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The Effect of Ownership on Reimbursement Incentives – Evidence From a 2016 Primary Care Reform in Stockholm County

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Abstract: Private care providers play an important role in Swedish healthcare provision, but their place in the Swedish welfare state remains a contentious issue. This study utilizes a difference-in-difference regression model and a 2016 reimbursement reform in Stockholm County to investigate how private ownership affects sensitivity to reimbursement incentive effects among primary care providers. It finds that private primary care providers are more likely to decrease patient contact compared to public primary care providers, following a reduction in fee-for-service reimbursement. While public primary care providers replace general practitioner (GP) visits with auxiliary nurse visits when compensation is lowered for GPs, private care providers are more likely to reduce GP contacts without replacing them. Additionally, multi-site providers are more likely to reduce GP visits when compared to providers operating a single primary care centre. This paper concludes that there are important differences in how private and public providers respond to reimbursement incentives.

Keywords: ownership, general practice, primary care, reimbursement, Stockholm

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1. Introduction

Sweden has one of the highest rates of healthcare expenditures to GDP in Europe¹ and privatization is commonly invoked in political debate as a means of reducing healthcare expenditures². Consequently, the role of privately owned primary care providers has become increasingly pronounced on the Swedish healthcare market³. At the same time private care providers have come under scrutiny with some questioning the quality and equity of private provision in healthcare and adjacent sectors such as eldercare and education. Cost and efficiency concerns have led Sweden to adopt a quasi-market system where private and public providers coexists according to rules that are adopted at a regional level⁴. Regions both provide healthcare directly, in their role as public health care providers, and set the rules according to which their own provision and private providers are reimbursed. As regions have a high degree of freedom when designing this ruleset, the market for healthcare provision can look radically different across different areas of Sweden⁵.

Fundamental to this system is that private providers are reimbursed according to the same rules as public providers⁶. The reimbursement system creates powerful incentive effects by varying what and how much healthcare is reimbursed. These incentive effects in turn affect how care providers choose to structure their business⁷, for example the degree of patient contact⁸. As such these reimbursement schemes are of great interest to policymakers who can use them to influence how healthcare is provided in their region. However, because they vary across regions reimbursement schemes can be a difficult area to study. Moreover, regional policymakers tend to make incremental changes to the reimbursement scheme over time and major changes are often

¹ European Commission, *Healthcare Expenditure Statistics* [website], https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Healthcare_expenditure_statistics, (accessed 10 May 2021)

² A. Anell, 'The Public – Private Pendulum – Patient Choice and Equity in Sweden', *New England Journal of Medicine*, vol. 372, no. 1, 2015

³ A. Anell, "Choice and Privatisation in Swedish Primary Care." *Health Economics, Policy and Law*, vol. 6, no.4, 2011, pp. 549–569

⁴ Anell, 'The Public – Private Pendulum – Patient Choice and Equity in Sweden'.

⁵ F. Mellgren, 'Läkarförbundet: "Ett Totalt Misslyckande"', *Svenska Dagbladet*, 2 January 2021, <https://www.svd.se/lakarforbundet-ett-totalt-misslyckande>

⁶ J. Dietrichson, LM. Ellegård & G. Kjellsson. 'Patient Choice, Entry, and the Quality of Primary Care: Evidence from Swedish Reforms' *Health Economics* vol.29, no. 6, 2020, pp. 716–730

⁷ Riksrevisionen, 'Primärvårdens Styrning – efter Behov eller Efterfrågan?' *Riksrevisionen*, Stockholm, Riksdagen Interntryckeri, 2014, p 12, https://www.riksrevisionen.se/download/18.78ae827d1605526e94b2fc81/1518435446126/RIR_2014_22_%20v%C3%A5rdval_Anpassad_2.pdf (accessed 1 may 2021)

⁸ J. Agerholm, et al., 'Equity Impact of a Choice Reform and Change in Reimbursement System in Primary Care in Stockholm County Council' *BMC Health Services Research*, vol. 420, no.15, 2015

introduced in connection to a broader reform agenda, making it difficult to discern specific effects of the reimbursement scheme⁹. As such relatively little empirical research is available to guide policymakers in designing these reimbursement systems. If the incentive effects of the reimbursement system vary between private and public providers, this could further complicate policymaking.

In this paper, we use a 2016 reimbursement system reform to study the differential reaction of private and public primary care providers to changing reimbursement incentives. We utilize Stockholm County reimbursement data which allows us to observe visits and listings for PCCs registered in Stockholm between 2012 – 2020. We use a difference-in-difference framework to examine how the degree of patient contact changed between private and public general practitioners (GPs) when the reimbursement for patient contact was lowered. Additionally, we examine the way private primary care centers (PCCs) changed their use of GPs and nurses respectively as the reimbursement for these professionals changed. Lastly, we examine whether this response differed between large, multi-PCC private providers and smaller, GP-owned PCCs.

As far as we are aware, this makes our paper the first to examine the difference in reimbursement incentives between private and public healthcare providers in a Swedish context using econometric methods. Prior empirical research has investigated how private and public providers differ in the market for ambulance services in Stockholm¹⁰, and how reimbursement incentives have affected the establishment of new PCCs in Stockholm¹¹. Such research has indicated that private providers reach different outcomes when compared to public providers and has illustrated the effectiveness of incentives connected to reimbursement systems. This motivates us to further investigate how governance form might influence reimbursement incentive effects. We draw on theoretical research on incomplete contracting to motivate our hypothesis that private care providers are more sensitive to reimbursement incentive effects. We then investigate the 2016 reimbursement system reform using theory on incentive effects connected to such reimbursement. This reform

⁹ P. Lindgren, *Ersättning i Sjukvården: Modeller, Effekter, Rekommendationer*, Stockholm, SNS förlag, 2014

¹⁰ D. Knutsson & B. Tyrefors, 'Quality and Efficiency Between Public and Private Firms: Evidence from Ambulance Services', IFN Working Paper No. 1365 (October, 2016), Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3713065

¹¹ A. Anell, M. Dackehag & J. Dietrichson, 'Does Risk-Adjusted Payment Influence Primary Care Providers' Decision on Where to Set up Practices?', *BMC Health Services Research*, vol. 18, no. 1, 2018

significantly lowered fee-for-service reimbursement in Stockholm¹². Several papers theorize that a reduction in fee-for-service reimbursement incentivizes less patient contact¹³. As such, we conclude that the reform should motivate private PCCs to decrease their patient contact more when compared to public PCCs, provided that our hypothesis holds true. This runs contrary to the policy evaluation immediately following the reform which did not find a difference in private providers' response to the new reimbursement system¹⁴. We elaborate on that paper primarily in two ways. Firstly, we examine the reform using econometric methods. Secondly, we use a more extensive dataset, covering several years after the reform.

This paper is organized as follows. Section 2 provides background on healthcare in Sweden, in Stockholm and explains the 2016 reform utilized in this paper. Section 3 gives an overview on existing literature and presents how our research fits into those studies. Section 4 presents our research method, hypothesis, provides an overview of our data and specifies our regression models. Section 5 reviews our results and section 6 goes on to discuss our findings, the limitations of our research and possible extensions. Lastly section 7 will summarize our paper.

2. Background

Healthcare in Sweden is provided in a quasi-market system where providers administer care to patients and are reimbursed by the regional government. The system functions the same regardless of whether the provider is administered by the region or is private. Each reimbursement system is regulated by the local regional government in 21 different regions¹⁵. Regions exercise a high degree of autonomy in shaping the reimbursement system and local regulations, and the regions themselves are providers of healthcare alongside private actors¹⁶.

¹²C. Dhalgren, M. Hagman & C. Rhenberg 'Uppföljning av Utvecklingen Inom Husläkarverksamheten efter Förändring av Ersättningsmodellen', Stockholm, *Karolinska Institutet*, 2016, p.4
https://ki.se/sites/default/files/migrate/pm_uppfoljning_av_utvecklingen_inom_huslakarverksamheten_etter_forandring_av_ersattningsmodellen.pdf (accessed 4 April 2021)

¹³ E.Z Fainman & B. Kucukyazici, 'Design of Financial Incentives and Payment Schemes in Healthcare Systems: A Review', *Socio-Economic Planning Sciences*, vol. 72, 2020

¹⁴Dhalgren, Hagman & Rhenberg, 'Uppföljning av Utvecklingen Inom Husläkarverksamheten efter Förändring av Ersättningsmodellen'

¹⁵ Formally, there are 17 county councils and 4 regional bodies (Skåne, Halland, Västra Götalandsregionen, and Gotland). We will not be making this distinction in this paper.

¹⁶ A. Anell, AH. Glenngard & S. Merkur. 'Sweden Health System Review', *Health Syst Transit*, vol. 14, no. 5, 2014

The aim of this section is to provide an overview of reimbursement systems used in primary care, as well as the 2016 policy reform that will be utilized in measuring the sensitivity to incentive effects of primary care providers. A glossary is available in Appendix 1.

2.1 Primary care

Reimbursement varies with both the region and the type of care provided. Most commonly healthcare is divided along the lines of primary care (Swedish: primärvård) and hospital care (specialistvård). Primary care is most often provided at a care centre and concerns day-to-day care that does not require extensive treatment, regular checkups and other care given by a “Husläkare”, a GP. If the patient requires more specialized healthcare they are referred to Hospital Care, which provides specialized and intensive care. Private practitioners generally provide primary care although a few examples exist of private hospitals. This paper will focus on primary care and more specifically, general practice. Unless otherwise stated, primary care will always refer to general practice in this paper.

General practice (Swedish “Husläkarvård”) is the initial contact patients have with the healthcare system. It includes diagnosis, treatment and follow-up of a broad set of issues. If the general practice lacks the competence to help a patient they are responsible for arranging referral of the patient to more specialized care. The general practice also provides regular check-ups and disease prevention. The general practice thus functions as a filter for simpler and routinized medical issues and as a gateway into other primary and hospital care. All PCCs providing general practice are subject to the same rules and reimbursements, whether owned by the region, the resident GPs or any other party.

A Swedish GP undergoes at least five and a half years of training¹⁷ and a medical internship¹⁸. In our dataset we do not differentiate between different physicians and will refer to any physician working in general practice as a GP. Our definition of a GP therefore does not indicate any specialist training (for Swedish readers, note that we translate general practitioner to “Husläkare” as opposed to “Allmänläkare”). A nurse has undergone at least three years of training¹⁹. Nurses

¹⁷ Lunds Universitet, *Läkarprogrammet* [website], <https://www.lu.se/lubas/i-uoh-lu-MAL%C3%84P>, (accessed 1 May 2021)

¹⁸ Socialstyrelsen, *Legitimation och Intyg* [website], <https://legitimation.socialstyrelsen.se/legitimation/utbildad-i-sverige/lakare-utbildad-i-sverige/>, (accessed 1 May 2021)

¹⁹ Lunds Universitet, *Sjuksköterskeprogrammet* [website], <https://www.lu.se/lubas/i-uoh-lu-VGSKS/80544>, (accessed 1 May 2021)

often hold specialist training as well. Many nurses working in the Stockholm region hold the title of district nurse, which requires another 15 months of training in addition to work experience²⁰. In this essay, we will separate the roles of nurses and auxiliary nurses. An auxiliary nurse requires secondary education but not higher education. Auxiliary nurses assist nurses and GPs in simpler tasks that do not require extensive medical training²¹.

2.2 Reimbursement

The regional government can influence providers by a combination of direct regulation and the reimbursement system. Direct regulation sets rules for the medical practice while the reimbursement system decides what care is billable. The reimbursement is based on different factors depending on the region, but two forms of reimbursement are especially prominent in general practice.

Capitation provides a fixed fee based on the number of regional citizens who are registered at the PCC. Registration is automatic and based on address, but citizens can choose to manually change their registration free of charge. Most opt to stay at their automatically registered centre²². Additionally, capitation is often subject to some modification based on demographic characteristics such as age, Care Need Index (CNI) or Adjusted Clinical Groups (ACG). For primary care most regions employ a reimbursement scheme heavily skewed towards capitation, which made up more than 80% of the total fee received by healthcare providers in most of the 21 regions in 2013²³. Some regions base their payment scheme almost exclusively on capitation²⁴. Capitation derive some of its popularity from the predictability of reimbursement, both to the region and to the care providers²⁵.

