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When Private Equity goes Public

The Impact of Private Equity Ownership on Nursing Homes Across Varying Levels of Market Competition

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Abstract

This study explores the impact of private equity (PE) ownership on portfolio companies in the nursing home industry. Utilising a comprehensive dataset of 17 buyouts and 205 matched firms between 2014 and 2018, this study employs a Difference-in-Differences (DiD) analysis to investigate the impact of PE ownership of nursing homes regarding investments in the facilities, profitability, service offering, and staffing efficiency. Furthermore, these findings are analysed in different nursing home markets with varying levels of market competition by using a Triple Difference (DDD) analysis. The findings reveal that PE firms increase revenues of buyout nursing homes by 34.9%. Moreover, Operating Expenses (OPEX) increase between 60.3% and 76.8% in private markets whilst declining up to 44.0% in public markets. In private markets, this allows for a relative decrease in Personnel Expenses (PEX), as PEX over OPEX decrease by 41.4 percentage points. Furthermore, this study finds that prices per customer increase by 24.0% in private markets. In contrast, in public markets, PE-owned nursing homes decrease prices per customer by up to 43.4%. The implications of these findings are significant for policymakers, providing new insights into the impact of PE ownership on nursing homes homes in an environment of increasing grey pressure.

Keywords: Private Equity, Nursing homes, Public sector, Competition, Efficiency, Grey pressure

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Note: The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

List of used abbreviations

CAPEX	Capital Expenditure
CAPM	Capital Asset Pricing Model
COGS	Cost of Goods Sold
CNA	Certified Nurse Assistant
DCF	Discounted Cash Flow
DDD	Triple Difference
DiD	Difference-in-Differences
EBIT(DA)	Earnings before Interest, Tax (Depreciation and Amortisation)
EV	Enterprise Value
FTE	Full-Time Equivalent
G&A	General & Administrative Costs
GDP	Gross Domestic Product
GEE	Generalised Estimated Equations
GP	General Partner
ICT	Information and Communications Technology
IPO	Initial Public Offering
IRR	Internal Rate of Return
IV	Instrumental Variable
LBO	Leveraged Buyout
LP	Limited Partner
LPN	Licensed Practical Nurse
Mat. Cost	Material Costs
MOIC	Multiple On Invested Capital
M&A	Mergers and Acquisitions
NAICS	North American Industry Classification System
NPV	Net Present Value
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
OPEX	Operating Expenses
OVB	Omitted Variable Bias
PE	Private Equity
PEX	Personnel Expenses
PIPE	Private Investments in Public Equity
P&L	Profit and Loss Statement
REV	Revenue
RN	Registered Nurse
R&D	Research and Development Expenditure
SBO	Secondary Buyout
TFA	Total Fixed Assets
UK	United Kingdom
US	United States
VC	Venture Capital

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1 Introduction

> *"Ageing populations (...) and the increasing reliance on the private sector to help societies pay for ballooning healthcare costs continue to make healthcare a prised sector (...) for PE players to create value."*
>
> – McKinsey & Company, European healthcare: a golden opportunity for private equity

1.1 Setting of social problem

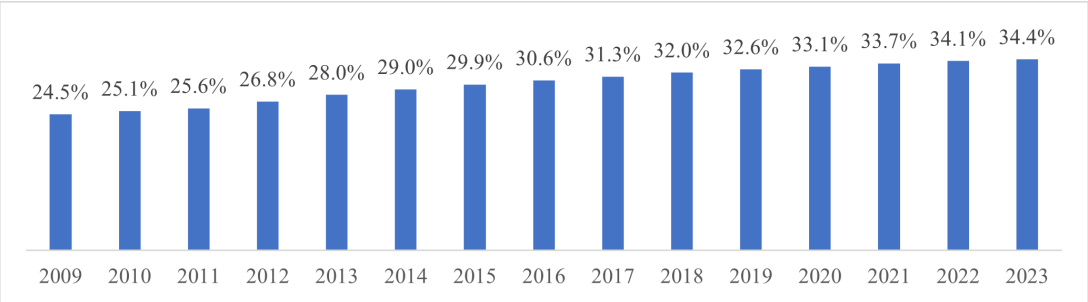
As the world ages, pressure on nursing homes and their staff increases significantly. Whilst fertility rates decline, the percentage of people over 65 will increase further. In 1960, this number was 9.2%; however, by 2021 this figure has doubled to 18.3% (OECD, 2023). In countries such as Portugal and Spain, this ratio is expected to reach more than one-third of the total population by 2050 (OECD, 2023). This will have a significant impact on healthcare systems. The workforce within the nursing home sector, particularly, is set to become a significant bottleneck, potentially undermining the efficacy of long-term healthcare. For instance, in the Netherlands, there were 11 nurses per 100 people aged over 65 in 2011, but this number dropped to eight in 2019 (OECD, 2021). The situation concerning the long-term healthcare workforce is even more problematic in other OECD countries, such as Poland and Greece, where, as of 2019, there was only one nurse for every 100 people aged over 65. If the demand for nursing services drives the costs of nursing homes beyond what government funding can cover for basic care, it could lead to significant issues. Specifically, if citizens lack sufficient personal savings for future nursing home expenses, this could have profound and detrimental consequences.

