad (3)$$

and similar for distance and capacity.

Patients choose from a set of alternative providers N_{jt} . We have created choice sets that include all accepted providers in the patients' insurance districts and all other providers within 80 kilometres. Provider j is chosen if it results in the highest utility in the choice set. We assume that the error term e_{ijt} is independently and identically distributed (IID) with a type-1 extreme value distribution, which leads to a conditional logit model where the probability that a patient i selects provider j is:

$$P_{ijt} = \frac{\exp(V_{ijt})}{\sum_{j' \in M_{it}} \exp(V_{ij't})} \quad (4)$$

The results of the patient choice models for years 2011 and 2015 are found in Table 4. In general, our main results are very similar to previous empirical literature on patient choice [11–12], showing that patients prefer large, high-quality providers within close distance. The patients' heterogeneity is captured through the interaction terms in the model, indicating that older patients are not as sensitive to quality differences between providers and prefer shorter distances. We also find that patients who receive the service at their home choose providers from longer distance, which is intuitive as they do not bear the cost of extra travel-time. The results also provide an important policy-relevant point regarding the studied market: Even though the districts did not stimulate competition for the markets by rejecting a sufficient number of providers, patient choice has encouraged quality-competition among the selected providers in the market.

We use the estimates of the choice models and predict provider j 's market share in its district in the year of the competitive bidding, by summing up patients' estimated choice probabilities for choosing provider j in 2010 and 2014. We use the estimates from the 2011 choice model for predicted choices in 2010 and similarly estimates from the 2015 model for predicted choices in 2014. For the predictions we use choice sets that cover all providers in patient i 's insurance district. We measure the goodness-of-fit of our model by comparing the predicted results against patients' actual choices. We follow previous literature [30–32] and calculate a "hit-or-miss" variable where predicted choice for a patient is the provider that has the greatest predicted probability. This analysis shows that our model correctly predicts 28.0% of the choices in 2011 and 26.6% in 2015. These prediction rates are comparable to the previous studies. As the demand model predicts choices well, the correlation between the HHI based on actual and predicted patient flows ($r=0.670$) is also strong.

Price equations

We estimate two different linear regression models to analyze the effects of risk on prices. The first model is the following:

$$\ln(P_{jdt}) = \beta_0 + \beta_1 R_{jt}' + \beta_2 H_{jdt} + \beta_3 Z_{jt} + \beta_4 X_{pmt} + \beta_{jdt}, \quad (5)$$

where the dependent variable $\ln(P_{jdt})$ is a natural logarithm of provider j 's price in district d in the competitive bidding organized at time t . The key variable of our interest is the risk measure R_{jt}' , which receives value 1 if the provider is located in an area where at least one rejection was done in the previous round, and 0 otherwise. The second empirical model takes the following form:

Table 4 Conditional logit models of patient choices in 2011 and 2015

Variable	2011		2015	
	Est	SE	Est	SE
Main effects				
Quality	0.085	0.004***	0.130	0.007***
Distance	-0.144	0.005***	-0.120	0.004***
Distance ²	0.0004	0.000***	0.0001	0.000***
Capacity	0.005	0.0005***	0.004	0.000***
Interaction with quality				
× Age	-0.001	0.000***	-0.001	0.000***
× Male	-0.003	0.002	-0.007	0.003*
× Number of annual sessions	-0.000	0.000	0.0001	0.0001
× Number of illnesses	-0.0001	0.001	-0.003	0.002
× Sessions at home	0.005	0.002*	-0.006	0.004
Interaction with distance				
× Age	-0.001	0.000***	-0.0005	0.0001***
× Male	0.002	0.002	0.002	0.002
× Number of annual sessions	0.0002	0.0001**	-0.0001	0.0001
× Number of illnesses	0.008	0.001***	0.005	0.001***
× Sessions at home	0.018	0.003***	0.019	0.002***
Interaction with capacity				
× Age	0.0001	0.000***	0.0001	0.000***
× Male	0.0001	0.0002	0.0001	0.0002
× Number of annual sessions	0.000	0.000	0.000	0.000
× Number of illnesses	-0.0002	0.0002	-0.0002	0.0001
× Sessions at home	-0.003	0.000***	-0.002	0.000***
Number of patients	12,728		13,045	
Number of observations	1,602,202		1,671,001	
BIC	70,544.97		76,009.07	
Pseudo R ²	0.400		0.378	

Estimated coefficients are marginal utilities. Interactions on patient characteristics with distance² are not reported (available from the authors)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

$$\Delta P_{jdt} = \beta_0 + \beta_1 R_{jt}^d + \beta_2 H_{jdt} + \beta_3 Z_{jt} + \beta_4 X_{pmt} + \varepsilon_{jdt} \quad (6)$$

where the dependent variable ΔP_{jdt} is the difference in provider j 's prices between two competitive biddings. The risk measure R_{jt}^d in the model is the provider j 's distance to the threshold in the previous round, calculated using the quality-price scores. The motivation for explaining price differences with the distance to the threshold is that we are not only interested in the price-level in general, but to investigate whether providers learned that they could have offered higher prices in the previous procurement. In both of the models we control for competition H_{jdt} , which is calculated using predicted patient flows. We also include vector Z_{jt} , which controls for providers' quality, capacity, premises, experience and business type, as well as vector X_{dmt} , which includes the number of potential patients in municipality m

as demand-side indicator and rents in postcode p as supply-side indicator. These supply and demand-side factors have been shown to influence prices in previous empirical literature [25, 33]. Finally, ε_{jdt} is the error term of the models.

Results

Descriptive evidence

Table 1 shows the descriptive statistics of the accepted and rejected providers in the studied competitive biddings. The average price of accepted providers was 33.4 euros in 2003, increased to 39.3 euros in 2006, to 47.5 euros in 2010 and finally to 57.8 euros in 2014. Moreover, the difference between the lowest and highest prices increased from 25 euros in 2003 to 82 euros in 2014. Most of the providers have participated in several competitive biddings, and

Table 5 Regression results: Ln (Price)

	2010			2014		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Rejections	-0.004 (0.015)	-0.028* (0.014)	-0.020 (0.013)	-0.078*** (0.018)	-0.071*** (0.018)	-0.054** (0.017)
- Ln(Predicted HHI)		-0.079*** (0.011)	-0.079*** (0.010)		-0.034*** (0.009)	-0.026** (0.008)
Quality			0.004*** (0.0003)			0.008*** (0.001)
Premises			0.000 (0.018)			-0.028 (0.017)
Capacity			0.0002* (0.0001)			0.0002* (0.0001)
New			0.056*** (0.013)			0.050*** (0.013)
Rent			0.012*** (0.002)			0.005* (0.002)
Potential demand			0.000 (0.000)			0.000 (0.000)
Business-type	No	No	Yes	No	No	Yes
<i>N</i>	1202	1202	1202	1187	1187	1187
<i>R</i> ²	0.0001	0.049	0.278	0.018	0.030	0.196

OLS estimates of Eq. (5) where the dependent variable is Ln(Price)

HHI Herfindahl–Hirschman Index

p* < 0.05; *p* < 0.01; ****p* < 0.001

the proportion of new providers has been around 15% in each procedure.¹⁵ On average, these experienced providers increased their prices by 5.5 euros 2006, 8.1 euros in 2010 and 10.1 euros in 2014. Providers also increased their annual capacity from an average of 18 annual patients in 2006 to 41 in 2014.¹⁶ The data show that even though the districts did not implement a systematic capacity-rule for acceptance, the average price of the rejected providers has been higher and quality lower compared to the accepted providers in each procurement. Thus, it seems that the districts only rejected the very few inefficient bids that they received. Also, more than half of the rejected providers were new providers and had a smaller number of existing patients compared to the accepted providers. These providers were most likely the easiest to reject as they had no existing patient relationships.

Regression results

The main regression results on the effects the risk of rejection has on prices are presented in Table 5. The risk of

rejection is measured as whether the provider was located in an area where at least one bid was rejected in the previous competitive bidding. The results show that higher risk had small and statistically weak but negative effects on prices in the 2010 competitive bidding. However, previously made rejections decreased prices by more than 5% in 2014. Thus, the results indicate that rejecting at least one provider maintains a credible risk of rejection and enhances competitive pressure. We have two main explanations why increased risk did not have statistically as strong effects on prices in 2010 as in 2014. First, many of the districts merged between 2006 and 2010, and providers might have anticipated that new geographically larger districts would reject some of the providers. Second, the results indicate that the providers started to learn that the risk of rejection is very low within their district, and this finally actualized in 2014, when providers in areas where no rejections were previously made offered higher prices.