²⁰ Lunds Universitet, *Specialistsjuksköteskeprogrammet, Distriktssjuksköterska* [website], <https://www.lu.se/lubas/i-uoh-lu-VASDA/27921>, (accessed 1 May 2021)

²¹Sveriges Kommuner och Regioner, *Undersköteska – Frågor och Svar* [website], <https://skr.se/skr/arbetsgivarekollektivavtal/sverigesviktigastejobb/attraktivarbetsgivare/rekryteringsmaterial/rekryteringsmaterialunderskoterskor/underskoterskafragorochsvar.13493.html>, (accessed 1 May 2021)

²²Swedish Competition Authority, 'Etablering och Konkurrens bland Vårdcentraler – om Kvalitetsdriven Konkurrens och Ekonomiska Villkor', *Swedish Competition Authority*, Stockholm, 2014, https://www.konkurrensverket.se/globalassets/publikationer/rapporter/rapport_2014-2.pdf (accessed 8 May 2021)

²³ Lindgren, *Ersättning i Sjukvården: Modeller, Effekter, Rekommendationer*

²⁴ J. Dietrichson, LM. Ellegård & G. Kjellsson. 'Patient Choice, Entry, and the Quality of Primary Care: Evidence from Swedish Reforms.' *Health Economics*, vol. 29, no. 6, 2020

²⁵ P. Lindgren, *Ersättningen och E-Hälsan*, Stockholm, SNS Förlag, 2019

Fee-for-service provides a fee for every billable service that the PCC provides. Example of services are visits, tests and treatments. While patients generally seek care from their registered provider they are free to visit any provider both inside and outside the region. As a result regions pay a small fee to providers in other regions. When this happens, it is the provider's rather than the patients' reimbursement scheme which governs the fee. A Stockholm resident receiving care in neighboring regions thus causes the Stockholm region to pay according to the reimbursement system of the neighboring region. Fees can vary based on the nature of the service as well as the patient, diagnosis and the individual administering the service on behalf of the provider.

2.3 Healthcare in Stockholm

The county of Stockholm is the largest of the 21 counties. Commonly referred to as SLL or Region Stockholm, the county is responsible for the delivery of all publicly financed healthcare for its 2.4 million citizens²⁶. The region is heavily urbanised when compared to the rest of Sweden. Private providers account for approximately one third of SLL's total care delivery, including both primary care and hospital care. However, private providers are especially prominent in primary care where Stockholm has the highest share of private providers out of all counties of Sweden (see Appendix 2). Private for-profit providers made up 68% of the total care provision in 2018. In the same year, 63% of total GP visits in Stockholm were conducted by a private provider, which is notably higher than the national average of 44%.²⁷

Stockholm introduced a patient's choice for primary care in 2008. In connection to this patient-choice policy a new reimbursement system was put in place. Prior to 2008, the reimbursement scheme had been based largely on capitation, which accounted for 75% total reimbursement. Age and a series of socioeconomic indicators were used as weights for the fixed reimbursement. The new system introduced in 2008 took a notably different format, with capitation accounting for only 40% of total reimbursement. The remaining 60% of total reimbursement was primarily fee-for-service reimbursement²⁸. The new reimbursement scheme policy aimed to facilitate the establishment of new PPCs and incentivise a high level of patient contact. The low share of

²⁶ Statistiska Centralbyrån, *Folkmängd i Riket, Län och Kommuner 31 mars 2020 och Befolkningsförändringar 1 januari – 31 mars 2020* [website], <https://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningens-sammansattning/befolkningsstatistik/pong/tabell-och-diagram/kvartals-och-halvarsstatistik--kommun-lan-och-riket/kvartal-1-2020/>

²⁷ Swedish Association of Local Authorities and Regions. *Köp av Verksamhet*. Stockholm, 2019.

<https://skr.se/tjanster/merfranskr/rapporterochskrifter/publikationer/kopavverksamhet2019.31141.html>

²⁸ Agerholm, et al., 'Equity Impact of a Choice Reform and Change in Reimbursement System in Primary Care in Stockholm County Council'

capitation distinguished the chosen reimbursement scheme from the capitation-dominated policies that pervaded in other regions.

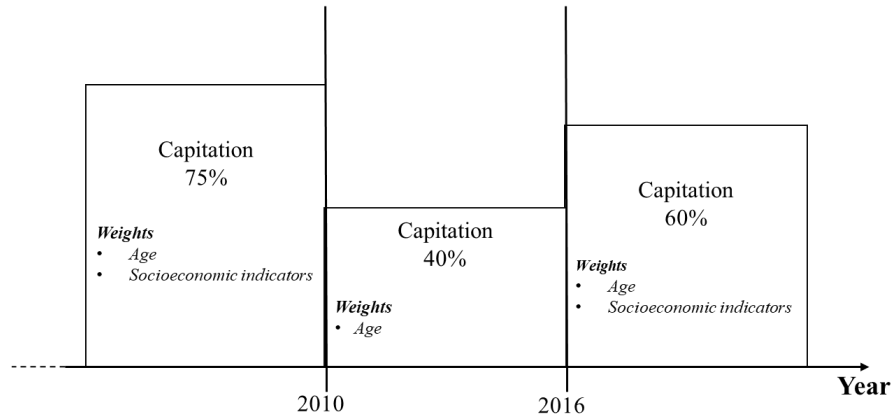
2.4 The 2016 reform

In 2015, the Stockholm County government again decided to adopt a new reimbursement system. The new reimbursement policy came into effect on the 1st of January 2016 and meant that general practice would be reimbursed with a greater degree of capitation. The reform was motivated by costly overprovision ascribed to the fee-for-service payment schemes. Examples included physical visits used when phone contact would have sufficed and an underutilization of nurses due to the higher compensation for visits handled by GPs²⁹. Consequently, capitation increased from approximately 40% of reimbursement before the reform to 60% after the new reform was rolled out. Stockholm hence moved to a model more consistent with the rest of the country, with greater emphasis placed on the number of registered patients³⁰. The new policy also meant that any visit handled by a trained health professional would be reimbursed more equally. In practice, this meant lowering the compensation for visits to GPs to the same compensation as visits to nurses. As a result, the compensation for visits to GPs was decreased by almost half. The price rates from 2008 – 2016 are shown Appendix 3. The reform was rolled out simultaneously throughout Stockholm.

²⁹ Hälso- och Sjukvårdsnämnden, 'Inriktningsbeslut och Ersättningsmodell för Vårdval Husläkarverksamhet med Basal Hemsjukvård', *Stockholms Läns Landsting*, Stockholm, 2020, <https://www.sll.se/globalassets/5.-politik/politiska-organ/halso-och-sjukvardsnamnden/2020/200924/9-inriktningsbeslut-om-ersattningsmodell-for-varldval-huslakarverksamhet-med-basal-hemsjukvard.pdf>

³⁰ B. Burström, 'Mycket Positivt med Nytt Ersättningsystem – Viktigt att Utvärdera Dess Effekter'. *Folkhälsoguidens Blogg* [web blog], 29 October 2015, <https://www.folkhalsoguiden.se/nyhetsbrev/folkhalsoguidens-blogg/mycket-positivt-med-nytt-ersattningssystem--viktigt-att-utvardera-dess-effekter/> (accessed 20 March 2020)

Figure 1: Capitation reimbursement in Stockholm County in recent years



Note: Author's rendering, based on B. Burström, 'Mycket Positivt med Nytt Ersättningsystem – Viktigt att Utvärdera Dess Effekter' & Agerholm, et al., 'Equity Impact of a Choice Reform and Change in Reimbursement System in Primary Care in Stockholm County Council'

The reform included other changes. In addition to age of the listed patient, socioeconomic factors factored into capitation reimbursement.

3. Literature Review

The debate on private provision of healthcare services has not been restricted to policymakers, it has also been the focus of empirical and theoretical research. This section presents relevant research on ownership and reimbursement incentives. Sections 3.1 – 3.2 provide a broad overview of the empirical literature on ownership in healthcare, which has often been concerned with the relative performance of private providers. Section 3.3 introduces the theoretical literature on incomplete contracting, which provides an explanation as to why private providers behave differently from public ones. Section 3.4 revisits the literature on the incentives tied to fee-for-service and capitation reimbursement. We conclude by noting how our paper contributes to the existing literature.

3.1 Research in an international setting

Researching the difference between public and private healthcare provision can be a complicated task due to complex and internationally heterogeneous³¹ regulation. Previous research has found mixed effects associated with private ownership on outcomes related to both economic performance and quality. To provide an overview, we propose that the literature on private ownership be divided into two broad categories, similar to those laid forward by Tiemann et al³². The first category is concerned with comparing the performance of private and public providers on healthcare markets where both types coexist. This category is the most extensive. Tynkkynen et al conducted a recent meta-study of papers looking at European markets for hospital care. They conclude that public hospitals are more frequently reported to perform better in terms of efficiency, though a considerable number of studies find insignificant results. However, private ownership could not be linked to worse performance in terms of quality measures³³. Shen et al conducts a similar study but concludes that there is little evidence that privately owned hospitals are more efficient than public ones³⁴. Relatedly, there is a broad literature on the effect of competition on quality and economic outcomes in healthcare. Competition has been linked with management quality which in turn has been shown to correlate with clinical outcomes like survival rates in English hospitals³⁵ but competition has also been shown³⁶ to have adverse effects in the US³⁶. The second category of papers look at the effects on healthcare once there is a change in ownership, commonly when hospitals are privatized and therefore acquired by a for-profit owner. Such studies have often differentiated between private for-profit and private not-for-profit healthcare, often in the US where private for-profit hospitals have been linked to higher mortality³⁷. A review of this literature was conducted by Burns et al³⁸, which concluded that research on hospital ownership conversion in the US has found the impact of privatization to be mixed on performance measures

³¹ P. Smith et al., 'Leadership and Governance in Seven Developed Health Systems.' *Health Policy (Amsterdam)*, vol. 106, no. 1, 2011, pp. 37–49

³² O. Tiemann, & J. Schreyögg. 'Changes in Hospital Efficiency after Privatization.' *Health Care Management Science*, vol. 15, no 4, 2012, pp. 310–326.

³³ L. Tynkkynen, & K. Vrangbæk. 'Comparing Public and Private Providers: a Scoping Review of Hospital Services in Europe.' *BMC Health Services Research*, vol. 18, no. 1, 2018, p. 141

³⁴ Y. Shen et al. 'Hospital Ownership and Financial Performance: What Explains the Different Findings in the Empirical Literature?', *Inquiry (Chicago)*, vol. 44, no 1, 2007, pp. 41–68.

³⁵ N. Bloom et al. 'The Impact of Competition on Management Quality: Evidence from Public Hospitals.' *The Review of Economic Studies*, vol. 82, no. 2, 2015, pp. 457–489

³⁶ DP. Scanlon et al., 'Competition and Health Plan Performance: Evidence from Health Maintenance Organization Insurance Markets.' *Medical Care*, vol. 43, no. 4, 2005, pp. 338–346

³⁷ Tiemann, & Schreyögg, 'Changes in Hospital Efficiency after Privatization.'

³⁸ L. Burns et al., 'The Impact of Hospital Ownership Conversions: Review of the Literature and Results from a Comparative Field Study', *Advances in Health Care Management*, vol. 8, 2009, pp. 171–229

(such as access, quality and cost), alas with a slight majority of studies pointing towards positive effects on efficiency. These results were replicated by Tiemann et al³⁹ when studying hospital ownership conversions in Germany, where privatization was found to increase efficiency. In addition to studies on efficiency and quality outcomes, some studies link privatization to changes in organizational performance and profitability⁴⁰.

3.2 Research in a Swedish setting

Because of the quasi-market which regulates healthcare in Sweden, international literature has not always been relevant in a Swedish context. Health economics research across countries always must contend with different national systems that make comparisons across countries difficult and the Swedish system thus warrants research in a national setting. Swedish primary care providers compete with private providers for listings and visits, which are reimbursed by the regional government⁴¹. Medical professionals are particularly strong stakeholders who shape the practice of their providers⁴² and private PCCs are often managed by resident GPs who come from the public sector⁴³. The relative power and mobility of employees in Swedish health care practices could potentially mute the effects of different provider ownership, one complicating factor in applying international research to Sweden. Relatedly, previous research on the difference between public and private providers have shown mixed effects. A recent study by Knutson and Tyrefors has found a difference in the quality and efficiency offered by private hospitals in ambulance services in the county of Stockholm, looking specifically at St Görans Sjukhus. They conclude that private ambulance services are better at responding to contracted outcomes, such as answering calls faster, but worse at non-contractable outcomes, such as mortality rates⁴⁴. The division between contracted and non-contracted outcomes stems from theoretical literature on incomplete contracting, which we discuss further in section 3.2.