As the nursing home industry is characterised by high staffing turnover and low investment in productivity improvements, change is required to avert a coming crisis in this sector. A recent trend within the classic publicly-owned nursing home market is increased investment by private equity (PE) firms. Often traditionally public sectors, such as the nursing home sector, are privatised to achieve specific economic objectives, for instance, modernisation, cost saving or the need for investment (Cruz and Sarmento, 2017; Massey and Shidlo, 2010). Companies in public sectors possess attributes that PE firms value. For instance, these industries are associated with reliable revenue figures because public utilities are unlikely to be cut back during times of recession (Hall, 2006). Consequently, PE ownership of nursing home markets increases (Bos et al., 2020; Patwardhan et al., 2022). The impact of PE ownership on nursing homes will be evaluated in this study.

The nursing home sector is of particular interest within the public domain due to increasing grey pressure. Grey pressure refers to the ratio of people aged 65 and people aged 20 to 65. This ratio has grown significantly in the Netherlands from 24.5% in 2009 to 34.4% in 2023 (CBS, 2023). The increasing

grey pressure provides an environment in which revenue growth can be easily realised in a growing market. If there should be a supply shortage in the future, this will coincide with increased pricing possibilities, as for-profit nursing homes can increase prices. With limited capacity, consumers may be forced to choose a privatised nursing home, which generally charges higher prices for the services they offer (Rabobank, 2024). Therefore, this study will test the pricing of PE-owned nursing homes. Increased prices may signify service differentiation towards a higher segment of service.

Figure 1: Grey pressure in the Netherlands



Source: Statista (2023b)

In the United Kingdom (UK), the nursing home market, among others, has witnessed a substantial influx of private equity investment attributed to heightened privatisation initiatives. This was seen as a way of modernising the public sector, which extended even to the defence industry (Massey and Shidlo, 2010). An important benefit of PE investment can be an increased flow of investment, which contributes to modernisation. Therefore, this study will evaluate the investments made by PE firms in acquired nursing homes. Analysis of the impact of the nursing home sector's privatisation provides crucial insights for assessing the potential impact of increased private equity investment in countries like the Netherlands, where PE investment is currently low.

This study examines the impact of private equity ownership on nursing home sectors with varying degrees of privatisation to determine whether private equity ownership has different effects depending on the level of privatisation. This impact encompasses investment into nursing home facilities, revenue and profitability improvement, price changes and staffing. As this study focuses on the impact of PE ownership on the level of portfolio companies, returns generated by PE firms towards their investors are outside the scope of this research. PE investments in the Dutch healthcare sector have consistently increased, particularly in recent years (Deloitte, 2023). If these investments prove to be harmful to the Dutch healthcare sector, a suitable response from policymakers is necessary as the Dutch nursing home market is currently privatising at a fast pace (Bos et al., 2020). This research will evaluate the impact of PE ownership on the nursing home sector across various markets, with a focus on the increasing pressure on staffing in this sector. Given the ambiguous findings of previous research regarding the

impact of PE ownership on nursing home quality and the challenges in objectively measuring quality, this study concentrates on aspects of PE ownership that can be quantifiably assessed. The research question that will be answered in this paper is as follows:

What is the impact of PE ownership on nursing homes in terms of investment, financial performance, price point and staffing, and how does the impact of PE ownership on nursing homes differ across different levels of privatisation?