Table 6 shows the results regarding the effect of providers’ previous distance to the rejection threshold on their price difference between the two competitive biddings. The results show that an increase of one quality–price point from the rejection threshold increased prices by more than 0.15 euros in 2010 and 0.06 euros in 2014. Thus, providers that were further away from the rejection threshold offered higher prices in the next competitive bidding. This indicates

¹⁵ Altogether the data includes 2023 different providers, 36% of which participated in all of the four procurements.

¹⁶ All of the districts did not include capacity in their quality–price score tables in 2006.

Table 6 Regression results:
 Δ Price

	2010			2014		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Distance to threshold	0.165*** (0.023)	0.174*** (0.023)	0.153*** (0.024)	0.073*** (0.020)	0.079*** (0.020)	0.060** (0.021)
–Ln (Predicted HHI)		– 1.609*** (0.344)	– 1.607*** (0.344)		– 0.789* (0.348)	– 0.636 (0.362)
Quality			0.050*** (0.012)			0.080** (0.028)
Premises			– 0.121 (0.763)			– 1.442* (0.725)
Capacity			0.001 (0.004)			– 0.001 (0.004)
Rent			0.178* (0.082)			– 0.243** (0.092)
Potential demand			– 0.0002 (0.0002)			0.0003 (0.0002)
Business-type	No	No	Yes	No	No	Yes
N	964	964	964	934	934	934
R ²	0.061	0.082	0.114	0.014	0.019	0.055

OLS estimates of Eq. (6) where the dependent variable is Δ Price

HHI Herfindahl–Hirschman Index

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

that providers learned to evaluate their optimal bids, taken their quality, and noticed that they could take a bigger risk in the next round. Thus, providing providers information regarding their optimal prices and risk of rejection enabled strategic bidding behavior, and increased the overall price-level of the service.

In both of the regression analyses we also include competition, measured as a negative natural logarithm of a HHI that is based on predicted patient flows. Regarding the analysis on prices (Table 5), the coefficients for competition are negative and statistically significant both in 2010 and 2014 across all of the models. This result indicates that prices were lower in districts that are more competitive. Table 9 (in the Appendix) provides similar regression results using the competition measure based on actual patient flows. This analysis shows that the results regarding the effects of the risk of rejection on prices are robust across the two different measures of market structure. In contrast with the previous work by Pekola et al. [9], our results show that greater competition decreases prices. The difference between the results is most likely due to different measures of competition, as their paper measures the degree of competition using the number of physiotherapy providers in a given municipality.

The main results regarding both of the regression analyses are rather robust across all model specifications, including when we control for various provider and area-level attributes. The results in Table 5 show that providers with greater

quality and larger capacity offered higher prices. Also, new providers and providers in more expensive areas offered higher prices. Further, we also tested whether the number of rejections had an effect on prices. These results confirmed that the more providers the district rejected, the lower the price level was in the next round. We also analyzed models including all control variables except quality, because quality and price are likely to be related, even though the measured quality in this study is based on long-term quality investments. This analysis did not change the main results of the study. Finally, we analyzed whether the effect of distance to the threshold was stronger in the districts that made rejections, but found no statistically significant evidence.

Counterfactual policy analysis

We analyze the effects of implementing a capacity-rule for acceptance in the 2014 competitive bidding for the 2015–2018 contract period. We investigate two capacity-rules that are based on the number of patients in the district added by 10 or 100 percent.¹⁷ From a practical point of view,

¹⁷ In the 2018 competitive bidding, Kela used a capacity-rule based on number of patients in 2017 added by 10 percent, but accepting at least three providers in each municipality to ensure short travel distances.

the scenarios take into account potential market exits and increasing demand during the contract periods. We perform the analysis using the following three steps: first, we create the counterfactual pools by including all providers in the quality–price lists until the capacity rule is reached.¹⁸ Second, we examine how patients distribute among providers in the counterfactual pools. We predict the choice of provider among patients who are required to switch, because their initial provider is not included in the counterfactual pool. For the predicted choices we use the estimates from the choice model in 2015 (see Table 4). In these predictions we replace the variable capacity with providers' remaining free capacity, to take into account that switching patients would be less likely to choose a provider with only little free capacity. The provider with the greatest probability is considered as the chosen one. In the final step we calculate expected annual costs and travel distances per patient at their chosen provider.

Table 7 presents the results of the counterfactual scenarios calculated in 2015. Implementing a 100% capacity-rule results in 586 accepted providers and 601 rejected providers. The average price of the accepted providers is 2.3 euros lower and the average quality 3.6 points higher compared to the actual pools. Because a large number of providers are rejected, 35% of the patients are required to switch providers. However, compared to the actual choices in 2015, an average patient visits a provider with 2.4 points higher quality located only 0.7 km further from their home. Patient-level annual costs are on average 104 euros less than actual costs in 2015, and the total annual costs decrease by 1.35 million euros. This represents annual savings of 2% points. Table 7 also shows estimations for the stricter 10% capacity rule, where only 353 providers are accepted and 60% of the patients are required to switch providers. An average patient visits a provider with 3.7 points higher quality located 3.7 km further away from home, compared to actual choices in 2015. Implementing the rule results in annual savings of 2.3 million euros.

Our results show that implementing a capacity-rule would have resulted in large fiscal savings and higher quality of care in the 2015–2018 contract period.¹⁹ On the other hand,

many patients would have been required to switch providers and travel longer distances. Our analysis for the direct fiscal savings can be viewed as lower bound estimates, because rejecting a large number of providers would have probably kept the initial level of the bids lower. Also, the two districts that piloted a fixed price were also excluded from this analysis. Further, the districts have a legal possibility to negotiate direct contracts between patients and providers located in areas with few alternatives. Using these direct contracts can further reduce unnecessary forced switching and increased travel distances in cases where a provider is rejected from the pool of providers but might be necessary for a small portion of patients nearby.

Discussion

Competitive bidding can be a powerful cost containment mechanism in health services. Even though the use of competitive biddings has increased, there is very little empirical evidence regarding the characteristics of regular competitive biddings in health care. In this study we analyze competitive biddings that were organized repeatedly every 4 years by Kela's insurance districts to acquire multiple providers for a physiotherapy service in their area. The districts rejected only very few providers because of a lack of financial incentives to use a systematic acceptance rule, and because the districts did not want to terminate established relationships between patients and their usual providers. We analyze whether these features had an effect on providers' bidding behavior.

Our descriptive analysis regarding the competitive biddings in 2003, 2006, 2010 and 2014 shows that the overall price-level and dispersion of the bids increased heavily during the period. The regression analysis provides further evidence regarding bidding behavior. We show that providers that are located in areas where at least one bid was rejected in the previous competitive bidding offered 5.5% lower prices in the 2014 competitive bidding. Further, we show that providers that were far above the rejection threshold increased their price bids more than providers closer to the threshold. These results indicate that providers learned the institutional features of the competitive bidding and started to behave more strategically. Finally, we perform counterfactual analysis, which shows that using a systematic 100% capacity-rule of acceptance would have resulted in direct fiscal savings of at least 5.4 million euros in the 2015–2018 contract period. Even though rejecting a larger number of

¹⁸ For example the district of Helsinki was responsible for organizing the service for 985 patients in 2014. The district received bids from 72 providers with a total capacity of 3471 in the 2014 competitive bidding for the contract period 2015–2018. The district accepted all 72 providers into the pool. Using the 10 percent capacity-based rule we create a counterfactual pool where the first providers in the quality–price list are accepted until the required capacity of 1084 is reached. In this example, the first 23 providers are accepted in the counterfactual pool and the remaining 49 providers in the list are not included.

¹⁹ We performed a similar analysis for the 2010–2014 contract period. The results are similar to the 2015–2018 period, but potential

Footnote 19 (continued)

direct fiscal savings would have been lower because the overall price-level of the bids was lower. The results are available from the authors.