³⁹ Tiemann, & Schreyögg, 'Changes in Hospital Efficiency after Privatization.'

⁴⁰ G. Picone, S. Chou, & F. Sloan, 'Are For-Profit Hospital Conversions Harmful to Patients and to Medicare?' *The Rand Journal of Economics*, vol. 33, no. 3, 2002, pp. 507–523.

⁴¹ Anell, 'Health System Review'

⁴² E. Kuhlmann, Y. Rangnitt, & M. von Knorring. 'Medicine and Management: Looking Inside the Box of Changing Hospital Governance.' *BMC Health Services Research*, vol. 16, no. 2, 2016

⁴³ Swedish Competition Authority, 'Etablering och Konkurrens bland Vårdcentraler – om Kvalitetsdriven Konkurrens och Ekonomiska Villkor', *Swedish Competition Authority*, Stockholm, 2014, https://www.konkurrensverket.se/globalassets/publikationer/rapporter/rapport_2014-2.pdf (accessed 8 May 2021)

⁴⁴ Knutsson & Tyrefors, 'Quality and Efficiency between Public and Private Firms: Evidence from Ambulance Services'

Studies focused specifically at the primary care segment of the Swedish healthcare market are also conflicting or inconclusive. Lindström et al found no significant difference between private and public providers in patient-reported access to primary care⁴⁵, whereas a study by Maun et al found private care centres to offer higher patient-perceived quality but also higher antibiotics use⁴⁶. There is also some evidence of self-selection among patients, with higher income correlating to private listing, which further complicates studies⁴⁷. Research on ownership in Swedish primary care has often focused on the introduction of patient choice which opened the Swedish market to competition⁴⁸, especially its equity effects⁴⁹. Like other research on the difference between public and private providers, research focused on the patient choice reform has often had ambiguous or conflicting findings.

3.3 Incomplete contracting perspective

The role of private entities in welfare provision has also attracted theoretical attention. Laffont and Tirole's classic paper on conventional wisdoms on public production of welfare services argues that public providers have several advantages relative to private ones. They highlight their ability to take broader social structures into account and their benefits of centralized control, as well as disadvantages, such as the absence of a capital market and politicized resource allocation⁵⁰. Relatedly, modern property rights theory as researched extensively by Oliver Hart, among others, has often been invoked in literature on ownership in public goods provision⁵¹. Such property rights theory describes differing incentives created due to incomplete contracting, contracts that due to constraints of renegotiation and complexity cannot fully encapsulate the intention of its signatories. This makes Hart's work relevant to the Swedish healthcare market where the recipient of the service (the patient) and the buyer of the service (the government) are separate actors and contracts written between PCCs and the regions are subject to frequent renegotiations. As the actions of the

⁴⁵ C. Lindström, M. Rosvall, and M. Lindström. 'Differences in Unmet Healthcare Needs between Public and Private Primary Care Providers: a Population-Based Study.', *Scandinavian Journal of Public Health*, vol. 46, no.4, 2018, pp. 488–494.

⁴⁶ A. Maun et al. 'Is the Quality of Primary Healthcare Services Influenced by the Healthcare Centre's Type of Ownership? An Observational Study of Patient Perceived Quality, Prescription Rates and Follow-up Routines in Privately and Publicly Owned Primary Care Centres', *BMC Health Services Research*, no. 15, vol. 1, 2015

⁴⁷ D. Isaksson et al. 'Risk Selection in Primary Care: a Cross-Sectional Fixed Effect Analysis of Swedish Individual Data.' *BMJ Open*, vol. 8, no. 10, 2018

⁴⁸ Dietrichson, Ellegård, & Kjellsson. 'Patient Choice, Entry, and the Quality of Primary Care: Evidence from Swedish Reforms', pp. 716–730.

⁴⁹ B. Burström et al., 'Equity Aspects of the Primary Health Care Choice Reform in Sweden - a Scoping Review.' *International Journal for Equity in Health*, no. 16, vol. 1, 2017, p. 29

⁵⁰ J. Laffont & J. Tirole, *A Theory of Procurement and Regulation*. Cambridge, Mass, MIT Press, 1993

⁵¹ T. Besley & M. Ghatak, 'Government versus Private Ownership of Public Goods'. *The Quarterly Journal of Economics*, vol. 116, no. 4, 2001, pp. 1343–1372.

healthcare provider are observed by the patient, who is assumed to have hold less information than the healthcare provider⁵²⁵³, providers have some flexibility in their care provision. Models originally laid forward by Grossman and Hart⁵⁴ as well as Hart and Moore⁵⁵ have illustrated how the ownership form of firms matter when contracts are incomplete. In another article, Hart, Shleifer and Vishny⁵⁶ argue that private ownership incentivizes excessive cost reduction and leads to moderate incentives to engage in quality improvement. In Appendix 4 we adapt one of their models⁵⁷ to illustrate why private firms can be expected to act differently to public providers when contracts are incomplete. In section 4.1 we argue that such theorization may be applicable in a Swedish primary care context.

In contrast, the case for healthcare-sector exceptionalism has also been made in the theoretical literature. For example, healthcare has been suggested as a mission-oriented sector, where healthcare professionals will be bound by strong norms regardless of owner⁵⁸. This could make incomplete contracting less applicable to a Swedish healthcare context, as it would predict that healthcare professionals owning and operating PCCs would internalize social benefit similar to how the regions intend to contract (see the role of social benefit in shaping private provider incentives in Appendix 4). Combining healthcare sector exceptionalism with an incomplete contracting perspective could imply that small, GP owned private firms would behave differently to larger PCCs with outside shareholders.

3.4 Reimbursement incentive theory

Central to primary care in a Swedish context is the reimbursement system, which has also been subject to research. It is widely accepted among both researchers and policymakers that the design of the reimbursement scheme affects caregivers' behavior by generating different incentives. A challenge when studying the effect of reimbursement systems is the absence of major isolated

⁵² D. A Orgione et al. 'DRGs, Costs and Quality of CARE: An Agency Theory Perspective', *Financial Accountability & Management*, vol. 21, no. 3, 2005, pp. 291–308.

⁵³ O. Hart, 'Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships', *The Economic Journal (London)*, vol. 113, no. 486, 2003, pp. 69 – 76

⁵⁴ Grossman, J. Sanford & O. Hart, 'The Costs and Benefits of Ownership: a Theory of Vertical and Lateral Integration'. *Journal of Political Economy*, vol. 94, no. 4, 1986, pp. 691-719

⁵⁵ O. Hart & J. Moore, 'Property Rights and the Nature of the Firm', *Journal of Political Economy*, vol. 98, no. 6, 1990, pp. 1119-1158.

⁵⁶ O. Hart, A. Shleifer, & RW. Vishny, 'The Proper Scope of Government: Theory and an Application to Prisons', *The Quarterly Journal of Economics*, vol. 112, no. 4, 1997, pp. 1127–1161.

⁵⁷ Hart, 'Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships'

⁵⁸ T. Besley, M. Ghatak. 'Competition and Incentives with Motivated Agents.' *The American Economic Review*, vol. 95, no. 3, 2005, pp. 616–636

changes to the system. Most major changes occur as part of a wider policy change, meaning that the effect of the reimbursement system is difficult to discern⁵⁹. The theoretical literature on reimbursement in healthcare distinguishes between retrospective and prospective as well as variable and fixed payment schemes. A useful typology based on these two dimensions was laid forward by Jegers et al⁶⁰, who connect the variable/fixed dimension to activities and the retrospective/prospective dimension to costs. A *retrospective* payment scheme reimburses the healthcare provider for each service they provide. The fundamental idea is that the amount reimbursed thus reflects on the actual use of resources. Such a system will be variable by default, as costs cannot be observed ex ante⁶¹. In a *prospective* payment scheme funding is agreed upon before services and treatments take place and may be both variable and fixed⁶². This paper is mainly concerned with capitation and fee for service reimbursement, as these are used in Swedish primary care. In this context, capitation is a prospective and fixed system whereas fee-for-service is retrospective and variable⁶³. Theoretically, an important distinction between prospective (capitation) and retrospective (fee-for-service) reimbursement is that the latter implies that financial risks are borne to a greater extent by the government, as expenditures cannot be predicted before production. Capitation places the financial risk with the healthcare provider⁶⁴ and has therefore been theorized to generate higher barriers of entry for new providers⁶⁵. In addition to placing the financial risk on the government, retrospective payment systems, such as fee-for-service, have been theorized to incentivize overproduction of services. Capitation, on the other hand, is theorized to not give care providers enough incentives to improve productivity⁶⁶. Both effects have some empirical support^{67,68}. Furthermore, fixed systems like capitation have been criticized for under-provision of healthcare. Providers benefit if activities associated with care are minimized⁶⁹. By the same token, capitation has been linked to cost-shifting behavior when laws do not adequately enforce financial responsibility of patients. Examples of cost shifting are

⁵⁹ Lindgren, 'Ersättning i Sjukvården: Modeller, Effekter, Rekommendationer',

⁶⁰ M. Jegers et al. 'A Typology for Provider Payment Systems in Health Care.' *Health Policy (Amsterdam)*. vol. 60, no. 3, 2002, pp. 255–273

⁶¹ Fainman & Kucukyazici. 'Design of Financial Incentives and Payment Schemes in Healthcare Systems: A Review'

⁶² Fainman & Kucukyazici, 'Design of Financial Incentives and Payment Schemes in Healthcare Systems: A Review'

⁶³ Lindgren, 'Ersättning i Sjukvården: Modeller, Effekter, Rekommendationer',

⁶⁴ Jegers, 'A Typology for Provider Payment Systems in Health Care',

⁶⁵ Anell, 'Choice and Privatisation in Swedish Primary Care'

⁶⁶ Lindgren, 'Ersättning i Sjukvården: Modeller, Effekter, Rekommendationer'

⁶⁷ U. Gerdtham, C Rehnberg & M Tambour. 'The Impact of Internal Markets on Health Care Efficiency: Evidence from Health Care Reforms in Sweden', *Applied Economics*, vol. 31, no. 8, 1999, pp. 935–945.

⁶⁸ Gerdtham, Rehnberg & Tambour. 'The Impact of Internal Markets on Health Care Efficiency'

⁶⁹ Anell, 'Choice and Privatisation in Swedish Primary Care',

increased referral to specialists, which has been found to be the case on Norwegian data⁷⁰. All papers referenced above illustrate the influence of reimbursement models on healthcare provision. However, to the best of our knowledge, no study using econometric models has investigated the incentive effects of the reimbursement models based on governance form.

3.5 Our contribution to existing literature

Our paper exploits a 2016 reimbursement reform in the Swedish region of Stockholm to discern different trends between public and private primary care providers. This allows us to combine research on the incentives tied to reimbursement systems with the research on ownership in healthcare. Our research contributes to the existing literature in three ways. Firstly, by using data from a policy reform in Stockholm County our research becomes relevant to policymakers in Sweden. Secondly, by investigating the reimbursement system effects on private and public providers our paper adds to the sparse empirical literature on reimbursement systems while providing further nuance to the debate on private for-profit ownership in the Swedish healthcare system. Thirdly, by combining the two perspectives we investigate a so far unanswered question of how private providers adapt differently to regional incentive reforms.

4. Research Design

This section outlines our research question and our hypothesis by drawing on two strands of research in health economics, research on incentive effects of reimbursement systems and research on the effect of private ownership in healthcare provision. We hypothesize that private primary care providers are more strongly affected by reimbursement systems and propose a difference-in-difference regression model to investigate evidence of this in the 2016 reform in Stockholm County.

4.1 Research question

Previous research has indicated that private care providers can differ from public care providers in outcomes and structure but has often had conflicting findings. Due to the differences between

⁷⁰ T. Iversen & H. Lurås, 'The Effect of Capitation on GPs Referral Decisions', *Health Economics*, vol. 9, 2000, pp. 199–210.

different fields of healthcare, as well as differences between countries and even regions, it becomes more important to have a rich set of research to guide policymakers. In Sweden the centrality of the reimbursement system makes it meaningful to examine private healthcare provision using a reimbursement system perspective. As such, this paper proposes to investigate the question:

Do private care providers react differently to reimbursement incentive effects compared to public care providers?