1.2 Relevance

1.2.1 Scientific relevance

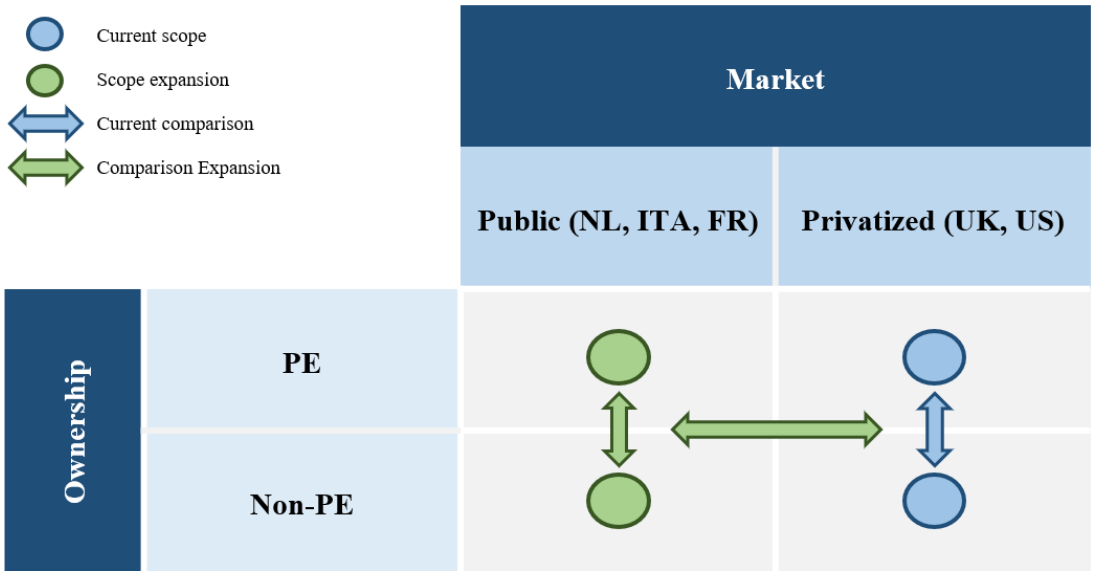
In the academic discourse, the topic of value creation by PE companies is subject to much discussion. This study provides an overview of the current thinking on the value that PE ownership may offer in the public sector. Furthermore, this study expands on the current literature on PE ownership of nursing homes by considering public nursing home markets. As earlier works focused more on financial performance, in the past years, more attention has been paid to PE ownership's impact in a broader sense (Wright et al., 2009b; Popov and Roosenboom, 2009). The impact of PE investments in the public sector is a popular subject since, in this setting, the government often controls the market to ensure the quality of the service or product involved.

However, market failures caused by government intervention have been criticised since the previous century (Pack, 1987). It raises the question of why certain markets continue to experience these market failures, such as the Dutch Long-Term Care Act, which is aimed at barring for-profit enterprises from entering the long-term healthcare industry. This legislation mandates that long-term care companies operate without a profit motive, thereby forbidding the distribution of profits. Should there be considerable advantages associated with PE ownership, this situation could represent a costly market failure. The impact of PE ownership on healthcare is a relatively new area of research. The first study on this topic was conducted in 2008 and found little correlation between PE ownership and changes in quality (Stevenson and Grabowski, 2008). Over the following years, many contradicting pieces on the impact of PE investment on nursing home quality were published (Bos and Harrington, 2017; Grabowski et al., 2016; Harrington et al., 2012; Pradhan et al., 2014). In the academic discussion, staffing of nursing homes has often been viewed as a proxy for quality (Bos and Harrington, 2017; Pradhan et al., 2014; Stevenson and Grabowski, 2008).However, as more initiatives are undertaken to alleviate traditional nursing home staff, this study abandons this view (Mukai et al., 2010). Given the apparent ambiguity surrounding the impact of PE ownership on nursing home quality, this research

focuses on variables that are objectively measurable. By researching the impact on required staffing in the industry, important societal implications of PE investments in the nursing home sector are discerned. This research aims to answer the question of whether PE ownership can aid in the context of increased grey pressure on staffing by reducing reliance on traditional staffing methods.