Table 7 Results of the counterfactual analysis in 2015

Variable	100% capacity rule						10% capacity rule					
	N	Mean	SD	Min	Max	ΔActual	N	Mean	SD	Min	Max	ΔActual
Accepted providers												
Price (€)	586	55.50	8.30	37.6	84.5	-2.33	353	54.66	8.12	37.6	84.5	-3.17
Quality	586	41.02	5.88	19	55	3.61	353	42.37	5.73	20	55	4.96
Quality-price score	586	78.28	5.56	58.55	100	4.83	353	80.28	5.62	58.55	100	6.83
Rejected providers												
Price (€)	601	60.68	10.54	34	116	-9.70	834	59.59	10.14	34	116	-10.79
Quality	601	33.39	7.24	9	50	6.82	834	34.95	7.25	9	50	8.38
Quality-price score	601	67.98	6.71	39.68	83.7	10.83	834	70.01	6.87	39.68	87.29	12.86
Patient characteristics												
Forced switch	13,045	0.35	0.48	0	1	0.35	13,045	0.60	0.49	0	1	0.60
Predicted provider's quality	13,045	43.92	4.88	19	55	2.42	13,045	45.22	4.53	20	55	3.72
Predicted distance (km)	13,045	12.94	20.06	0.5	474.96	0.73	13,045	15.40	22.57	0.5	471.29	3.19
Predicted annual costs (€)	13,045	5020	2937	287.5	24,120	-104.00	13,045	4951	2907	287.5	23,940	-173.00
Predicted total costs (€)	65,492,269					-1,354,849	64,579,814					-2,267,304

We have predicted the choice of provider for all patients who were forced to switch, because their actual choice was not included in the counterfactual pool of providers, using estimates from the conditional logit choice model (see Table 4). ΔActual is the difference in mean values between actual and counterfactual scenario

providers might have resulted into forced switching of providers and longer travel distances, patients would have also received a higher quality of care.

Our study offers some important policy implications in regularly arranged competitive biddings with multiple winners in health care. We show that unless a clear rejection threshold is used, the competitive pressure regarding prices does not exist. Thus, the overall price-level increases when providers eventually learn that the risk of rejection is low. Applying a systematic capacity-rule of acceptance has two main features that increase efficiency of the services. First, the capacity-rule brings positive dynamic effects because the competitive pressure increases. Even though our analysis focuses only on price competition, it is likely that also quality competition increases as a result of a higher quality-price threshold for acceptance. Second, the capacity-rule also has direct effects because only the most efficient providers with the greatest quality-price ratio are accepted in the pool of providers.

The results raise some challenges for practical decision-making. It might be difficult for the service organizer to suddenly reduce the number of accepted providers for two main reasons. First, rejecting providers might end a large number of existing relationships between patients and providers. Second, it is likely that the travel distances would increase as a result of the rejections. In 2018 Kela renewed its procurement practices. Five large districts that organized the procurement were instructed to accept providers based on the number of patients in their area and the capacity of the providers added by around 10%. Thus, the main policy recommendation of this paper was placed into practise. However, Kela did receive a lot of negative feedback. One possible solution to avoid the negative features is to apply a fixed-price and accept all providers that meet the minimum quality

standards. This requires information about the supply-side costs to determine the right price-level. A fixed price might also not encourage providers to invest in their quality beyond the minimum necessary level, unless patients have freedom of choice and quality information about the providers.

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Compliance with ethical standards

Conflict of interest Pitkänen and Jauhainen receive a salary from Kela, which organizes and finances the studied rehabilitation services and the competitive biddings. The paper represents the views of the authors and does not necessarily represent the official views of Kela.

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Appendix

See Appendix Fig. 3; Tables 8, 9.

Table 9 Regression results: Ln (Price)

	2010		2014	
	Model 1	Model 2	Model 1	Model 2
Rejections	-0.027 (0.014)	-0.017 (0.013)	-0.066*** (0.018)	-0.053** (0.017)
-Ln(Predicted HHI)	-0.078*** (0.011)	-0.073*** (0.010)	-0.042** (0.009)	-0.028** (0.009)
Quality		0.004*** (0.0003)		0.008*** (0.001)
Premises		0.0003 (0.018)		-0.022 (0.018)
Capacity		0.0002* (0.0001)		0.0002** (0.0001)
New		0.058*** (0.013)		0.049*** (0.013)
Rent		0.012*** (0.002)		0.004 (0.002)
Potential demand		0.000 (0.000)		0.000 (0.000)
Business-type	No	Yes	No	Yes
N	1202	1202	1187	1187
R ²	0.042	0.266	0.035	0.196

OLS estimates of Eq. (5) where the dependent variable is Ln (Price)

HHI Herfindahl–Hirschman Index

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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**Competition and efficiency in repeated procurements: Lessons from the
Finnish rehabilitation markets**

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RESEARCH ARTICLE

Competition and efficiency in repeated procurements: Lessons from the Finnish rehabilitation markets

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Abstract

Inefficient practices and lack of competition are common problems in public procurements. In this study, I examine the effects of a procurement practice reform in the Finnish rehabilitation markets where providers are acquired in a repeated manner through competitive bidding scoring auctions. Until recently, the largest public procurer did not use any systematic criteria for accepting providers, and only a few providers did not receive a contract. After the reform, providers were systematically accepted based on their capacity and the local demand. I analyze the effects of the reform on prices in physio, speech and occupational therapy services with data that covers five subsequent procurements. I use the pre-reform differences in local competition within the markets in a difference-in-differences setting. The descriptive evidence shows that the reform slowed down the rapid increase of prices in all three services. The regression analysis indicates that effects are strongest in the most competitive local physiotherapy markets. This suggests that increasing entry and competition in the less competitive services and local markets would benefit the public procurer.

KEYWORDS

competition, competitive bidding, health care, price, public procurement

JEL CLASSIFICATION

D44, H57, I11, I18

1 | INTRODUCTION

Thousands of public authorities in the EU spend annually around 14% of GDP on the purchase of services, works and supplies from private companies (European Commission, 2020). Typically, publicly financed services are purchased from private providers in order to exploit market competition as an instrument for improving efficiency (Poutvaara & Jordahl, 2020). The success of public procurements depends greatly on the following two factors: efficient procurement practice and a competitive underlying market. However, studies have found that a variety of inefficient practices are common in public procurements (Hyytinen et al., 2018) and they often lack the necessary competition (Jääskeläinen & Tukiainen, 2019). Many publicly financed health and social services are also acquired from private providers through

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public procurement mechanisms such as competitive biddings (EXPH, 2021). Even though different competitive measures are increasingly used to achieve cost savings in health services, the empirical literature on public procurements in health care is still very scarce.

In this study, I examine the importance of an efficient procurement practice and market competition in the Finnish rehabilitation services, where the largest public purchaser acquires private providers through repeated competitive bidding scoring auctions arranged every 4 years. In particular, I analyze the effects of a procurement practice reform in 2018, which aimed to increase efficiency and price competition. Prior to the reform, the insurance districts that organized the procurements ranked providers based on their price and quality, but did not use any systematic acceptance criteria. In practice, the districts offered a contract to around 99% of all bidders. The reform introduced the following three changes: First, ranked providers were accepted based on their capacity and the local demand for the service. Second, quality weight decreased from the previous 50%–20%, and price weight increased correspondingly. Third, the procurement procedure was centralized from the districts to a specialized procurement department, which increased competence and decreased discretion in the procurement process. The aim of the reform was to increase price competition by increasing bidders' risk of not receiving a contract, while securing the availability of the services throughout the country.

I analyze the price effects of the reform in physio, speech and occupational therapy markets. The procurements were arranged in a similar manner across all three services throughout the country. However, there are notable differences in the level of competitiveness between and within the three markets. Physiotherapy markets are one of the most competitive health care markets in Finland, whereas speech and occupational therapy providers' capacity fails to meet demand in nearly all parts of the country. Therefore, it is very likely that the reform had different effects on providers' bidding behavior depending on the service and on local market competitiveness. I utilize procurement data that includes providers' prices, quality and capacity offers from five subsequent rounds of competitive biddings in all three services. In the analysis, I follow the approach by Propper et al. (2008), and use a difference-in-differences setting that exploits pre-reform geographical variation in competition within the three service markets.

The descriptive evidence shows that the trends showing consistent growth in average prices and average price changes were reversed to a significant degree across all three services in the 2018 procurement. For example, practically all providers in all three services increased their prices in every procurement round prior to 2018. However, in 2018, most providers increased their prices only a little and many providers even decreased their prices compared to the previous procurement. The regression analysis shows that the reform had the greatest impact in the most competitive local physiotherapy markets. However, a similar difference between more and less competitive markets is not present in the speech and occupational therapy markets. These results illustrate that a successful procurement requires an efficient procurement practice and a sufficient level of market competition.