In addition to policy relevance, this research question contributes empirical evidence to a theoretical debate about governance. Theories on incomplete contracting would indicate that private care providers internalize less of the social benefit of care provided when compared to public providers. This means that monetary benefit constitutes a larger proportion of total benefit for private providers, also making them more prone to cost cutting innovation. Private care providers would then be relatively more sensitive to monetary incentives. Studies on the Swedish healthcare market have also indicated that private firms are less likely to continue production when unprofitable, consistent with an incomplete contracting perspective⁷¹. Based on this we would expect private care providers to align their practice to the reimbursement system to a greater degree than public care providers. Our hypothesis is thus:

Private care providers are more affected by reimbursement incentive effects compared to public care providers.

To investigate this question, we need to establish an outcome that reflects the degree of alignment with the reimbursement incentive effect. As noted by prior research, fee-for-service will incentivize more provision of patient contact while capitation reimbursement incentivizes lower patient contact. This means that a higher capitation should result in a lower number of patient contacts when accounting for size, while higher fee-for-service should result a higher number of patient contacts. An appropriate outcome measure should be impacted by these incentives and should preferably not be subject to any other effect changes during our time sample. We will use visits per listed individual (VPLI) as an outcome measure, which will indicate the degree of patient contact while controlling for the size of the care centre. Fewer patient visits per listed individual

⁷¹ Swedish Competition Authority, 'Etablering och Konkurrens Bland Vårdcentraler – om Kvalitetsdriven Konkurrens och Ekonomiska Villkor'

will indicate the greater alignment with the reimbursement system incentives. If our hypothesis holds true, private care providers should reduce their VPLI more than public care providers.

Given this setup, our paper is limited to the reform's impact on patient contact. It does not attempt to make inferences on whether the reform had an impact on the quality of care or the efficiency of care. This is an important topic for further research, as indicated in section 6.3.

4.2 Choice of method

Our hypothesis is that private care providers are more sensitive to reimbursement incentive effects. Based on this, we would expect private care providers to have a greater number of patient visits per listed individual when fee-for-service is high. Simple inspection of the data will also reveal that private PCCs on average have a higher degree of patient contact prior to the 2016 reform. However, it is difficult to establish what constitutes a high degree of fee-for-service, and different cost structures mean that this can vary across PCCs. Additionally, a potential interpretation issue exists as private PCCs might be established in areas with different care needs to public PCCs. Some evidence of private care providers considering socio-economic factors when establishing their practice exists⁷². These issues make it difficult to conclude that the difference in patient contact is due to a difference in sensitivity to reimbursement incentives.

To remedy this, we use a difference-in-difference framework to investigate whether private care providers react more strongly to a *change* in the reimbursement system that lowers fee-for-service. In this way we control for factors that can cause the initial level of our dependent variable to differ, although we still have to argue for why these factors should not affect the reaction to the reimbursement change. To employ a difference-in-difference model we divide our dataset into two periods, a pre-reform period before 2016 and a post-reform period after 2016.

If the reform affects private care providers more than public care providers with similar trends, this would indicate that private care providers are more sensitive to the reimbursement incentive effects. In doing this, we would ideally design our paper as an experiment where some healthcare providers were randomly affected by the reform to ensure we do not capture any other effects in

⁷² Anell, Dackehag, & Dietrichson, J., 'Does Risk-Adjusted Payment Influence Primary Care Providers' Decision on Where to Set up Practices?'

our regression. However, as the reform was rolled out in all of Stockholm County in 2016, such a study cannot be conducted. Conducting such a study would be further complicated by possible contaminating effects like patients switching provider when patient contact decreases.

4.3 Data description

This section will present our data and describe how we have matched different data sources. We first describe our main data sources. We then move on to describe the variables extracted from the data and show an overview of how we have matched different datasets. Lastly, we briefly describe additional datasets which we have used to complement our main analysis.

4.3.1 Main datasets

Our data was provided by the Stockholm County database VAL, also called the Stockholm County Patient Care Register. Stockholm County started this collection of patient level data in 1993 to track healthcare provision and evaluate improvements. It contains details on all primary care visits that are financed using the Stockholm County reimbursement system, as well as other data used to determine reimbursement amounts like individuals listed at the PCCs and some demographic data. To avoid having to sign any secrecy agreements, we requested that the data was aggregated at a PCC-level before we accessed it. We have thus not filtered any data at an individual level.

The VAL database is especially useful for two reasons. Firstly, since it contains county invoice data it allows us to access any data that is relevant to the reimbursement models at a PCC level for the entirety of Stockholm County. Secondly, it allows us to easily match data across different databases. Most importantly, it allows us to match visitation data with listing data.

Our main analysis relies on two datasets. One set contains information on visits to PCCs across Stockholm. The other dataset contains information of the number of individuals listed at each PCC. Our initial visitation dataset contained data on all 259 PCCs across Stockholm that had been active sometime during the years 2012-2020. From this data we removed all PCCs that had missing data for any of the years 2012-2020. Additionally, Norrtälje municipality does not follow the same reimbursement model as the rest of Stockholm and as such any PCCs in that area were dropped from our dataset. We then manually changed the name of some PCCs in our dataset. This was

either to ensure that all observations of the same PCC used the same name in our data, or to ensure that the name of the PCC in the visitation dataset matched that of the listing dataset. Any PCC that lacked visitation data for any of our nine years was dropped from the sample. This prevented biasing our regression due to PCCs opening or closing down during the time period, something that will be elaborated on in section 6.2. Next, our visitation dataset was matched with our listing dataset. Finally a single PCC that was present in the visitation data throughout the nine years but only in the listing data for two of the years was dropped. Below is a table summarizing these changes to our dataset.

Table 1: Changes to panel

Change	Explanation	Impact
Initial Dataset	Dataset including visitation statistics for all PCCs in Stockholm County	259
Dropping Norrtälje	All PCCs in Norrtälje were removed from the dataset	-8
Merging similar PCCs	Some PCCs are registered twice due to different spelling and renaming	-14
Dropping PCCs with missing data	PCCs with missing data for any of the years 2012 - 2020 were dropped from the dataset	-49
Dropping PCCs without listings	Excluding a single PCC lacking listing data	-1
<i>Total size of used dataset</i>	<i>The number of PCCs included in final regression</i>	<i>187</i>

4.3.2 Variable description

In addition to merging visitation data with listing data, we were able to separate out visits to general practitioners and nurses. These were added as separate variables to our dataset. Additionally, we categorized PCCs as either private or public. For our extended analysis we also categorized private PCCs into two different categories based on their ownership. Below is a table summarizing the

variables used in our analysis, while a more detailed description of our variables and dropped variables is available in the Appendix 5 and 6.

Table 2: Variable list

Variable	Description
PCC	Name of the PCC
Year	Year of the observation
VPLI GP	Visits to GPs per listed individual
VPLI Nurse A	Visits to nurses per listed individual
VPLI Nurse B	Visits to nurses and auxiliary nurses per listed individual
VPLI A	All visits, per listed individual
VPLI B	All visits to GPs, nurses and auxiliary nurses, per listed individual
Private	A dummy set to 1 if the PCC is privately owned
Concern	A dummy set to 1 if the PCC has a private owner which administers multiple PCCs and is not primarily owned by employees
Post Reform	Reform effect, a dummy set to 1 for years 2016, 2017, 2018 and 2019
DiD. Est	<i>Post Ref. * Private</i> , the additional reform effect for private PCCs
DiD Est. C.	<i>Post Ref. * Concern</i> , the additional reform effect for private concern PCCs
<i>ProviderFE</i>	Provider fixed effects. List of dummy variables for each PCC in our sample.

Note the inclusion of personnel other than GPs, nurses and auxiliary nurses in VPLI A. The difference is composed mostly of psychologists, psychotherapists and curators.

4.3.3 Supplementary data

In addition to our main datasets we use publicly available data to support our analysis. Below is a presentation of our two most important supplementary data sources.

Kolada

Kolada is a publicly available database containing a large variety of county- and municipal level data. We use Kolada to compare primary care visits per inhabitant across Stockholm and similar counties in our discussion. While the data is not as detailed as in our main dataset, it still allows us to compare visitation trends between counties and will be important for our argument that the 2016 reform is the most probably reason for a change in visitation statistics in Stockholm.

CNI data

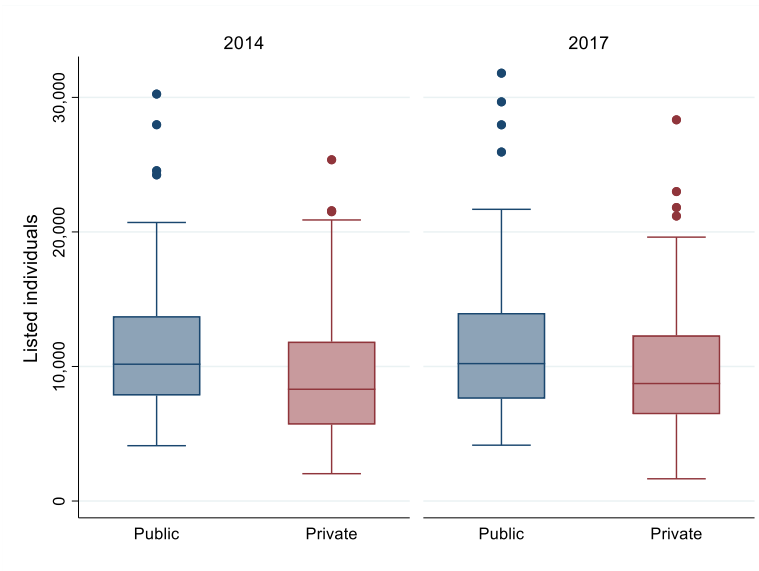
The Care Need Index (CNI) is a measure of socioeconomic factors that affect care need for individuals listed at a particular PCC. This data directly affects the reimbursement each PCC receives and is publicly available online from Stockholm County⁷³. In addition to a PCC's total CNI score, we also have access to the constituent parts such as unemployment and immigration rates. For the CNI score these factors are weighted against their additional care need, as estimated by a survey to Swedish GPs conducted by Statistics Sweden. The CNI data is only publicly available for recent years, so we do not use it as a control variable. However we still use it to illustrate the similarities between public and private PCCs in terms of demographic composition. A list of the constituent parts of the CNI score is provided in Appendix 7.

4.3.4 Descriptive Statistics

Summary statistics can be found in Appendix 8 and 9. Our final sample consists of 67 public PCCs and 120 private PCCs across the years 2012-2020, although only the years 2013-2019 are used for our analysis. Across the nine years public PCCs have on average 11750 listings, in contrast to the average of 9500 listings for private PCCs. The figure below shows the spread of sizes for public and private PCCs for one year before the 2016 reform was announced and one year after it took effect.

⁷³Region Stockholm, Erättning för Häläkarverksamhet [website]. <https://vardgivarguiden.se/avtal/vardavtal/avtal-wardval-lov/lov-wardval-stockholm/huslakarverksamhet/ersattning/>, (accessed 6 September 2018)

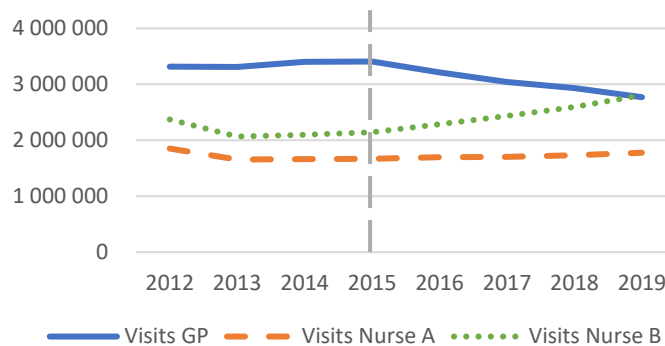
Figure 2: Listing distribution in dataset before and after reform



Note: Author’s rendering (data source: Region Stockholm, VAL, database (retrieved 3 Mar 2021))

Our dataset includes a total of 51,850,930 visits across the nine years and 187 PCCs included in our used dataset. Out of these 49,133,043 visits were handled either by a GP, a nurse or an auxiliary nurse. Figure 3 shows the development of total visits to these categories for the years 2012 to 2019.