Furthermore, current research regarding PE ownership of nursing homes focuses on privatised markets, such as the UK (82% privately owned, Savills (2022)) and the United States (US) (93% privately owned, Statista (2023a)) (Gupta et al., 2021; Patwardhan et al., 2022). This study breaks new ground in the academic literature by extending the research on PE ownership of nursing homes into markets with lower levels of privatisation. Consequently, the impact of PE ownership can now also be compared between PE in a privatised setting versus that of PE in a much less privatised setting. Therefore, a possible conclusion might be that it is more beneficial to have a nursing home sector that is completely privatised or one that is not privatised at all. To measure this, a variable is established per country that measures the level of privatisation in terms of what percentage of the nursing homes market share is in private hands. The new possible comparisons are depicted in the stylised example below:

Figure **2**: Expansion on current literature by including public nursing home markets



Furthermore, this study provides a literature review regarding the mechanics behind PE and specific guidance on the implications of PE investment in the public sector. The Difference-in-Differences (DiD) and Triple Difference (DDD) analyses used in this research have yet to be applied within the setting of the performance of nursing home companies in Europe.

1.2.2 Societal relevance

Currently, there is growing attention towards PE investments in the public sector in countries with low levels of PE investment, such as the Netherlands (Bischot and Van Hoewijk, 2020). This study focuses on the nursing home sector, examining the entry of PE players into this market. According

to Savills (2022), the Netherlands has the highest number of beds per 1,000 people over the age of 65 in Europe, indicating a relatively large nursing home market. However, private investment in this sector is currently low. Furthermore, the Dutch care home market is fragmented, whilst the customer population is expected to grow the most out of the seven biggest European nursing home markets (Savills, 2022). The future expected growth of the nursing home customer population will coincide with increased pressure on nurses active in this industry. The potential relief of increasing pressure on nursing home staff is crucial for the continued provision of healthcare in these facilities. Consequently, the penetration of PE into this market, with its consequent effects on investment, pricing, and staffing, poses significant policy considerations for the nursing home sector.

1.3 Main findings

This study, analysing 17 buyouts and 205 matched nursing homes from 2014 to 2018, uncovers significant differences in outcomes between PE ownership in private and public nursing home sectors. In private markets, PE ownership appears beneficial, marked by increased investments and reduced reliance on personnel, albeit leading to higher prices, likely partially offset by improved services. Contrarily, in public markets, while initial decreases in pricing are observed, these are likely temporary, with expectations of future increases.

This research suggests that PE investment boosts Operating Expenses (OPEX) by 60.3% to 76.8% in private markets, focusing on operational improvements rather than large-scale Capital Expenditure (CAPEX). This increase in OPEX coincides with a decrease in PEX by 41.4 percentage points. However, these investments do not increase profitability. Despite this, PE ownership does lead to a notable 34.9% revenue growth. Price dynamics also vary: in private markets, customer prices increase by 24.0%, while in public markets, they decrease by up to 43.4%.

1.4 Structure

The structure of this paper is as follows: in chapter 2, an in-depth exploration of the current landscape in Private Equity and its impact on nursing homes is performed by reviewing relevant literature. Chapter 3 introduces a conceptual framework that serves as the foundation for the hypotheses regarding the introduction of Private Equity ownership to nursing home industries. Chapter 4 delves into the details of the chosen data and the methodology employed to test the hypotheses. Moving forward, chapter 5 engages in a thorough discussion of the research findings and their nuanced interpretations per hypothesis. Finally, chapter 6 provides a comprehensive conclusion to this study.

2 Literature review

In order to understand the mechanics behind PE investments, as well as what incentives drive these investments, this chapter will delineate PE investing, value creation through PE investments and the impact of these investments in the setting of public sectors and nursing homes. This theory is the foundation for the conceptual model that will be discussed in chapter 3, as well as the hypotheses that support answering the central research question of this study.

2.1 Private Equity investing

2.1.1 Private Equity: buyout and venture capital

Private equity refers to investments by Private Equity funds in companies that are usually not listed on stock exchanges. However, there are exceptions, such as private investments in public equity (PIPE) and public-to-private transactions, comprising 6.7% of all buyout transactions from 1970 to 2007 (Strömberg, 2009). This research focuses on buyout funds, not Venture Capital (VC) funds, as PE investments. Unlike VC funds, buyout funds generally invest in mature, profitable companies with stable cash flows, utilising high levels of debt, often in the form of Leveraged Buyouts (LBOs). PE firms focus on financial metrics like Earnings before Interest, Tax (Depreciation and Amortisation) (EBIT(DA)) (Metrick and Yasuda, 2010; Leslie and Oyer, 2008). VC funds target less mature companies, emphasising revenue growth and business model (Da Rin et al., 2013; Block et al., 2019). Nursing homes are typically mature, established entities with steady cash flows, making them attractive targets for PE buyout funds.