2 | RELATED LITERATURE

This study connects to several different strands of literature on public procurement and health economics. First, the study contributes to the growing empirical literature on efficient procurement practices, including effects of more competent officials and lower discretion in the procurements. Tas (2020) finds that a high-quality procurement practice increased the number of bidders and the probability that prices are lower than originally estimated in European public procurements. Bandiera et al. (2009) find that some Italian public purchasers pay systematically more for standardized goods, and that these differences are explained by inefficient purchasing procedures. Hyytinen et al. (2018) show that a change from discretionary beauty contests to a more rule-based procurement environment resulted in cost savings in Swedish cleaning service procurements. Cameron (2000) finds that limiting purchaser's discretion reduced prices in the US electricity markets, and Coviello et al. (2018) show that greater discretion causes a significant increase in the probability that Italian purchasers will contract the same bidders repeatedly. Decarolis et al. (2020) show that an increase in US federal procurement officials' competence decreased expenditure, time delays and number of renegotiations. Buccioli et al. (2020) also show the importance of competence and discretion in their study on procurements of medical devices in Italy.

Second, the study contributes to the literature on competition in public procurements. The standard auction theory and everyday intuition say that competition is an important requirement for a successful public procurement that produces high-quality services at reasonable prices (Bajari et al., 2008; Bulow & Klemperer, 1996; Wilson, 1977). In a closely related context, Jääskeläinen and Tukiainen (2019) find that competition is relatively low in Finnish public procurements with a median bidder count of only two.¹ They also show that a higher number of potential and actual

bidders decreases price measures such as win margins. However, this result may not hold if the “common values effect”, “affiliation effect” or “entry effect” dominates the “competition effect” (see Jääskeläinen & Tukiainen, 2019). In short, when bidding is costly (in terms of acquiring information, bid preparation and opportunity costs) and participation in the procurement is endogenous, increasing competition beyond a certain number of bidders may have adverse effects on expected prices (Onur & Tas, 2019). These adverse effects of increased competition on prices have also been found in empirical studies (see Hong & Shum, 2002; Li & Zheng, 2009; Pinkse & Tan, 2005).

Third, the study contributes to the literature on public procurements in health services. The empirical literature is rather scarce and comes mainly from the US. Song et al. (2012, 2013) analyze the Medicare Advantage program, which implemented a competitive bidding system to determine plan payments in 2006. They show that insurers are able to use their market power to obtain higher prices in the procurements. A recent study by Ferraresi et al. (2021) shows that the introduction of centralized procurement within the regional health care systems reduced per capita health expenditures in Italy. Even though competitive measures are increasingly used to achieve cost savings in European health care systems, very little is still known about the nature of procurements in publicly financed health services. This study fills this gap and is the first to analyze the price effects of enhanced competition and procurement practice in repeated procurements for publicly financed health services.

Health service purchasers often select multiple providers simultaneously for a certain contract period in a geographical area (Barros et al., 2016). This has raised such questions as how many providers should be contracted to maintain a competitive market environment (McCombs & Christianson, 1987). Hoerger and Waters (1993) present a theoretical model of providers' behavior in markets where providers first participate in a competitive bidding and then compete for patients with other selected providers. They show that selecting multiple providers in the procurement may enhance price and quality competition. This structure is present also in the studied markets, which combines competition *for* the market (procurement) and *in* the market (patient choice).²

Quality is often a key interest for procurers, patients and other stakeholders in health care. Public purchasers typically use scoring auctions, where providers compete for the market on both price and quality, and the “economically most advantageous bidders” are contracted. Several studies offer theoretical views on the properties of scoring auctions compared to other mechanisms such as first-price auctions, so-called beauty contests and direct bargaining (see Asker & Cantillon, 2008, 2010; Bergman & Lundberg, 2013; Branco, 1997; Che, 1993).

Various long-term care services share characteristics similar to the studied rehabilitation services. Van Eijkel et al. (2018) provide evidence from procurements of daily housekeeping services by the Dutch municipalities. Their results show that higher competition has a moderate negative effect on prices. Forder and Allan (2014) study the English care home markets, where local authorities negotiate prices with providers, and find that greater competition reduces prices. Studies from the US nursing home markets also show that competition has a small negative effect on prices (Mukamel & Spector, 2002; Nyman, 1994).

Finally, this study directly continues the previous work by Pekola et al. (2017) and Pitkänen et al. (2020). Pekola et al. (2017) analyze the effects of competition on prices in the physiotherapy market using a sample of providers from the 2010 procurement, finding that greater competition had no effect on prices. Pitkänen et al. (2020) also examine the physiotherapy procurements using data from 2006, 2010 and 2014. They find that an inefficient procurement practice led to notable price increases as providers learned that the risk of not receiving a contract was very low. They also show that a systematic acceptance rule, similar to what was implemented in the procurement reform, would result in a trade-off between cost savings and service continuity at patients' usual providers.

3 | INSTITUTIONAL CONTEXT AND DATA

3.1 | Rehabilitation services

This study examines competitive biddings for intensive medical rehabilitation services in Finland. These services are financed and organized by the Social Insurance Institution of Finland (Kela), which is the single largest organizer of rehabilitation services in the country. The study focuses in outpatient physio, speech and occupational therapy markets, which are the three largest therapies of individual rehabilitation. All of these services are intended for persons under 65 years of age with disabilities, who face problems managing daily activities and fulfill the criteria defined by the law. The services are provided based on a written rehabilitation plan drawn up with a physician for one to 3 years at a time. Patients do not pay anything out of pocket and have free choice among the accepted providers. Typical therapy sessions

last 45 or 60 min and are scheduled a few times a week, depending on each patient's individual rehabilitation plan. Some patients may receive the therapy for several years. The services are organized either at the provider's facilities or remotely in a familiar environment such as the patient's home, school or kindergarten.

Kela organized and financed these three services for a total of 38,762 patients at a total cost outlay of 159.3 million euros in 2018. Figure A1 (in the Appendix) present the trends in the number of patients and in annual nominal costs of the services in 2002–2020. Physiotherapy is the largest service, but there was a particularly large increase in recent years (before the Covid-19 pandemic) in the number of patients undergoing speech or occupational therapy.³ The majority of patients in speech and occupational therapies are children who only receive the service for a few years, whereas physiotherapy is received more commonly by patients of all ages, and the rehabilitation typically lasts for many years. Very few patients receive two or more therapies simultaneously.

3.2 | Competitive biddings

Kela's insurance districts are responsible for organizing the three services for their local populations.⁴ The districts acquire the services from private providers using a competitive bidding scoring auction, which they have organized in a similar and predefined manner in all three services repeatedly since 2003.⁵ This study focuses on the competitive biddings that were organized simultaneously in all three services in 2003, 2006, 2010, 2014 and 2018. The procurement process has been as follows: Kela publishes a request for tenders, after which the providers give information on their quality and annual capacity and set a price for a 45-min rehabilitation session in their sealed bids. The bids are submitted to the district in which providers are based or in which they wish to operate remotely. The districts evaluate the tenders and rank the providers that meet the minimum criteria based on their quality-price scores. Each district decides an acceptance threshold, which should be based on the estimated demand for the service and the capacity of the providers. Providers above the threshold are offered a contract and providers that sign the contract form the pool of providers. Providers are paid for patients' visits based on their own accepted price bid.⁶ Since 2006, the districts have sent the quality-price rank lists to each provider that submitted a tender in that district, which has enabled providers to evaluate their tenders afterwards.⁷

However, prior to 2018, the districts did not apply systematic acceptance criteria or rules in the competitive bidding, and the most common acceptance threshold was below the provider ranked last. Therefore, very few providers that fulfilled the minimum requirements failed to receive a contract offer in each of the three services. For example, out of 25 districts in the 2010 procurement, only three rejected at least one provider in physiotherapy and occupational therapy services, and only two in speech therapy service. A previous study (Pitkänen et al., 2020) showed that this increased the overall price-level of the service, because firms eventually learned that the risk of not receiving a contract was very low and that they were able to bid for higher prices. The main reasons for this inefficient practice was that the district officials were not trained procurement experts and did not have strict budget constraints. They also wanted to enable patients to choose from a large pool of providers and to avoid the possible negative feedback that could have resulted from several patients being forced to leave their usual provider.

Kela made two notable public changes, and one internal practical change, to its procurement practices in 2018. First and foremost, Kela introduced systematic acceptance criteria based on providers' capacity and the current number of patients in each insurance district. All providers were accepted for inclusion on the quality-price rank list until the required capacity in the area was covered, and some additional providers were allowed in based on their location and language skills. In practice, providers were required to list all municipalities to which they would provide the service, and, in each municipality, at least three providers were accepted for physiotherapy and one provider for speech and occupational therapies. Some providers were accepted also in larger cities to ensure that local demand for the service would be fulfilled. In addition, many Swedish-speaking providers were accepted in the western and southern districts.⁸ All accepted providers were offered a contract for 1 year with options for three additional years.