Figure 3: Visits to GPs, nurses and auxiliary nurses

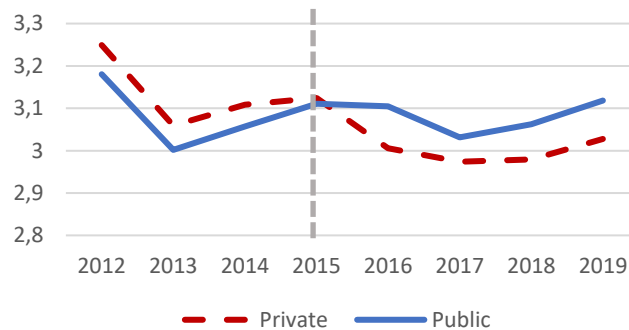


Note: Nurse B includes both nurses and auxiliary nurses. The grey dotted line indicates the time of the reform. Author’s rendering (data source: Region Stockholm, VAL)

The average VPLI was 3.06 for the whole sample. Of these 1.65 were handled by GPs and 1.24 were handled by nurses, including 0.35 handled by auxiliary nurses. The remaining 0.16 were handled by other professions. VPLI was higher for private PCCs in the pre-treatment period, 3.13

as compared to 3.09, but lower in the post-treatment period, 3.01 as compared to 3.02. Figure 4 shows the development in VPLI for the two groups during the period 2012-2019

Figure 4: Development of patient contact between 2012 and 2019



Note: Patient contact measured as VPLI A. The grey dotted line indicates the time of the reform. Author's rendering (data source: Region Stockholm, VAL)

4.4 Parallel trends condition

Our difference-in-difference setup assumes that the trends in the main outcome variables are similar across our treatment and control groups in the years leading up to the policy reform. To examine this identifying assumption, we study the linear trend in the main outcome variables between 2012 and 2015. Whilst the new policy came into effect on 1st of January 2016, it is reasonable to expect the care providers to have been informed on the new conditions during late 2015, which might slightly impact the trend. An inherent strength in our setup is the absence of region specific trends that might impact the comparison between the two target groups, including socioeconomic trends and differences in regulations, as all care centres in our sample are registered within the administrative area governed by SLL. However, the trends might differ due to unobservable factors, such as the intensity of marketing for private practitioners, changes to media coverage and changed social norms and perceptions in relation to private healthcare. It could potentially also be impacted by an unequitable distribution of private PCCs which is elaborated on in our discussion.

To examine the parallel trends assumption, we run an OLS regression on all outcome variables in a setup similar to our main difference-in-difference regression. Outcomes are observed on a yearly basis. We exclude the year 2012 in the same way as we do for the main regression. We also exclude the year 2015 to prevent a spill over effect from the announcement of the policy change. Our time variable is *Year2014*, which is set to 1 for observations from 2014 and 0 for observations from 2013. We include a dummy variable *Private* that takes on the value of 1 if the PCC is privately owned as well as the interaction between *Private* and the time variable *Year2014* and fixed effects dummies, which yields the following regression model:

$$VisitPerListed = \beta_0 + \beta_1 D2014 + \beta_2 Private + \delta_1 Interaction + \gamma_i ProviderFE + \varepsilon$$

Regression A: Parallel lines regression

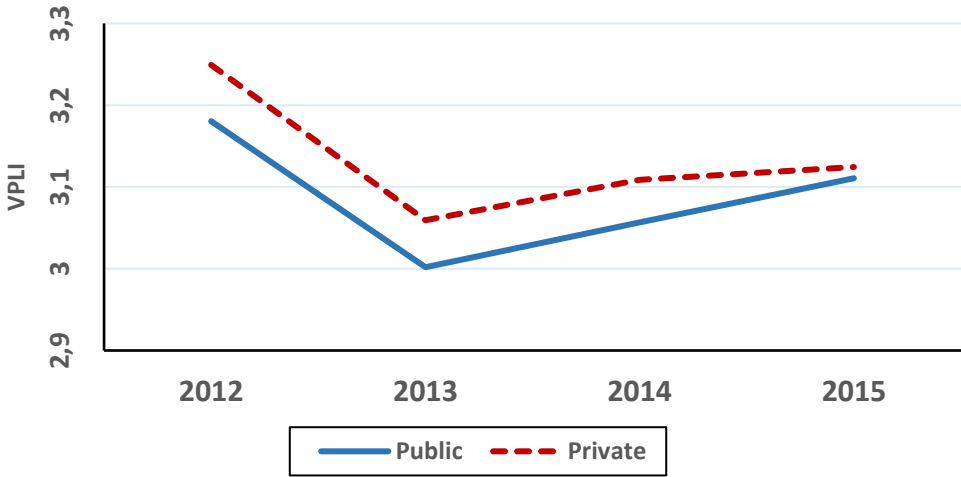
	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Year2014	0.0511 (1.85)	0.0367 (1.33)	0.0195 (1.03)	-0.000274 (-0.02)	0.0173 (0.92)
DiD Est.	0.000601 (0.02)	-0.00371 (-0.11)	-0.0118 (-0.50)	0.0133 (0.68)	0.00812 (0.35)
Private	0.230 (1.43)	0.174 (1.09)	0.219* (1.99)	-0.0250 (-0.27)	-0.0447 (-0.41)
Constant	2.944*** (25.82)	2.849*** (25.11)	1.646*** (21.18)	1.126*** (17.46)	1.203*** (15.55)
<i>N</i>	374	374	374	374	374

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)
 Note that fixed effect dummy variables have been omitted in the table

The interaction between *Private* and the time variable *Year2014* yields no statistically significant results, i.e. we cannot reject the null hypothesis that the difference between the two groups is zero. In Appendix 10 we use the same regression model but include the years 2012 and 2015. This regression also yields no statistically significant interaction effect.

To get a clearer idea of the linear trend in the main outcome variable, total number of visits, we illustrate VPLI trends leading up to 2016. Figure 5 shows the average VPLI A between 2012 – 2015. Appendix 11 shows the linear trend in average VPLI A between 2012-2015.

Figure 5: VPLI development leading up to reform



Note: Author’s rendering (data source: Region Stockholm, VAL)

Interestingly, the trends are similar up until 2015 when private care centres diverge slightly. As the policy change was announced in mid-2015, PCCs could begin adapting their patient contact before the reform came into effect. That this effect would be greater for private PCCs is consistent with our main hypothesis. Other than the 2015 divergence we do not observe any clear difference in trends by looking at our data. We are not able to reject the null hypothesis that the linear trend would be the same between the two groups. In fact leading up to 2015 the trends in VPLI are remarkably similar.

4.5 Econometric specification

In this subsection we specify the econometric models that are used in our analysis. All regressions are performed using STATA/SE 16.0.

4.5.1 Primary analysis

We will use a simple difference-in-difference framework to test whether private PCCs are more sensitive to the incentive effects of the reimbursement system. As a measure of the degree of patient contact, we use our matched visits and listing data to calculate the number of visits per listed individual (VPLI) for each PCC. This will be our main outcome variables. We test for both VPLI A where all visits are included, and VPLI B, that only includes visits handled by GPs, nurses and auxiliary nurses. The difference between the two consists mostly of visits handled by psychologists, psychotherapists and curators. Our regressions will take the form:

$$\begin{aligned} VPLI A &= \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon \\ VPLI B &= \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon \end{aligned}$$

We cluster standard errors at a PCC level. This is the most common form of a difference-in-difference regression. *PostReform* is a dummy indicating whether the observation is from after the reform and is as such set to 1 for years 2016, 2017, 2018 and 2019 and 0 for years 2013, 2014 and 2015. *Private* is a dummy set to 1 for privately managed PCCs and 0 for publicly managed. *DiD Est* is the interaction between *PostReform* and *Private*, and the coefficient δ_1 is interpreted as the combined effect of the year being 2016, 2017, 2018 or 2019 and the PCC being privately owned. This interaction term is the main variable of interest. Its coefficient will be interpreted as the difference between private PCCs' and public PCCs' reaction to the reform. The effect of the reform on public PCCs will thus be $\widehat{\beta}_1$ while the effect on private PCCs will be $\widehat{\beta}_1 + \widehat{\delta}_1$. Lastly, *ProviderFE* is a fixed effect term that will control for the PCCs' initial patient contact level and thereby increase our precision.

In addition to our main outcome variable, we will test the same regression on three more outcome variables:

$$VPLI GP = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI\ Nurse\ A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI\ Nurse\ B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

VPLI Nurse A include nurses, whereas VPLI Nurse B includes both nurses and auxiliary nurses. This will enable us to further analyze how PCCs change their patient contact. More specifically, it will show us whether PCCs reduce visits to GPs or nurses more, or whether they shift visits from one category to the other.

Our time variable, *PostReform*, is simply a dummy indicating whether the observation took place after the reform. As such, any year after the treatment is given the same weight. One drawback of this is that providers probably adapt to the new reimbursement scheme gradually. As we do not exclude 2015, our interaction might become biased if it catches the effect of PCCs adapting their provision during the time between the reform being announced in mid-2015 and implemented on 1 January 2016. However, this is unlikely to introduce a positive bias in our absolute effect size, as it results in some of the reform effects being absorbed by the pre-treatment period. It is likely to bias the reform effect and interaction effect downwards, in absolute terms. Another drawback of grouping the post reform years together is that it introduces more noise into the data, as the difference between any two post-treatment years for the same PCC is simply treated as unexplained variation, when in reality it could partly be due to the reform effect. In choosing what years to include in the post treatment period we must therefore balance our concern for sample size with this effect. Additionally, including years further away from the reform introduces additional risks of contaminating our interpretation of the results as other events can occur that impact primary care provision. For example, we exclude year 2020 from the data in part to avoid contaminating our results with the Covid-19 pandemic⁷⁴.

We exclude the outermost years 2012 and 2020 in our regression. The reason for this is twofold. Firstly it prevents other events from interfering with our interpretation of the results, as previously discussed. Secondly, by excluding any PCCs that do not have observations from 2012 or 2020 from our dataset, but not including these years in our regression, we ensure that no PCC included in our regression was started or closed down in the years 2013-2019. Such PCCs are likely to exhibit extreme values in our main outcome variable, as visits are recorded continuously

⁷⁴ The name Covid-19 references its year of initial discovery, 2019. However, the virus did not come to WHO's attention before 31 December 2019 and was not picked up by Swedish agencies until early 2020 which is why we can safely include 2019 from our data.

throughout our timeframe but listings are only recorded at the end of the year. A PCC opened November 2012 would then have very few visits but could still have many listings. If newly opened PCCs would be more likely to be either private or public, this would also introduce a bias in our estimate.

4.5.2 Extended analysis

For our extended analysis we introduce one more dummy variable, *Concern* which will be set to 1 for PCCs with large private owners, defined as owners that operate multiple PCCs and are not run as cooperatives. In this paper those PCCs are all owned by Capio, Lidetta and Helsa. Praktikertjänst, which is run as a large cooperative, is not included. The policy evaluation by Rhenberg et al⁷⁵ used a similar grouping⁷⁶. We generate a second interaction term $PostReform \times Concern$. This will take on the value 1 if a PCC belongs to a concern and the observation is made during the years 2016, 2017, 2018 and 2019. We begin by running the following regression, only including observations for privately owned PCCs.

$$VPLI A = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

The coefficient δ_2 is interpreted the difference between large private PCCs' and small private PCCs' reaction to the reform. Similar to our main analysis we run the same regression on the secondary outcomes (VPLI GP, VPLI Nurse A and VPLI Nurse B)

Secondly, we run a regression on the full sample, including both privately and publicly owned PCCs. In this regression, we include both interaction terms, $Private \times PostReform$ and $PostReform \times Concern$:

$$VPLI A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

⁷⁵ Dhalgren, Hagman & Rhenberg, 'Uppföljning av Utvecklingen Inom Husläkarverksamheten efter Förändring av Ersättningsmodellen' p. 15.

⁷⁶ The report by Rhenberg et al included Curera and Legevisitten aswell, which have since been aquired by Capio.

We run the regression for both the primary outcome variable and the secondary outcome variables. The extended analysis allows us to discern if large private providers are more likely to alter the number of patient contacts given the reform. We are primarily concerned with the interaction effects, where the two interaction terms have the same interpretation as in previous regressions. With this regression we can determine whether any effect shown in the main analysis is primarily driven by the large private PCCs. A full overview of our regressions is found in Appendix 12.

5. Results

5.1 Primary analysis

To examine the overall effect of the reform we first regress each of our outcome variables on the variable *Post Reform*, set to 1 for the years following the reform (2016, 2017, 2018 and 2019) not controlling for the administration system or an interaction term.