2.1.2 Buyout investment cycle

The dynamics between LP and GP

Buyout funds, structured as limited partnerships, involve PE companies, known as General Partners (GPs), raising capital from institutional investors, known as Limited Partners (LPs), to invest in private corporations, typically by acquiring controlling interests. GPs exercise significant control and earn fees for managing portfolio companies and generating returns for the LPs (Prowse, 1998; Phalippou et al., 2018). They often manage multiple funds concurrently, raising a new fund every three to five years (Braun and Schmidt, 2014). However, the practice of raising new funds before other existing funds are exited can lead to overstated performance claims by GPs (Brown et al., 2019). LPs conduct extensive due diligence before investing, as they have limited control once committed (Prowse, 1998; Manigart et al., 2002; Da Rin and Phalippou, 2017; McCahery et al., 2012). Typically, these funds have a fixed

lifespan, which requires the eventual sale of investments as the end of this period nears (Ljungqvist et al., 2020).

LPs compensate GPs through carried interest, management fees, and monitoring and transaction fees (Phalippou et al., 2018). The standard "two and twenty" remuneration model includes a 2% management fee and 20% of profits as carried interest, with a typical 8% hurdle rate before carried interest applies (Fleischer, 2008; Sorensen et al., 2014). Appendix B.1 displays the mechanism of carried interest as returns increase over the life of a fund. Carried interest aligns LP and GP interests, minimising agency costs, and is supplemented by GPs' capital commitments of 1-3% of total capital (Fleischer, 2008; Metrick and Yasuda, 2010; McCahery et al., 2012).

Agency issues arise from the fixed fund lifespan and the potential for GPs to take on risky projects to meet hurdle rates. Reputation serves as a mitigating factor, with successful GPs more likely to raise follow-on funds (Axelson et al., 2013; Chen and Lai, 2010; Harris, 2010; Kaplan and Schoar, 2005). LPs, particularly highly liquid LPs, are favoured for follow-on investments as these LPs are less affected by liquidity shocks. However, information on LP liquidity can be obscured by market information asymmetry (Lerner and Schoar, 2004). Moreover, persistently investing in funds of the same GP is not necessarily beneficial for LPs. Over time, the persistence of returns in buyout funds has weakened (Harris et al., 2023). Moreover, factors like market conditions and GP skill influence fund capital inflow (Diller and Kaserer, 2009; Fang et al., 2018).

Over time, the traditional "two and twenty" has evolved to include an additional 6% in transaction and monitoring fees (Phalippou et al., 2018). LPs face significant illiquidity, with average fund internal rates of return (IRRs) turning positive only around the eighth year (Ljungqvist and Richardson, 2003b). LPs sometimes engage in co-investments, investing directly in companies alongside the buyout fund, which initially served as a capital-raising tool for GPs but now also functions to build loyalty among fund sponsors (Tuft, 2023; Greenberger, 2007). Post-financial crisis, LPs have gained more control and bargaining power, leading to more LP-friendly contractual terms and innovative investment structures like separate accounts (McCahery et al., 2012; Ljungqvist et al., 2020).

In conclusion, the principal-agent relationship between LPs and GPs requires alignment of interests to reduce agency costs. The GP's reputation is crucial in this dynamic, but the shifting power balance towards LPs and the decreased persistence in buyout funds' returns suggest the LP-GP relationship is evolving to include more power for LPs. This shift could benefit nursing homes, as changing investment behaviours among institutional investors indicate a search for returns that also considers factors such as social responsibility (Sinha and Juneja, 2020).

The dynamics between GP and portfolio company

GPs investing in portfolio companies employ various strategies to enhance value, including implementing increased leverage and operational improvements within the portfolio companies. This maximises the potential return for the company when the GP exits the investment. The methods of value creation, which will be discussed in section 2.2, are marketed by GPs towards potential portfolio companies as a means of completing an acquisition (Gompers et al., 2016). Although GPs are generally managed by professionals from outstanding academic backgrounds, this is not necessarily the case for the management at portfolio companies (Lanier, 2012). These are generally entrepreneurs motivated to monetize a part of their equity, as most of their wealth is invested in the business to be acquired.