Second, Kela decreased the quality weight to 20% and increased the price weight to 80% in 2018. Previously, the quality-price scoring rule was a simple quality/price assessment in 2006, which changed to quality being weighted at 60% and price at 40% in 2010, and both weighted at 50% in 2014. Although the quality weight decreased, the minimum quality standards to which all providers need to adhere were increased. In general, quality is difficult to measure in health care because it is multidimensional (Tay, 2003). Quality measures are often based on rough measurements such as mortality, or inputs such as the number of beds. In all studied Kela procurements, the main quality categories have been the following process indicators: providers' experience with disabled patients, additional education and investments into facilities. Equipment has also been a category in the physiotherapy procurements.

In this study, the potential effects of changing the quality and price weights cannot be separated from the overall effects of the procurement reform. In the short term, it is very likely that the reform had a greater effect on prices than on quality, because the quality measures are investments in the provider's physical or human capital. The measures can be seen as a proxy for providers' underlying performance quality or utility gain construct (Forder & Allan, 2014). Increasing (or decreasing) such quality measures usually requires long-term planning, for example, renting new facilities or hiring new workforce. In this case, providers' only had a few months to react to the new quality weight.⁹ To avoid potential quality reductions during the contract period, Kela requires all providers to commit to maintaining quality at the level of their bid.

Kela also centralized the procurement procedure away from the insurance districts, which did not have much procurement expertise or education, to a specialized procurement department in its central administration. This change separated officials who work with patients from the procurement process, and decreased the discretion related to selecting accepted providers. Based on interviews with Kela's procurement officials, the aim of the reform was to increase price competition, while ensuring the availability of the services throughout the country. The acceptance criteria were specified in the request for tenders, and Kela publicly informed the providers through a variety of channels that not all providers would be offered a contract as had been the case in previous procurements. After the procurement, Kela received a lot of negative feedback from patients, because many of them were forced to leave their usual provider, and from providers, because the quality weight was decreased. Several rejected providers made an official complaint to the Finnish Market Court. The change in procurement practice also gained some attention in the media.

3.3 | Data

The main data source in this study are providers' quality-price evaluation lists from Kela's insurance districts compiled for the 2006, 2010, 2014 and 2018 procurements, and a list of contracted providers' prices in the 2003 procurement. The quality-price evaluation lists include quality scores, prices for 45-min service and annual capacities of all providers that fulfilled the minimum quality requirements. The data also includes the number of listed therapists for each provider in 2018. Providers' postal code, business identity code and business type information were collected from Kela's internal provider registry. Patient volumes and costs are retrieved from Kela's statistical database Kelasto. Tables A1–A3 (in the Appendix) present detailed descriptive statistics on accepted and rejected providers' prices, quality and capacity and on price changes in the procurements. Kela piloted beauty contest procurements with fixed prices for physiotherapy services in two insurance districts in 2010. Physiotherapy providers in these areas are therefore not included in the analysis. Providers' quality scores are not comparable between the three services and years, because quality was evaluated using different scales in the procurements.

3.4 | Market characteristics

There are some notable differences between the markets for the three rehabilitation services. Physiotherapy markets are among the most competitive health services in Finland, both in terms of the number of providers and their capacity: Based on Statistics Finland registries there were a total of 2632 physiotherapy firms in 2015, 1253 of which had a contract with Kela. Kela is the single largest financier of physiotherapy services, accounting for around a quarter of the entire sector's revenue. Unfortunately, similar statistics are unavailable for the speech and occupational therapy markets, which are not nearly as competitive as the physiotherapy market. Based on interviews with providers and Kela officials, speech and occupational therapy firms rely significantly more on the services financed by Kela.¹⁰ Patients of these two services also may need to wait for available providers or therapists for several weeks or even months in some areas, which reflects the lack of competition and capacity. These differences in level of competition are largely attributable to the supply of the education required to enter these professions, as the annual number of graduating speech and occupational therapists is much smaller than of physiotherapists.¹¹

Table 1 presents characteristics of the three rehabilitation markets in the 2006, 2010, 2014 and 2018 procurements. The number of bidders, accepted providers and their capacity, as well as the number of patients are much higher in physiotherapy than in speech or occupational therapy services. The table illustrates how small the number of rejected providers was in 2006, 2010 and 2014, and shows how the reform influenced the share of accepted providers in the three markets: In physiotherapy markets, the number of rejected providers increased from 28 (2.4% of bidders) in 2014 to 295

TABLE 1 Market characteristics in the procurements

	2006	2010	2014	2018
<i>Physiotherapy</i>				
Bidders	1295	1204	1187	1088
Accepted providers	1284	1197	1159	793
Rejected providers	11	7	28	295
Capacity	~35,000	40,431	47,512	34,988
Patients	13,508	13,067	13,481	14,974
<i>Speech therapy</i>				
Bidders	486	488	581	589
Accepted providers	480	481	577	580
Rejected providers	6	7	4	9
Capacity	~8000	8590	11,990	13,842
Patients	4651	5057	7439	11,757
<i>Occupational therapy</i>				
Bidders	330	396	485	517
Accepted providers	325	388	481	465
Rejected providers	5	8	4	52
Capacity	~8000	10,556	16,168	15,701
Patients	4407	4628	6491	10,793

Note: The table includes bidders that fulfilled the minimum requirements. The 2006 numbers on accepted total capacity are estimates based on available data.

(27.1%) in 2018. While the number of accepted providers decreased, the total capacity of these providers was still more than double the number of patients. Similar effects are present in the occupational therapy market, where the number of rejected providers also increased significantly from only four (0.1%) in 2014 to 52 (10.1%) in 2018. However, in speech therapy the number of rejected providers increased little from four (0.6%) in 2014 to nine (1.5%) in 2018. These increased rejection rates can be seen as a measure of the overall level of competitiveness in the three markets.

Table A4 (in the Appendix) presents additional provider characteristics in the 2018 procurement, and illustrates that there are also some notable differences between providers in the three markets. For example, 91% of physiotherapy firms had their own premises, whereas 83% of occupational therapy providers and only 70% of speech therapy providers had permanent premises. This confirms that remote services are more common in speech and occupational therapies, even though most providers with premises also offer services remotely. Physiotherapy providers are also, on average, larger than speech and occupational therapy providers in terms of their capacity and number of therapists. The majority of providers are independently operating firms, but 30%–40% of providers in all three markets were part of a larger chain. Some of these chains operate regionally, for example, within one district, but some operate nationwide. In principle, all providers are private firms that operate on a for-profit basis, but some providers may also have altruistic purposes.¹²

4 | EMPIRICAL APPROACH

Estimating the direct effects of competition on prices in public procurements is challenging due to reverse causality, omitted variables and the selection of bidders via entry (Jääskeläinen & Tukiainen, 2019). The focus of this study is on analyzing the effects of the procurement reform in areas and services that differ in terms of the degree of competition. My empirical approach follows Propper et al. (2008), who analyze the impact of competition on quality in the English National Health Service. They exploit policy reforms in the 1990s and use the fact that the pre-reform degree of competition differed between geographical areas. This approach has become common in health economics studies that analyze the effects of various competition-enhancing policies in different contexts (Cooper et al., 2011; Dietrichson et al., 2020; Gaynor et al., 2013; Roos et al., 2020). I use the same approach and exploit the pre-reform variation in market competition

TABLE 2 Descriptive statistics on the provider groups in 2014

Variable	Treatment				Control				Excluded				Difference (T-C)	
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SE
<i>Physiotherapy</i>														
Competition	19.53	15.96	4	62	1.98	0.79	1	3	40.85	26.41	2	77	17.55	0.970***
Price (€)	57.42	9.28	34	90	56.45	10.29	38	102.5	60.45	9.94	38.5	116	0.971	0.714
Quality	37.70	7.51	9	53	36.04	7.82	12	55	37.16	7.59	10	53	1.657	0.564**
Capacity	40.65	52.31	2	450	35.96	36.91	2	320	43.16	63.96	1	416	4.693	3.545
N	552				271				364					
<i>Speech therapy</i>														
Competition	11.55	11.21	2	58	1	0	1	1	57.36	25.72	1	89	10.55	1.712***
Price (€)	100.77	13.38	69	135	100.49	15.55	70	157	101.78	14.92	58	175	0.280	2.248
Quality	30.84	7.98	0	49	30.79	7.93	13	49	33.71	9.00	7	53	0.051	1.309
Capacity	22.33	24.13	1	180	20.70	26.71	2	160	19.33	18.74	1	160	1.634	4.020
N	271				43				267					
<i>Occupational therapy</i>														
Competition	10.38	10.30	2	35	1	0	1	1	25.39	5.92	2	31	9.380	1.404***
Price (€)	74.71	10.70	40	110	71.93	10.23	50	96	74.82	8.91	48	105	2.774	1.568
Quality	35.45	7.99	11	54	32.20	9.64	11	50	37.10	7.45	17	49	3.243	1.217**
Capacity	32.26	40.38	0	280	26.57	24.22	2	120	40.16	52.51	1	400	5.686	5.668
N	311				54				120					

Note: The last column shows the difference between treatment and control groups and standard errors for *t*-tests between their means.