Regression B: Patient contact for all PCCs

	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Post Reform	-0.0559 (-1.83)	-0.101*** (-3.38)	-0.285*** (-17.27)	0.00500 (0.30)	0.184*** (7.74)
Constant	2.972*** (170.57)	2.859*** (166.88)	1.802*** (191.17)	0.975*** (101.56)	1.057*** (77.98)
<i>N</i>	1309	1309	1309	1309	1309

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Note that fixed effect dummy variables have been omitted in the table

The *Post Reform* variable shows negative effects for VPLI A and B supporting our assumption that the reform as a whole has had the intended effect of reducing patient contact. The effect on total VPLI A is not significant, with an effect size of -0.06. However, in the case of visits that were directly targeted by the reform, VPLI B, we observe a statistically significant negative effect of -0.10 suggesting that care centres had approximately one less patient contact per ten listed individuals after the reform. Out of the Nurse variables only VPLI Nurse B is statistically

significant, implying that total visits made to both nurses and auxiliary nurses was approximately 0.18 VPLI higher in the years following the reform. After the reform, PCCs had approximately three less GP visits per ten listed individuals.

The next step is to run the full difference-in-difference regression for the main analysis. The interaction effect between *Post Reform* and *Private* is given by the DiD estimator.

Regression C: Patient contact for public and private PCCs

	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Post Reform	0.0187 (0.49)	-0.0165 (-0.42)	-0.246*** (-13.74)	-0.0340 (-1.48)	0.230*** (6.82)
DiD Est.	-0.116* (-2.04)	-0.132* (-2.34)	-0.0601* (-2.04)	0.0608 (1.89)	-0.0721 (-1.56)
Private	0.217*** (6.69)	0.214*** (6.64)	0.125*** (7.41)	0.0924*** (5.02)	0.0889*** (3.37)
Constant	2.929*** (133.16)	2.811*** (125.72)	1.780*** (173.71)	0.998*** (76.18)	1.030*** (53.52)
<i>N</i>	1309	1309	1309	1309	1309

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)
Note that fixed effect dummy variables have been omitted in the table

We find a statistically significant effect on the DiD estimator at a 95% significance level on the total number of patient contacts per listed individual including all visits (VPLI A), and the targeted groups (VPLI B). The effect sizes show that in the years following the reform, private PCCs had approximately 1.2 less visits for every ten patients if we incorporate all visits, and 1.3 less visits for every ten patients if we only incorporate visits targeted by the reform. The effect on public PCCs becomes insignificant. We also find significant interaction effects at 95% level on VPLI GP, indicating a VPLI GP decrease of 0.06 more for private PCCs. Public PCCs have higher VPLI B

effect size as compared to the overall regression, with a 0.23 increase in VPLI B following the reform. VPLI A remains insignificant for public PCCs.

5.2 Extended analysis

In this analysis we introduce a variable for concern owned private PCCs. The variable of interest is the *DiD Est. C.* variable which is the interaction effect between belonging to a concern and the post-reform years 2016, 2017, 2018 and 2019. Firstly, we run the five outcome variables on a sample consisting of only private PCCs. The results are shown below.

Regression D: Patient contact for private concern and non-concern PCCs

	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Post Reform	-0.0714 (-1.33)	-0.126* (-2.44)	-0.268*** (-8.01)	0.0124 (0.53)	0.142*** (4.29)
DiD Est. C.	-0.0653 (-0.76)	-0.0558 (-0.67)	-0.0952* (-2.18)	0.0359 (0.72)	0.0394 (0.57)
Concern	-0.897*** (-18.33)	-0.944*** (-19.84)	-1.320*** (-52.97)	0.304*** (10.64)	0.377*** (9.47)
Constant	3.523*** (115.14)	3.386*** (114.33)	2.910*** (151.87)	0.550*** (41.36)	0.476*** (25.14)
<i>N</i>	840	840	840	840	840

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Note that fixed effect dummy variables have been omitted in the table

We observe a statistically significant effect on the 95% level of the DiD estimator when running the regression on GP visits per patient. In the years following the reform, VPLI GP for large private actors decreases by approximately 0.1 more contacts for every listed patient. Other effects are not statistically significant. Secondly, we run the regression on the full sample, including both private and public actors. In this regression we include both interaction terms, which are the variables of interest.

Regression E: Patient contact for concern, non-concern and public PCCs

	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Post Reform	0.0187 (0.48)	-0.0165 (-0.42)	-0.246*** (-13.73)	-0.0340 (-1.48)	0.230*** (6.82)
DiD Est.	-0.0900 (-1.37)	-0.110 (-1.69)	-0.0220 (-0.58)	0.0464 (1.42)	-0.0878 (-1.86)
DiD Est. C.	-0.0653 (-0.76)	-0.0558 (-0.67)	-0.0952* (-2.18)	0.0359 (0.72)	0.0394 (0.57)
Private	0.202*** (5.37)	0.201*** (5.42)	0.103*** (4.76)	0.101*** (5.39)	0.0979*** (3.63)
Concern	-0.505*** (-10.33)	-0.570*** (-11.99)	-0.294*** (-11.81)	-0.244*** (-8.56)	-0.276*** (-6.94)
Constant	2.929*** (133.10)	2.811*** (125.66)	1.780*** (173.63)	0.998*** (76.15)	1.030*** (53.50)
<i>N</i>	1309	1309	1309	1309	1309

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Note that fixed effect dummy variables have been omitted in the table

Once we introduce the distinction between large and small privately owned PCCs, the previously significant interaction effect from regression C, between *Private* and *Post Reform* disappears for VPLI A and B. The interaction for VPLI GP is no longer significant for the private providers, and is in fact close to 0. As in Regression D we observe a statistically significant interaction effect of -0.1 for VPLI GP for concern owned private PCCs. On the remaining four variables, total visits and nurse visits, we do not observe a statistically significant effect for the large private providers.

6. Discussion

6.1 Interpretation of results

Regression B illustrates that the 2016 reform had the intended effect of reducing patient contact. VPLI B is larger in effect size when compared to VPLI A, indicating that the decrease in patient contact for GPs, nurses and auxiliary nurses is slightly offset by an increase in visits to other professionals. This is not a very interesting result itself, as the difference is the inclusion of professional groups not affected by the 2016 reform. On the other hand, there has been a more dramatic decrease in visits to GPs. This is to be expected, as compensation was dramatically reduced. VPLI Nurse A is not statistically significant, but there has been a large increase in VPLI Nurse B. This indicates that auxiliary nurses have taken a more prominent role in patient visits.

Our main finding is that private PCCs have reduced their patient visits more when compared to public PCCs. This result holds for VPLI B, indicating that the effect is driven by the affected professional groups, GPs, nurses and auxiliary nurses. In fact, the effect size is higher when other professional groups are dropped from the sample. When adding an interaction term for private PCCs, the effect of the reform on VPLI B is no longer significant. This indicates that the total VPLI effect of the reform is driven by private providers. The effect size for private PCCs amounts to roughly one less visit per ten listed individuals.

However, there is still clearly a shift in patient contact for public PCCs. GP patient contact for public providers has decreased by around two and a half visits per ten listed individuals, while Nurse B visits has increased by almost the same amount. This indicates that while overall patient contact has not decreased significantly for public providers, there has been a shift from GPs handling visits to auxiliary nurses. Private PCCs also offset the decrease in GPs handling visits with an increase in auxiliary nurses, but not to the same extent. GP visits decrease by around three visits per ten individuals, but auxiliary nurses only handle around two visits per ten listed individuals more. This results in the overall decrease of around one less visit per ten listings when excluding other professional groups.

Based on this, we argue that private PCCs are more sensitive to the effects of the reimbursement scheme. More specifically, they appear more willing to change how they accomplish their medical

mission. We propose the following explanation: While public PCCs compensate fully for the reduced role of GPs by taking in auxiliary nurses, private PCCs only compensate partially. This is in line with predictions from the incomplete contracting perspective. Regions Stockholm has more control over the public PCCs, which they also administer, when compared to private PCCs where their control is limited to contracting. Thus, private PCCs internalise social benefit to a lesser extent. This causes them to adhere more strictly to the monetary incentives offered by the reimbursement system. Private providers do still compensate for the reduction in GPs by utilising auxiliary nurses. This could be because of norms and ethics, or because not compensating would imply an unacceptable loss of service.

This is of course not the only explanation for why private and public providers can differ. Other explanations could include less effective administrative control among public providers, or more effective recruitment of auxiliary nurses among public providers. It is beyond the scope of this paper to examine these explanations, but they are interesting avenues for further research.

When extending our analysis to also introducing a concern-administered PCC group, we see similar results. As expected, all effects for public PCCs remain the same in size and significance. While VPLI A and B are insignificant for the private, non-concern group, this does not invalidate the results for the group as a whole from the last regression. However non-concern PCCs reduce their GP visits the same as public PCCs, while concern PCCs reduce their GP visits more.

VPLI GP is also the only outcome with a significant effect for the concern group. From effect sizes it is clear that the private interaction effect is driven by the concern PCCs. Concern PCCs decrease their GP contact by one visit more per ten listings, when compared to non-concern PCCs. This is an expected result. Non-concern PCCs are often owned by the GPs working there⁷⁷. It is unlikely that an employed owner would reduce their own role as much as an outside owner would reduce the role of employed GPs. Curiously private non-concern PCCs exhibit a similar development as public PCCs, so GPs have still dramatically reduced their role in non-concern PCCs, even if it is not as much as for concern PCCs. One explanation could be that the capitation reimbursement has

⁷⁷ Swedish Competition Authority, 'Etablering och Konkurrens bland Vårdcentraler – om Kvalitetsdriven Konkurrens och Ekonomiska Villkor', p.37

reduced reliance on patient contact for income, causing both public and non-concern PCCs to adopt lesser workloads for GPs without a reduction in employees.

6.2 Potential issues

6.2.1 Entry of online PCCs

The Swedish government has set up a vision to become world-leading in digital health provision by 2025 and has seen an increase in the utilization of digital health services in the past years. Through mobile and web applications individuals can quickly schedule appointments with GPs. According to the Swedish Association of Local Authorities and Regions (2021), digital visits accounted for 4.6 percent of total visits made in primary care in 2018⁷⁸.

As online care providers were not active in 2012, no online providers are included in our sample. Total visits are not expected to be greatly dispersed by the entrance of private providers as these were still a relatively small part of the market in 2018. Most importantly, there are no clear reasons as to why competition from online providers would have an adverse effect on one of our two target groups but not the other.

6.2.2 Excluded PCCs

The 2016 reform was rolled out simultaneously throughout Stockholm. However, seven PCCs did not take part of the reform. Four of these PCCs took part in a project called “Kroninnovation” that introduced a different reform. An additional three remained in the old reimbursement system.

We believe that the four PCCs that took part of the Kroninnovation project are unlikely to meaningfully bias our sample. Although Kroninnovation introduced a different reimbursement system, this new reimbursement system contained a similar capitation to fee-for-service mix as the 2016 reform⁷⁹. Additionally, although we were not able to identify the four PCCs that took part in the project we know from correspondence with Region Stockholm that they were composed of

⁷⁸ Lindgren, *Ersättningen och E-Hälsan*

⁷⁹ Hälso- och Sjukvårdsnämnden, 'Inriktingsbeslut och Ersättningsmodell för Vårdval Husläkarverksamhet med Basal Hemsjukvård', *Stockholms Läns Landsting*, Stockholm, 2020, <https://www.sll.se/globalassets/5.-politik/politiska-organ/halso-och-sjukvardsnamnden/2020/200924/9-inriktningsbeslut-om-ersattningsmodell-for-varldval-huslakarverksamhet-med-basal-hemsjukvard.pdf>

three private PCCs and one public PCC. This implies that the project was somewhat balanced across our sample, and as such it is not likely to bias our estimates in any specific direction.