Given that potential investments are generally not listed, information asymmetries between GPs and portfolio companies give rise to agency costs (Johan and Zhang, 2021). A great amount of research has been dedicated to the relationship between GP and portfolio companies. In this context, the GP acts as a principal, whereas the portfolio company serves as an agent. Therefore, the GP of a buyout fund assumes a dual role: acting as an agent towards the LPs, as previously discussed, and as a principal in relation to the management of portfolio companies. This hierarchy has been described as the three-tier hierarchy model in literature, where there is a principal, a supervisor and an agent, which are the LP, the GP and the portfolio company's management, respectively (Tirole, 1986). This situation may lead to collusion between the GP and the portfolio company, as GPs may engage in negative net present value (NPV) projects when nearing the investment deadline (Phalippou et al., 2018).

GPs mitigate agency costs by gathering extensive information on the portfolio company prior to making the investment decision (Kaplan and Strömberg, 2000). Since buyout funds invest in a diverse range of private firms, including distressed ones, extensive due diligence by GPs is essential. This need arises from the limited availability of public information on the buyout targets, leading to information asymmetry between GPs and buyout targets (Prowse, 1998). Due diligence decreases information asymmetry between GPs and portfolio companies and the agency costs arising from it but does not entirely remove it. Therefore, GPs monitor portfolio investments once a portfolio company has been acquired. Monitoring is necessary due to the private nature of investments. For instance, specific public monitors, such as investors who assess publicly available financial statements, are not present (Bloom et al., 2015; Jensen, 1989; Kazemian et al., 2017). However, GPs have since implemented monitoring measures that are stronger monitoring practices than regular public monitors (Bloom et al., 2015). Moreover, to monitor effectively, some PE firms request to be awarded a seat on the board of a company in order to monitor managerial activity directly, mitigating the agency costs associated with opportunistic managers at portfolio companies (Dai, 2011; Martin et al., 2019). Within the con-

text of buyout funds, as agency costs rise, so does the importance of monitoring by GPs. The need for monitoring by GPs makes syndication less attractive for GPs as there will be free-riding regarding monitoring by the non-lead investors (Meuleman et al., 2009b).

Furthermore, leverage can mitigate agency costs between GPs and portfolio companies. Especially in environments where portfolio companies have control rights to excessive cash flows, debt can remedy agency costs deriving from managers at portfolio companies that display empire building (Harvey et al., 2004; Jensen, 1986). An overview of the players in the PE industry and their interaction can be found under Appendix B.2.

Entry

After a GP has raised capital from LPs, it will seek investment opportunities to employ this capital. When evaluating investment opportunities, Gompers et al. (2016) find that in contrast to general corporate finance, the popular Discounted Cash Flow (DCF) method is used less frequently in PE. Instead, most GPs prefer to evaluate using the IRR and the Multiple On Invested Capital (MOIC), more commonly known as the "money multiple", which refers to the ratio of the sum of all fund distribution net of fees to the sum of all contributions by investors (Gompers et al., 2016; Harris et al., 2014; Smolarski et al., 2011). Over the life of an investment, GPs aim to realise an IRR of 22% on average, which exceeds a return based on the Capital Asset Pricing Model (CAPM) (Gompers et al., 2016).

Within the PE industry, the price to be paid for a portfolio company is expressed as the Enterprise Value (EV) to EBITDA, the latter being the financial metric that is most often used by GPs (Gompers et al., 2016; Lie and Lie, 2002). GPs target companies with high growth potential but weak operating profitability (Cohn et al., 2022). Koeplin et al. (2000) find that, when using earnings multiples such as the EV/EBITDA multiple for the valuation of private companies; this discount compensates for the illiquidity associated with private companies. Moreover, the underpricing hypothesis may explain this discount, suggesting that GPs possess unique insights regarding potential operational improvements or value enhancements that are not available to the public (Kaplan, 1989). This informational edge enables buyout investors to acquire the company at a lower price than what other investors would be willing to offer.

As there is a limited number of good private investment opportunities, at times that fund inflows from LPs increase, so do the multiples for these investment opportunities. Gompers and Lerner (2000) describe this phenomenon in PE is described as the 'money chasing deals' hypothesis. As higher capital inflows increase multiples paid for companies, this also decreases the potential for returns. Ljungqvist et al. (2020) find that industries that experience a capital inflow in a vintage year tend to have lower

returns. This suggests that as PE investment in nursing homes increases, driving up multiples, potential returns in this sector might be threatened (Fraser-Sampson, 2011).