Abbreviation: SE, Standard errors.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

in a difference-in-difference (DID, henceforth) setting. The approach is based on the intuitive idea that the reform would have the most impact for providers located in areas with greater market competition, and the least impact in areas with less competition and idle capacity.

I use two different institutional features to define the primary treatment and control groups. First, I account for regional differences in rejections in the pre-reform procurements, as they already influenced prices prior to 2018 (Pitkänen et al., 2020). Providers that had experienced at least one rejection in their district's quality-price list can be thought to have prior experience of a slightly more efficient procurement practice. Therefore, the focus of this study is on providers that are located in districts where all providers were offered a contract in the 2006, 2010 and 2014 procurements. Unfortunately, the data does not include information on rejected providers in the first procurement in 2003, but according to a Kela procurement official, the number of rejected providers in 2003 was most likely similar or even smaller compared to 2006.

Second, I use the acceptance criteria of the 2018 procurement. In 2018, Kela accepted at least one bidder per municipality in speech and occupational therapy services, and at least three bidders per municipality in physiotherapy service. This criterion was spelled out in the request for tenders and known to the bidders in 2018, but was not an acceptance criterion in the pre-reform procurements. Based on these features, the primary treatment group consists of providers that are located in municipalities where all providers were offered a contract prior to 2018 and the number of bidders in 2014 was at least two in speech and occupational therapy services, and at least four in physiotherapy. The control group then consists of providers located in municipalities where all providers were offered a contract prior to 2018 and the number of bidders in 2014 was smaller or the same as mentioned in the acceptance criteria in 2018. In practice, neither providers in the treatment group nor those in the control group had experienced an efficient procurement practice prior to 2018, but the treatment group consists of providers that are located in initially more competitive areas where the reform can be thought to have a greater impact.

The empirical approach divides providers into three groups: the treatment and control groups which both consist of providers that had not faced rejections in their area prior to the reform, and providers that were located in areas with

prior rejections. Providers in this third group are excluded from the regression analysis. Table 2 presents descriptive statistics on the three groups and the difference between the treatment and control groups in 2014, that is, prior to the reform. The table shows that the control group includes 271 providers (23% of all providers) in physiotherapy, but consists of only 43 providers (7%) in speech therapy and 54 providers (11%) in occupational therapy. Compared to the control group, providers in the treatment group were naturally located in municipalities with a higher level of competition in all three markets. The two groups had similar prices and capacities in all markets, but the treatment group consisted of higher quality providers in the physiotherapy and occupational therapy markets prior to the reform. In addition, the table also shows that providers located in areas with pre-reform rejections faced greater competition compared to the treatment and control groups, which means that accounting for previous rejections makes the treatment and control groups more comparable.

I use variations of the following provider-level DID model separately in the three services to analyze the effects of the reform:

$$\ln(P)_{jmt} = \alpha + \beta (\text{Treatment}_m * \text{Reform}_t) + \mu_j + \delta_t + \gamma_d + \varepsilon_{jmt}, \quad (1)$$

where $\ln(P)_{jmt}$ is a natural logarithm of provider j 's price located in municipality m in procurement year t . Treatment_m takes value 1 for providers in the treatment group and 0 for providers in the control group. Reform_t takes value 1 if the observation is from the 2018 procurement and 0 if from the pre-reform procurements prior to 2018. Thus, the interaction $\text{Treatment}_m * \text{Reform}_t$ takes value 1 if the observation is from 2018 and the provider belongs to the treatment group, and 0 otherwise. The DID coefficient β is the parameter of main interest, measuring the price effect of the reform in the treatment group relative to the control group. Variables μ_j , δ_t and γ_d are provider, year and district fixed effects, and ε_{jmt} is an error term. Standard errors are clustered at provider-level. The main specifications are estimated using data from all five subsequent procurements in 2003, 2006, 2010, 2014 and 2018.

As Roos et al. (2020) discuss, using this empirical approach does not identify the effect of the reform per se, but can be thought capable of identifying the differential effects of the reform between initially more and less competitive areas. Fricke (2017) shows that comparing groups where treatment intensity varies requires the following two identifying assumptions: First, the traditional common trends assumption must hold. Second, the sign of the effect should be the same both in treatment and control groups (Fricke, 2017). Then, following Fricke (2017) and Roos et al. (2020), this approach identifies a lower bound for the effect of the reform in more competitive markets compared with the continuation of the inefficient procurement practice in the same areas.

The definition of the treatment and control groups naturally has some caveats. First, geographical boundaries such as municipalities are often not considered as good local market definitions because they are either too small or large (Dranove & Ody, 2015). However, the acceptance criterion in the 2018 procurement was based on municipalities where providers offer their services, and thus the municipality serves as a natural market definition. Second, the number of providers in a municipality in 2014 does not fully represent the local degree of competition, because providers may travel to neighboring municipalities to offer their services remotely. In practice, providers listed the municipalities where they would offer the services in 2018, whereas the calculated number of bidders in 2014 is based on the providers' physical location. This approach, then may underestimate true competition in municipalities where providers are not physically located but offer remote services.

Finally, even though most providers participate in subsequent procurements, new providers may enter and incumbent providers may exit the markets in between the procurements. For the robustness of the empirical results, it is important that the composition of treatment and control groups remains stable over time. For example, if the number of bidders per municipality has increased after the reform in 2014, the control group could have been directly affected by the reform. Table A5 (in the Appendix) shows the number of providers in the treatment, control and excluded groups in the five subsequent procurements. The table shows that the number of providers in the control group peaked in both speech and occupational therapies in 2018. However, the overall number of bidders has also increased in these two services through the years, and clearer evidence of increased participation in the control municipalities would require additional data from future procurements.

5 | RESULTS

5.1 | Descriptive evidence

Figure 1 presents trends in providers' average prices and price changes in the procurements. The figure illustrates that prices are, on average, highest in speech therapy and lowest in physiotherapy. The average price has increased in all three markets in every procurement. Prices rose particularly rapidly between 2003 and 2014. For example, in physiotherapy the average price rose by as much as 74% from 2003 to 2014. Meanwhile, the Finnish Consumer Price Index increased only by 21% (SVT, 2019). The main reason for these significant price increases was probably that the providers had a low risk of not being included in the pool of accepted providers prior to 2018 (Pitkänen et al., 2020). The figure illustrates the immediate and clear effect that the reform had on prices in 2018: Average prices increased by only 8% in physiotherapy, 10% in speech therapy and 5% in occupational therapy.

Most providers in all three markets have participated in subsequent procurements. For example, 80% of physiotherapy providers in the 2014 procurement had participated also in 2010. The right-hand side of Figure 1 shows the average price increases in the procurements. The figure shows that the average price changes increased in all three markets in every procurement from 2006 to 2014. Some of the price increases were rather substantial: For example, the single highest price increase was 70 euros by a speech therapy provider in 2014. The effect of the reform is illustrated clearly in 2018, as the average price changes declined sharply across all three markets. The average price increases fell to a similar level as in 2006 in speech therapy, and even more in physiotherapy and occupational therapy. Perhaps surprisingly, the figure shows similar effects in all three markets, even though speech and occupational therapy markets are less competitive than physiotherapy markets.