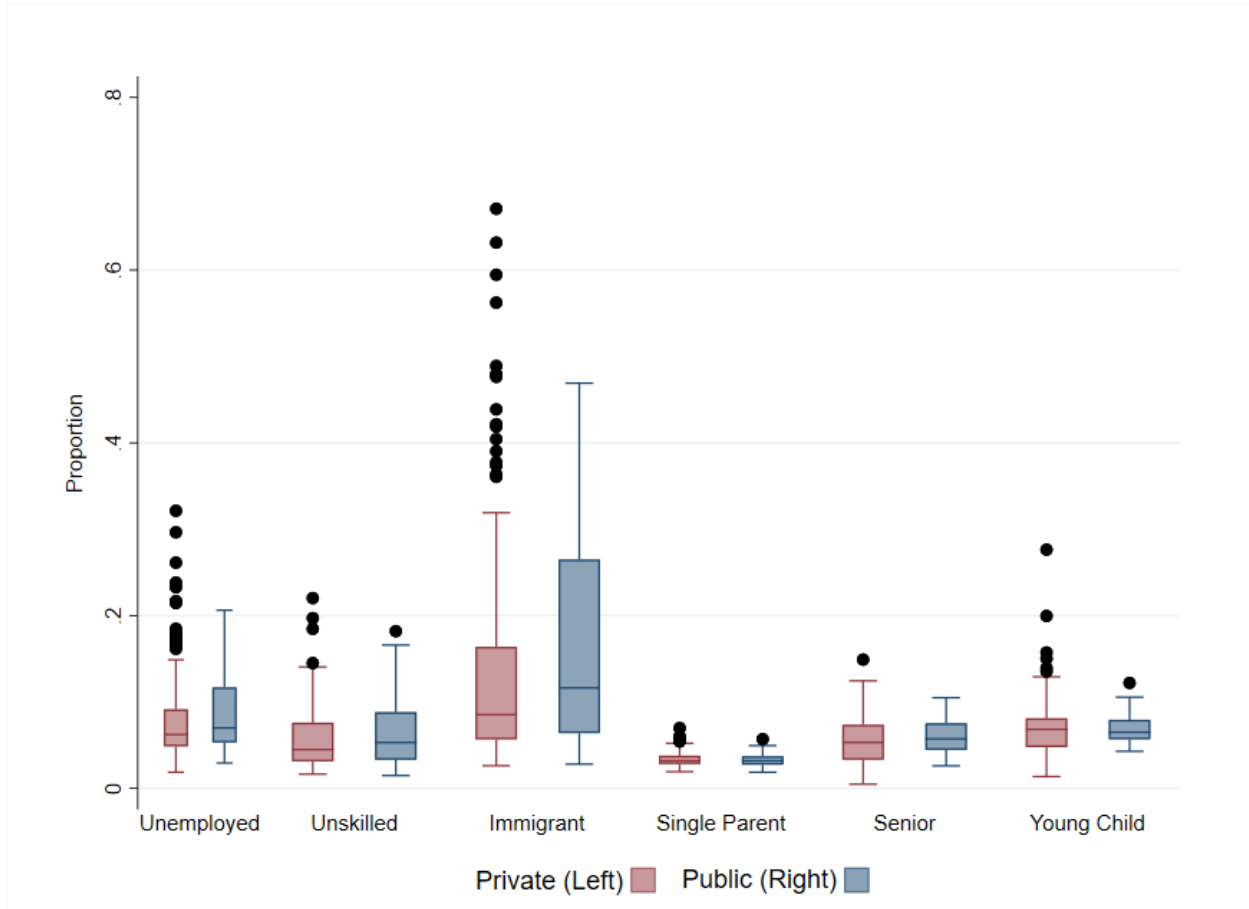
We have not been able to identify the three PCCs that did not take part of the reimbursement reform. Their number is low relative to the sample as a whole, but if the three PCCs were public this would imply that the difference-in-difference estimators are biased upwards in absolute terms. We argue that it is more likely that the three PCCs are private, as the region is more likely to exercise a greater influence over its own PCCs. This would mean that our difference-in-difference estimator is biased downwards in absolute terms. These PCCs do introduce uncertainty in our estimates, but we think that their number relative to the sample means that they do not invalidate our results.

6.2.3 Socioeconomic placement of PCCs

Our interpretation relies on private governance being the only separator of the treatment and control group. An unequitable distribution of PCCs and different patient characteristics impact the interpretation of our results, as developments could be linked to socioeconomic differences rather than ownership. For example, if private healthcare centres were located in areas with demographic characteristics that reduced care need, it would allow private PCCs to reduce patient contact without serious risk to the patient.

We argue that the socioeconomic placement of PCCs is unlikely to be the source of any difference between private and public providers in our regression. The Care Need Index, CNI, is an indicator of socioeconomic factors often used in Swedish demographic research. It is also used by Stockholm County to adjust reimbursement based on the care needs of patients at the PCC. By dividing the CNI score for the PCC by the CNI for Stockholm as a whole, a relative CNI is calculated. The relative CNI is then used by Stockholm County to modify how much compensation is received by the PCC. Furthermore, CNI can be split into factors such as unemployment and secondary education schooling. By comparing these factors separately we argue that private and public PCCs have similar demographic composition. A more extensive description of factors is available in Appendix 7. Factor distribution is illustrated in Figure 6.

Figure 6: Socioeconomic factors across private and public PCCs (2020)



Note: Author's rendering (data source: Region Stockholm, 'Erättning för Hälso- och sjukvård' [website], <https://vardgivarguiden.se/avtal/vardavtal/avtal-varldval-lov/lov-varldval-stockholm/huslakarverksamhet/ersattning/> (accessed 7 March 2021))

For all boxplots the median of either group is contained within the 25th and 75th quartiles of the other groups. This illustrates that private and public PCCs are similar before aggregating socioeconomic factors into the Care Need Index and that any the socioeconomic placement of private PCCs is unlikely to affect our interpretation of the main results.

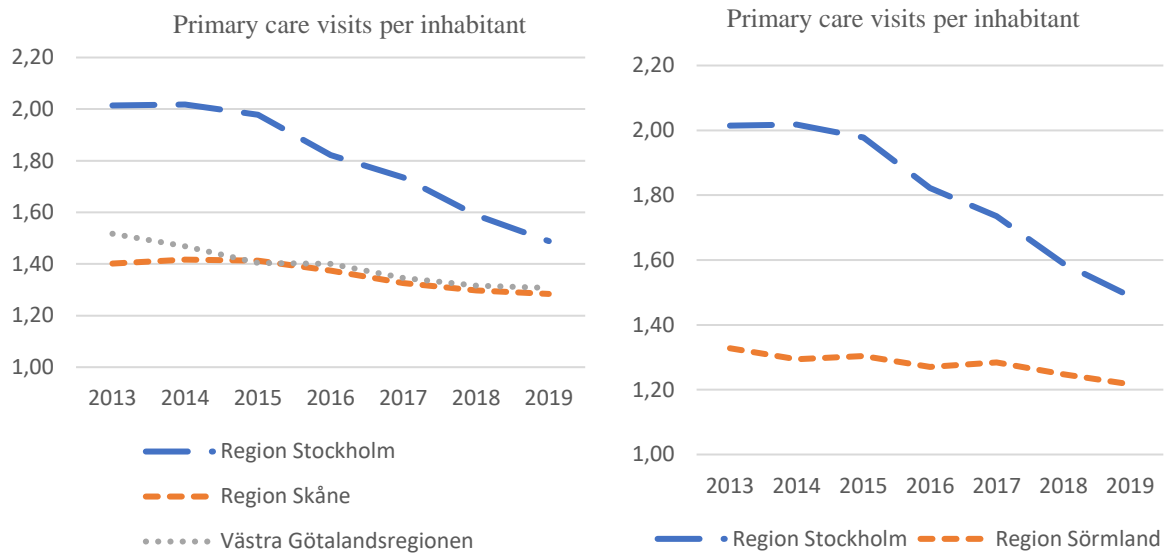
6.2.4 Isolating the reform effect

To determine that any potential difference between private and public developments is a response to the 2016 reform, we need to rule out any other event that could cause a drop in patient contact.

As the 2016 reform was only rolled out in Stockholm and did not directly affect other regions, we should not see the significant reduction in patient visits after 2016 outside of Stockholm.

Stockholm is commonly compared to two similar counties with large metropolitan areas, Region Skåne and Västra Götalandsregionen. Figure 7 and 8 illustrate the development of patient contact in Stockholm when compared to these regions, as well as compared to region Sörmland that also has a reimbursement system with a high degree of fee-for-service.

Figure 7: Visitation development across large regions and low capitation regions



Note: Only including visits handled by physicians, including visits outside of general practice. Author's rendering (data source: Kolada, 'Nyckeltal: Läkarbesök Primärvård, Antal/1000 Inv', [website], www.kolada.se/verktyg/fri-sokning/ (accessed 01 May 2021))

These graphs show a noticeable downward shift in patient contact in Stockholm starting around 2016, not present in the other regions. Based on this any change in patient contact in Stockholm following 2016 is likely to be a response to the reform. A small general decline across all regions is likely to be a result of a combination of the entry of online providers and cost reducing efforts in other regions. The effect of online providers was discussed more extensively in section 6.2.1, where we argued that they are not likely to affect our results.

6.3 Further studies

Our paper illustrates that the reaction to reimbursement changes vary depending on the ownership of the primary care centre, and that this has resulted in a decrease in GPs handling patient contact. An interesting question that arises is what effect incentive schemes have on the economic outcomes of care providers. Our regressions show that the visits to doctors decrease both among private and public care providers, but not necessarily whether care providers decrease their personnel cost. It also does not examine healthcare outcomes that result from nurses taking on more patient contact. Such further research can be important to provide a more comprehensive evaluation of capitation biased reimbursement systems.

Another interesting topic for future research is the equity impact of 2016 policy implemented in Stockholm. Such a study could draw upon previous research⁸⁰, which has uncovered that the introduction of patient choice in Stockholm led the number of visits to increase more in socioeconomically wealthy areas. A possible challenge with this setup could be data access, as legal demands for using patient-level data, which could be required, are high. Access to patient level data would allow for more detailed observations with regards to which patients were affected by the reform, which in turn could have important policy implications.

Whilst the results derived in this paper indicate that ownership type may impact the way in which PCCs responded to the 2016 reform with regards to patient contact, it makes no attempt to evaluate outcome measures that have been broadly scrutinized in the ownership literature, such as quality indicators and efficiency. Understanding the impact of the reimbursement scheme on such outcomes for public compared to private providers could add much value for policymakers.

While more research is needed to understand the incentive effects tied to reimbursement schemes in Swedish healthcare, and how those effects might differ between ownership types, this paper has shown that the 2016 reform in Stockholm provides a useful case study to better understand reimbursement incentive effects.

⁸⁰ Agerholm, et al. 'Equity Impact of a Choice Reform and Change in Reimbursement System in Primary Care in Stockholm County Council'

7. Conclusion

This paper makes three important contributions to the existing literature. Firstly, it illustrates how privately owned healthcare providers may respond differently to reimbursement incentive effects as opposed to publicly owned providers. Secondly, it provides a case study of the incentive effects of fee-for-service and capitation reimbursement which has been the subject of much theoretical research in the past. By quantifying the sensitivity of public and private actors this paper can help inform future decisionmakers who architect reimbursement schemes in Swedish primary care. Lastly, it sheds light on the heterogeneity between concern-managed primary care centres, and employee-owned primary care centres. Thus it highlights the need for a nuanced analysis of private provision of public goods among policymakers and researchers.

This study provides evidence that private primary care providers are more sensitive to reimbursement incentive effects. More specifically, they are more likely to decrease patient contact when fee-for-service reimbursement is lowered, while public providers are more likely to shift responsibilities to maintain the same level of patient contact. This raises the interesting question of what effect incentive schemes have on the economic outcomes of care providers. There can also be equity outcomes depending on where private healthcare providers are established. Further research into such topics can be important to provide a more comprehensive evaluation of capitation-based reimbursement systems.

Previous research has found that private care providers reach different outcomes compared to public care providers and with this paper we provide further evidence for that, while also differentiating between large, multi-site providers and smaller single-site and cooperative providers. Policymakers should thus consider how care is provided in their respective regions when designing healthcare systems. Specifically, they should consider the response of private providers as they balance economic factors such as reimbursement amounts and incentives such as fee-for-service and capitation. While healthcare economics is a complicated area to research due to the complexity of regulation and quasi-markets, our paper shows that such research can uncover policy relevant effects.