Figure 2 presents average prices and price changes in the procurements separately for the three groups in all three markets. The left-hand side of the figure reveals three issues: First, providers that were located in areas with previous rejections had higher prices than the treatment and control groups prior to the 2018 procurement, especially in the physiotherapy market. Second, the figure suggests that the price trends were rather similar in the treatment and control groups in all three services prior to 2018. The figure also confirms that accounting for the previous rejections makes the treatment and control groups' price trends more consistent, especially in the physiotherapy market. Third, the figure suggests that the 2018 reform had the greatest effect on prices in the treatment and rejections groups, as the average prices increased the most in control groups in all three markets. The right-hand side of the figure shows price changes in the

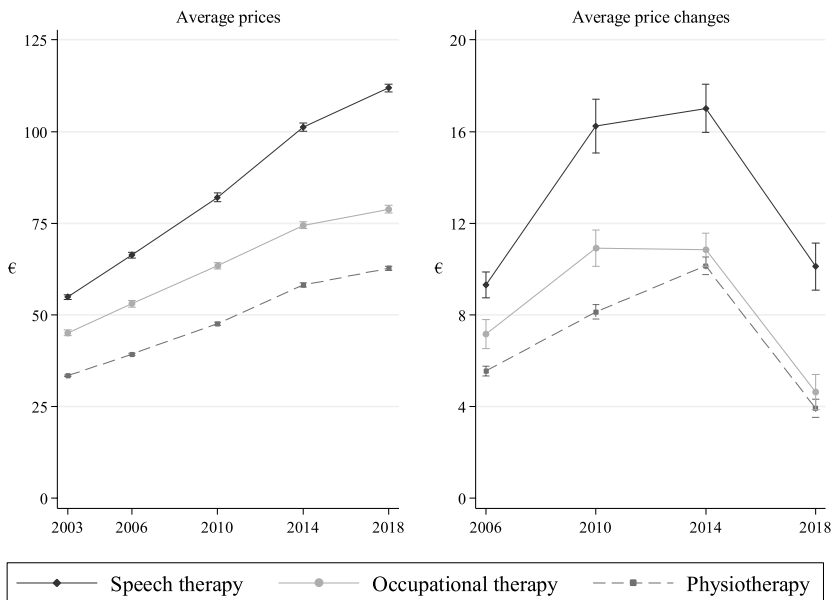


FIGURE 1 Average prices and price changes in the competitive biddings

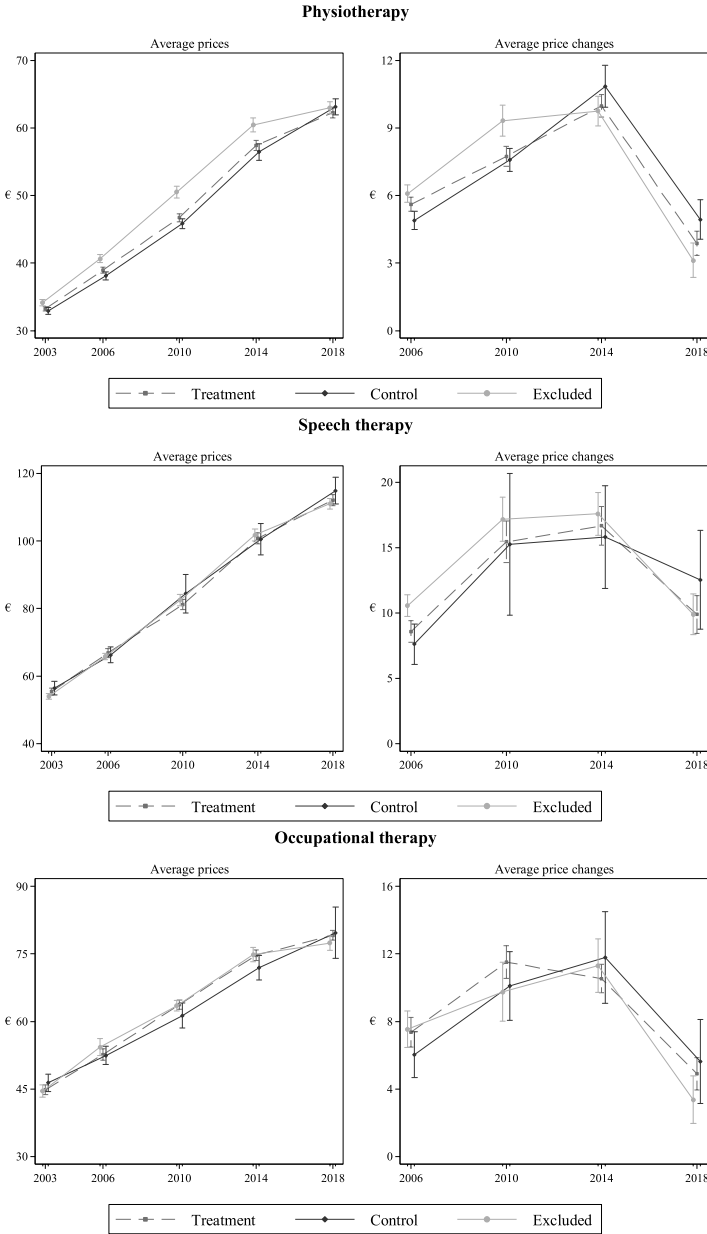


FIGURE 2 Average prices and price changes in the different provider groups and markets

procurements. These figures indicate that providers in the control group increased their prices slightly more than the other two groups in all three markets in 2018, but these differences are statistically insignificant.

More detailed evidence on prices and price changes is presented in the online Appendix. Tables A1–A3 present the descriptive statistics regarding accepted and rejected providers' prices, quality, capacity and price changes in the procurements. The tables confirm that very few providers with a low quality-price ratio failed to receive a contract offer prior to 2018 in all three services. Importantly, the tables show direct effects of the more efficient procurement practice in 2018 from the procurer's perspective: Accepted providers had significantly lower prices and higher quality than rejected providers in physiotherapy and occupational therapy markets. However, this effect is not present in the speech therapy market, as only nine providers were not offered a contract even in the 2018 procurement.

Figure A2 shows price distributions in the procurements for the three markets. Low price dispersion is perhaps the most common measure of procurement efficiency (Scheffler et al., 2016), even though it can also be a sign of collusion especially if the number of bidders is small. The figures show that price dispersion increased from 2006 to 2014 in all three services, but this trend ended in 2018. Figure A3 shows similar histograms regarding price changes. The effect of the reform is illustrated clearly in these histograms, as 2018 was the first procurement in which several providers decreased their prices in all three markets. In conclusion, all the descriptive evidence suggests that the procurement reform had a clear negative effect on prices.

5.2 | Regression results

Table 3 shows the results of the main specifications for the three services. The results show that the reform had a greater negative effect on prices in initially more competitive areas in the physiotherapy market. The negative effect of 3.7% is statistically significant and supports the graphical evidence presented in Figure 2. The sign and magnitude of the estimates are very similar also in speech and occupational therapy markets, but these results are statistically insignificant.

The results indicate that especially physiotherapy providers in initially more competitive areas responded to the increased risk of not being included in the pool of providers. There are at least three potential explanations why similar statistically significant effects are not found in the speech and occupational therapy markets. First, the empirical approach offers a lower bound estimate for the effect of the procurement practice reform. Second, the treatment and control groups are small compared to those in the physiotherapy markets, which produces large confidence intervals. For example, the descriptive evidence (see Figure 2) suggests that the effects may have been slightly larger in more competitive areas, but these differences are statistically insignificant unlike in the physiotherapy market. Third, there are differences in the degree and nature of competition in physiotherapy markets compared to the speech and occupational therapy markets. For example, the two markets have less idle capacity from the procurer's perspective, and the services are more often delivered remotely, decreasing the importance of physical premises and local competition.

The negative effect of a little under four percent in the physiotherapy market corresponds to an average price decrease of around 2.3 euros in the treatment group. Because the reform had a smaller but still negative impact on prices also in the control group, and the two groups share similar pre-trends, the empirical strategy should fulfill the two assumptions discussed by Fricke (2017). Thus, the result can be interpreted as a lower bound for the effect of the reform in these initially more competitive areas. The following simple back-of-the-envelope calculation shows the financial impact of the reform in the physiotherapy market: Municipalities in the treatment group accounted for 7664 patients and costs of 31.5 million euros in 2019, which equals to around 47% of all patients and total costs. An average price increase of 3.7% for contracted providers would then have resulted in around 1.2 million euros higher annual costs in these areas. As noted, these cost savings are only a small part of the overall impact of the reform, because the reform had a negative impact on prices also in the control group, as well as in areas with rejections already prior to 2018.

TABLE 3 Effect of the reform on prices

	Physiotherapy	Speech therapy	Occupational therapy
DID	-0.037*** (0.010)	-0.041 (0.024)	-0.028 (0.023)
Provider FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Observations	4298	1362	1518
Providers	1517	571	655
R^2	0.724	0.721	0.642

Note: Dependent variable: $\ln(\text{Price})$. Standard errors (in parentheses) are clustered by provider.