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9. Appendix

Appendix 1: Glossary

PCC: Primary Care Centres (Swedish: Vårdcentral)

VPLI: Visits Per Listed Individual

SLL: Stockholms Läns Landsting (also Stockholm County or Region Stockholm)⁸¹

FFS: Fee-For-Service, payment based on productivity

Capitation: Payment based on population, in this case listings

County: administrative body which handles different aspects of the welfare system including primary health care

Region: used interchangeably with county

Primary Care: basic forms of healthcare which do not require hospital treatment, including but not limited to general practice

GP: General practitioner, in this essay we will refer to any physician working in general practice as a GP

Incomplete Contracting Theory: Property rights theory that emphasizes renegotiation and the inability of contracts to cover any contingency to discuss private ownership

Listings: Patients registered at a particular PCCs

⁸¹ In 2019 SLL changed name to *Region Stockholm*

Appendix 2: Fraction of private primary care providers by region, 2018

Region Örebro	10 - 19 %
Region Norrbotten	10 - 19 %
Region Västerbotten	10 - 19%
Region Jämtland	10 - 19%
Region Dalarna	10 - 19 %
Region Värmland	20 - 29 %
Region Östergötland	20 - 29 %
Region Kalmar	20 - 29 %
Region Blekinge	30 - 39 %
Region Kronoberg	30 - 39 %
Region Gävleborg	30 - 39 %
Region Västernorrland	30 - 39 %
Region Sörmland	30 - 39 %
Region Jönköping	30 - 39%
Region Gotland	30 - 39%
Region Skåne	40 - 49 %
Region Uppsala	40 - 49 %
Västra Götalandsregionen	40 - 49 %
Region Västmanland	50 - 59%
Region Halland	50 - 59 %
Region Stockholm	60 - 69%

Authors' own elaboration (Source: Swedish Association of Local Authorities and Regions. Köp av Verksamhet. _Stockholm, _2019. <https://skr.se/tjanster/merfranskr/rapporterochskrifter/publikationer/kopavverksamhet2019.31141.html>, p. 69)

Appendix 3: Changes to visitation reimbursement by profession

REIMBURSEMENT PER VISIT (Swedish Kr)						
PCC visit				Home visit		
Year	Doctor	Nurse	Auxiliary Nurse	Doctor	Nurse	Auxiliary Nurse
2008	600	200	100	1100	250	150
2009	460	200	100	960	250	150
2010	479	200	100	979	250	150
2011	479	200	100	979	250	150
2012	495	207	103	1012	259	155
2013	484	210	105	994	260	155
2014	484	210	105	994	260	155
2015	484	210	105	994	260	155
2016	250	200	100	750	300	200

Reimbursement per visit 2008 – 2016. Data on fee-for-service reimbursement comes from SLL (Förfrågningsunderlag 2008 - 2016) Source: Region Stockholm, Erättning för Hälso- och sjukvård [website], [https://vardgivarguiden.se/avtal/vardavtal/avtal-wardval-lov/lov-wardval-stockholm/huslakarverksamhet/ersattning/](https://vardgivarguiden.se/avtal/vardavtal/avtal-vardval-lov/lov-wardval-stockholm/huslakarverksamhet/ersattning/), (accessed 7 March 2021)

Appendix 4: Adapted incomplete contracting model

Agents are assumed to be rational and risk neutral. Drawing from Hart et al's framework, we envision a situation in which the government G signs a long-term contract with a manager M . The manager manages all non-human assets used to provide the service. Hart, Shliefer and Vishny⁸² denote these assets F for facility. These might be either public or private. If F is public, M is a government employee. We will turn to the case in which F is private and owned by the manager M . Hence the service is provided by a private owner (M). The contract formed between the two parties is incomplete, which leaves room for M to engage in two types of behaviors:

- i) Cost reducing efforts at a cost e , borne by M
- ii) Quality enhancing efforts at a cost i , borne by M

⁸² Hart, Shliefer, & Vishny, 'The Proper Scope of Government: Theory and an Application to Prisons'

Once M engages in one of these *innovations* (cost reduction or quality improvement) he or she modifies the good or the service provided within the boundaries of the contract. When a contract is incomplete, i and e are observable to G but not verifiable to an external enforcer. Once the parties learn about the nature of potential cost reductions or quality improvements, they might renegotiate the contract.

The framework introduces the following variables:

B - Benefit to Society yielded from M's effort

C - Cost to M yielded from M's effort

B_0 - Benefit to society of providing good or service without modification

C_0 - Cost to M of providing good or service without modification

$c(e)$ - Reduction in cost corresponding to M's cost-reducing effort

$b(e)$ - Reduction in benefits corresponding to M's cost-reducing effort

$\beta(i)$ - Increase in benefit B corresponding to M's quality-enhancing effort

We can write:

$$B = B_0 - b(e) + \beta(i)$$

$$C = C_0 - c(e)$$

In a benchmark first-best case we assume *complete* contracting, which implies that both i and e are contractable. In this case, M will choose i and e to maximize:

$$\max_{e,i} \{-b(e) + c(e) + \beta(i) - e - i\} \quad (A)$$

M's choice of e and i (e^* and i^*) represent the socially optimal outcomes. Secondly, we consider the case of incomplete contracting. Hart, Shleifer and Vishny make the simplifying assumption of Nash bargaining, meaning that parties split the surplus 50/50 when the contract is renegotiated and date 1. Consequently, M receives 50% of the surplus yielded from the quality improving effort $\beta(i)$. In case, M chooses i and e to maximize:

$$\max_{e,i} \{0.5\beta(i) + c(e) - e - i\} \quad (B)$$

Comparing equations (A) and (B), we see that M fully internalizes the benefits from the cost-reducing effort, but only partially the benefits connected to quality improvement. Furthermore, M ignores the damage done to B by engaging in cost reduction, denoted $b(e)$ in the above example.

M will therefore, in the case of incomplete contracting, choose values for e and i different from the socially optimal first-best outcome.

Appendix 5: Long list of variables

Variable	Description
PCC	Name of the PCC
Year	Year of the observation
Listings	Number of individuals listed at the PCC, observed on December 31st of each year
Visit to GPs	Number of visits that were handled by a GP in a given year
Visits to Nurse A	Number of visits that were handled by a nurse in a given year
Visits to Nurse B	Number of visits that were handled by a nurse or auxiliary nurse in a given year
Visits A	Number of visits made to the PCC in a given year
Visits B	Number of visits made to GPs, nurses and auxiliary nurses at the PCC in a given year
VPLI GP	<i>Visits to GPs / Listings</i>
VPLI Nurse A	<i>Visits to Nurse A / Listings</i>
VPLI Nurse B	<i>Visits to Nurse B / Listings</i>
VPLI A	<i>Visits A / Listings</i>
VPLI B	<i>Visits B / Listings</i>
Private	A dummy set to 1 if the PCC is privately owned
Concern	A dummy set to 1 if the PCC has a private owner which administers multiple PCCs and is not primarily owned by employees
Ref. Effect	A dummy set to 1 for years 2016, 2017, 2018 and 2019
DiD. Est	<i>Ref. Effect * Private</i> , the additional reform effect for private PCCs
DiD Est .C.	<i>Ref. Effect * Concern</i> , the additional reform effect for private concern PCCs

Appendix 6: Dropped variables

Variable	Description
Area	Geographic area where the PCC was based
Age (visits)	Age of patient
Contact type	General Practice, Basic homecare of type General Practice, Psychosocial work associated with General Practice
Profession	The profession of the medical personnel
HEJ	Specifies if visit is registered in HEJ database, and if it is covered by reimbursement, our dataset only contains visits covered by reimbursement (E is dropped)
Age (listing)	Age of listed individual

Appendix 7: CNI factors

A list of the constituent parts of the CNI score is provided below:

Number of listed individuals who have no partner and are aged above 65

Number of listed individuals born outside of Europe and North America

Number of listed individuals who were unemployed aged 16-64

Number of listed individuals who have no partner and are parents to children aged below 18

Number of listed individuals who moved into the area and are older than one

Number of listed individuals with no secondary education aged 25-64

Number of listed individuals aged younger than five

Appendix 8: Summary statistics including all observations 2013-2019

SUMMARY STATISTICS					
Variable	Obs	Mean	Std.Dev	Min	Max
Listings	1,309	10370.83	5174.615	1410	31801
All Visits	1,309	30947.35	15344.6	2512	114526
GP Visits	1,309	16866.36	8010.208	2512	114526
Nurse AVisits	1,309	9090.788	5454.037	225	43843
Nurse BVisits	1,309	12553.06	7637.583	225	52906
VPLI B	1,309	2.904986	0.624407	1.353188	6.211206
VPLI A	1,309	3.050694	0.629447	1.353188	6.300135
VPLI GP	1,309	1.691638	0.369349	0.620416	3.797348
VPLI Nurse A	1,309	0.882796	0.335666	0.083685	2.265363
VPLI Nurse B	1,309	1.213348	0.502173	0.089465	4.301637

Appendix 9: Summary statistics including all observations 2012-2020

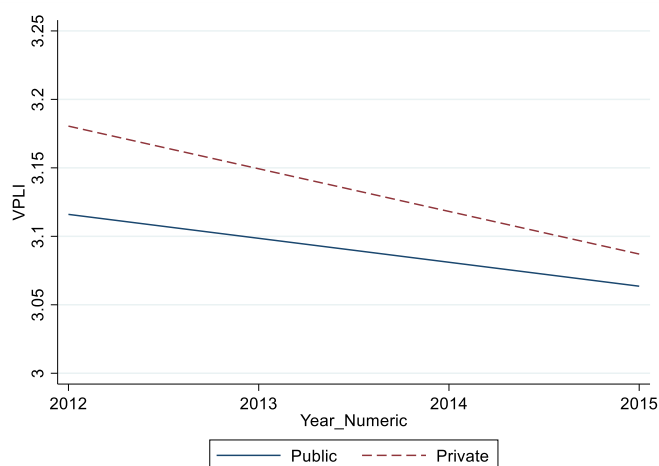
SUMMARY STATISTICS					
Variable	Obs	Mean	Std.Dev	Min	Max
Listings	1,683	10335.02	5200.281	536	31801
All Visits	1,683	30808,63	15636.2	559	115950
GP Visits	1,683	16389.44	8075.932	499	61814
Nurse AVisits	1,683	9095.119	5596.153	60	43843
Nurse BVisits	1,683	12804.29	7,901,879	60	52906
VPLI B	1,683	2.893748	0.661685	0.911042	6.211206
VPLI A	1,683	3.058181	0.899958	0.964344	21.63249
VPLI GP	1,683	1.654772	0.415009	0.620416	3.925215
VPLI Nurse A	1,683	0.884202	0.354554	0.080619	2.86449
VPLI Nurse B	1,683	1.238976	0.526622	0.080619	4.301637

Appendix 10: Pre-reform regression for years 2012-2015

	(1)	(2)	(3)	(4)	(5)
	VPLI A	VPLI B	VPLI GP	VPLI Nurse A	VPLI Nurse B
Year2014	-0.0121 (-0.35)	-0.0376 (-1.12)	0.00787 (0.41)	-0.0453* (-2.29)	-0.0455 (-1.88)
DiD Est.	-0.0226 (-0.53)	-0.0320 (-0.76)	-0.0341 (-1.43)	0.00682 (0.28)	0.00203 (0.07)
Private	0.225 (1.13)	0.186 (0.95)	0.213 (1.92)	-0.0123 (-0.11)	-0.0268 (-0.19)
Constant	2.993*** (21.30)	2.891*** (20.82)	1.673*** (21.28)	1.094*** (13.44)	1.219*** (12.18)
<i>N</i>	748	748	748	748	748

t statistics in parentheses (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Appendix 11: Linear trend of VPLI for primary care providers 2012 - 2015



Appendix 12: Full set of regressions

Primary analysis – reform effect

$$VPLI A = \beta_0 + \beta_1 PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI GP = \beta_0 + \beta_1 PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse A = \beta_0 + \beta_1 PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse B = \beta_0 + \beta_1 PostReform + \gamma_i ProviderFE + \varepsilon$$

Primary analysis – reform effect with DiD-estimator

$$VPLI A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI GP = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \delta_1 Private \times PostReform + \gamma_i ProviderFE + \varepsilon$$

Extended analysis – concern reform effect with private sample

$$VPLI A = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_1 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_1 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI GP = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_1 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse A = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_1 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse B = \beta_0 + \beta_1 PostReform + \beta_2 Concern + \delta_1 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

Extended analysis – concern reform effect with full sample

$$VPLI A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI GP = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse A = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$

$$VPLI Nurse B = \beta_0 + \beta_1 PostReform + \beta_2 Private + \beta_3 Concern + \delta_1 Private \times PostReform + \delta_2 PostReform \times Concern + \gamma_i ProviderFE + \varepsilon$$