Abbreviations: DID, difference-in-differences; FE, fixed effects.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5.3 | Robustness checks

Table A6 in the Appendix presents the following robustness checks: The first column offers a formal test for the crucial parallel trends assumption, showing a placebo treatment that takes place in 2010. These results confirm that the treatment and control groups share similar price trends prior to the reform. Similar results are also found if the placebo treatment takes place in 2014. The second column of the table shows results for a model where the treatment and control group definition does not account for previous rejections but only the acceptance criteria in the 2018 procurement. These models suggest that accounting for previous rejections does not influence the regression estimates. However, as shown in the descriptive analysis, accounting for previous rejections makes the treatment and control groups more comparable. The third column of the table adds controls for providers' quality and capacity. These models do not include the years 2003 and 2006, because the data does not contain information on all providers' quality-scores and capacities from these procurements. Because providers' quality scores are not comparable, I have transformed the quality scores into simple quintiles in each service and year. The results suggest that providers with higher quality offered slightly higher prices in the procurements. In addition, I have estimated models that do not include the first procurement year 2003, as this data may not include all bidders that did not receive a contract. The results for these models also confirm the main results of the study.

The primary treatment group consists of providers that are located in municipalities where the number of bidders in 2014 was at least two in speech and occupational therapy services, and at least four in physiotherapy. Figure A4 presents the price effects of the reform with different thresholds for the treatment group in all three markets. The figure shows that the main results range around the initial cutoffs. The only notable difference is that the negative result becomes insignificant in the physiotherapy market when the treatment group is defined similarly as in speech and occupational therapies. This suggests that local monopolies do not drive the prices to any considerable extent in any of the three markets.

6 | CONCLUSION

This study provides evidence on the effects of a more efficient procurement practice on providers' prices in Finnish rehabilitation markets in 2018. The reform brought three changes: A more rule-based acceptance criterion based on capacity and demand in a municipality, a decrease of quality-weight from 50% to 20%, and the centralization of the process to a specialized procurement unit. Nearly all bidders received a contract under the previous procurement practice, which resulted in rapidly increasing prices (Pitkänen et al., 2020). The aim of the reform was to foster price competition by increasing the providers' risk of not receiving a contract. This study focuses on the effects of the reform in physio, speech and occupational therapy markets, which differ greatly in terms of the degree of market competition. The physiotherapy market is one of the most competitive health care sectors in Finland, but in many parts of the country, there is a lack of especially speech therapy providers. Traditional auction theory suggests that greater competition results in lower prices, which suggests that the reform would have the greatest influence in the most competitive service and local markets. Hence, the empirical approach is based on a comparison between providers that were located in initially more or less competitive areas, but had not experienced rejections in the procurements prior to the reform.

The analysis shows that the reform affected prices and costs via three channels: First, the descriptive evidence shows that the reform had a clear negative effect on prices in all three markets. The strong growth rate of prices declined sharply in 2018, and providers that participated in subsequent procurements increased their prices significantly less than in previous procurements. Second, the reform had a direct impact on costs because most providers with relatively high prices were not offered a contract. Pitkänen et al. (2020) calculated that implementing a similar acceptance rule would have decreased annual costs directly by 1.35 million euros already in 2014. Third, the price effects are strongest in the initially more competitive local physiotherapy markets, where prices decreased by little less than four percent compared to areas with less initial competition. However, this difference between initially more and less competitive areas is not present in the speech and occupational therapy markets. Overall, these results provide empirical evidence that supports the traditional "competition effect" in the studied procurements. The results also highlight the importance of an efficient procurement practice, which includes rule-based selection criteria and competent procurement officials.

Even though the reform increased price competition and generated cost savings for the procurer, the welfare implications of the reform are ambiguous: Limiting the number of contracted providers forced several patients to switch their incumbent provider for the new contract period. For some patients finding and choosing a new suitable provider can be

challenging and may also increase their travel time and costs. On the other hand, the new pool of accepted providers consists mainly of higher quality providers, which may benefit some of the switching patients. Changes in the pool of providers and the resulting search costs for patients are the main disadvantage when repeatedly organized procurements are used in health services that patients receive frequently and for a long time.

Naturally, the study has some limitations as the analysis concentrates solely on the immediate price effects of the procurement reform. In time, providers will likely learn about the risk of not receiving a contract in their service and local markets, which may increase prices in future procurements. Increased competition for the market and the new quality-price scoring rule may also influence providers' quality, especially in the long term. The effects on quality competition in the market are also unclear, as a smaller number of providers now compete for patients, many of whom are forced to choose a new provider at the start of the contract period. The reform may also have spillover effects to other markets, such as the procurements organized by Finnish municipalities. For example, increased competition in one market may also increase competition and decrease prices in other markets (Baicker et al., 2013). These long-term effects and spillovers are a natural direction for a future research agenda.

Maintaining a competitive market environment will be necessary for successful future procurements. After the reform, several providers found themselves without a contract from the largest service purchaser. If these providers do not find new markets and patients, the potential number of bidders may decrease in future procurements. A lower number of contracted providers may also decrease providers' expectations and incentives to participate in future procurements (McCombs & Christianson, 1987). On the other hand, accepted providers can expect a larger number of patients and greater revenue during the contract period, compared to previous procurements where all providers were included in the pool of providers. A potential way to maintain or even increase the overall level of competition, in terms of the number of potential bidders and their capacity, is to increase supply of the required education especially for speech and occupational therapy markets. Providers should also not be highly rewarded based on their previous experiences with the same procurer as it may reduce the willingness of new bidders to participate in procurements (Butler et al., 2020).

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CONFLICT OF INTEREST

The author receives a salary from Kela, which organizes and finances the studied services and procurements. The paper represents the views of the author and does not necessarily represent the official views of Kela.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available upon request from the Social Insurance Institution of Finland.

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ENDNOTES

- ¹ The procurement data in Jääskeläinen and Tukiainen (2019) does not include data used in this study, but covers procurements of rehabilitation services by the Finnish municipalities. They find that municipalities attract at least as many as and often more competition than procurements made by other larger administrative bodies such as the government.
- ² Pitkänen and Linnosmaa (2021) show that physiotherapy patients prefer high-quality providers within a close distance. However, their results indicate that patients who are forced to switch, because their usual provider exits the market, choose their new provider in a limited period of time, leading into poorer choices.
- ³ The number of patients in speech and occupational therapies has increased rapidly because of two main reasons: First, the need for the therapy is recognized earlier than before, and second, a law reform eased access to the services especially for children who are the largest patient group in these services (Heino et al., 2020).

- ⁴ Kela has centralized its administration over the years: Starting from 59 in 2006, the number of insurance districts declined to 29 in 2010, 25 in 2014, and five in 2018.
- ⁵ The exceptions are the South Ostrobothnia and Päijät-Häme districts, which piloted quality-only procurements with fixed prices (so-called beauty contests) in physiotherapy service in the 2011–2014 contract period.
- ⁶ Procurements where multiple winners are selected and their prices are based on their own bids are often called “discriminatory auctions”, because each winner receives a different price (Hoerger & Waters, 1993).
- ⁷ Even though quality scores are collected in the procurements, Kela has not facilitated patient choice by making the information publicly available to the patients.
- ⁸ Swedish is an official language in Finland, and individuals are entitled to receive public services in Swedish throughout the country. However, most of the Swedish-speaking population lives on the southern and western coasts.
- ⁹ Details on the new procurement practice, including the tighter acceptance criteria and new quality-price weights, were announced in a public briefing on 22 February 2018. The request for tenders was published on 12 of March and the deadline for submitting a bid was 4 June in 2018. The new contract period started in 1 January 2019.
- ¹⁰ Municipalities also finance and organize all three services for patients with less severely disabilities. Compared to speech and occupational therapy firms, the physiotherapy sector has more patients who pay out of pocket or are financed by other organizers such as municipalities, insurance companies or employers.
- ¹¹ In 2019, there were 15 polytechnics providing physiotherapy education, five polytechnics providing occupational therapy education and five universities providing speech therapy education in Finland. The polytechnics accepted a total of 427 new physiotherapy students and 142 new occupational therapy students, whereas the universities accepted 116 new speech therapy students in 2019.
- ¹² There are seven different business types in Finland: sole proprietor (around 37% of physiotherapy providers, 63% of speech therapy providers and 45% of occupational therapy providers in 2018), limited liability company (46%, 35% and 48%, respectively), limited partnership (12%, 1% and 2%), general partnership (3%, 0% and 1%), co-operative (0%, 0% and 1%), association (1%, 1% and 2%) and foundation (1%, 0% and 2%). Associations and foundations are non-profit organizations, but often operate profitably in the rehabilitation markets to cover their other operating costs.

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SUPPORTING INFORMATION

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**PUBLICATION
IV**

**Competitive biddings and fixed price procurements in health services:
Evidence from a Finnish physiotherapy market**

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