The offer price plays a crucial role in dictating the future returns generated by PE firms. Consequently, GPs raising funds in a high-interest-rate environment with substantial capital inflow may find it challenging to yield high returns under conditions where capital inflow diminishes, and valuation multiples decrease. The current economic uncertainty has translated into fewer exits and inflow as a response (Bain & Company, 2023). Moreover, higher costs at portfolio companies due to inflation and high interest rates lead to declining valuations (McKinsey & Company, 2023).

In conclusion, PE companies target companies with high growth potential but weak profitability and base their investment decisions on the IRR and the MOIC rather than the traditional DCF method. They often acquire private firms at a discount compared to public firms and use the EV to EBITDA multiple. Limited good investment opportunities in the nursing home industry can lead to higher valuations when capital inflows rise, potentially lowering returns.

Holding period

After investing in a portfolio company, a GP implements the avenues for value creation outlined in the investment thesis, generally focusing on two key aspects: promoting growth and enhancing efficiency (Lanier, 2012). Efficiency refers to the operational improvement of a portfolio company, which is one of the value creation methods discussed in section 2.2. In addition to organic growth, a business can also achieve expansion inorganically by executing add-on acquisitions and assimilating them into the existing portfolio company. Valkama et al. (2013) demonstrate that an increased number of add-on acquisitions during the holding period correlates with higher returns for buyouts. These high returns generated by realising add-on acquisitions during the holding period of a portfolio company can explain the recent rise in popularity of the "buy-and-build" strategy in private equity (Bain & Company, 2019). Buy-and-build refers to the process of initially acquiring a portfolio company that functions as a platform in a certain industry or geography. Afterwards, a GP grows this platform by performing multiple add-ons, which are companies that generally operate in the same industry and are usually smaller than the platform. After acquiring an add-on company, this company will be integrated into the platform company.

Holding periods in PE have increased since the financial crisis to an average of 5.8 years (Joenväärä et al., 2022). Currently, there is an increased emphasis on operational improvement within PE. In contrast to implementing leverage in a firm, operational improvements take time to implement and, therefore, will likely continue to increase average holding times in the future. Financial leverage does

not take time to implement, and therefore, when credit conditions become looser and the access to leverage is great, average holding periods in PE should decrease if GPs focus more on this avenue of value creation. Exit opportunities also influence holding periods, as the two seem to have a negative correlation. For instance, when IPO markets heat up, and exit opportunities in this channel also do, holding periods decrease (Mäkiaho, 2016).

The experience of a GP also influences the holding period, as more experienced GPs tend to sell to less experienced GPs. These secondary deals, known as Secondary Buyouts (SBOs), tend to occur later in the life of a fund and therefore Jenkinson and Sousa (2015) witness that holding periods increase with GP experience. The association between reputation and holding period is positive, given that more experienced GPs typically enjoy a greater reputation.

In summary, PE firms tailor their holding periods based on value creation strategies, mainly through efficiency improvements, add-on acquisitions and financial leverage. Recent trends show an increasing average holding period driven by a heightened focus on operational improvements. Credit market conditions can expedite or extend these periods, while exit opportunities inversely affect holding duration. Moreover, GP experience and reputation also play pivotal roles, with seasoned GPs favouring longer holds to ensure sustainable value creation.

Exit

GPs in private equity need successful exits to build a reputation and attract LPs for future fundraising, making exit timing and strategy crucial (Phalippou et al., 2018). The most common exit strategies are trade sales (38% of exits) and SBOs, which accounted for 24% of exits in 2008 but have since grown in popularity, particularly under the buy-and-build strategy (Strömberg, 2008; Jenkinson and Sousa, 2015; Shivdasani and Wang, 2011; Huang et al., 2016). The buy-and-build strategy offers great option value in the context of acquiring a platform, but also for add-ons increased synergies result in GPs being able to outbid strategic buyers (Bansraj and Smit, 2017).

GP competition for deals affects exit timing, with greater competition leading to longer holding periods, prioritising investment opportunities over immediate high returns (Ljungqvist et al., 2020). If GPs choose to exit in a highly competitive environment, they may be able to capitalise on the exit; however, finding new investment opportunities in such a market will be significantly more challenging. Other factors influencing exit decisions include PE fund structure, with pressures to sell as the fund nears its end and portfolio company characteristics like size and stage of development (Cummings and MacIntosh, 2003; Rigamonti et al., 2016; Lerner, 1994). IPOs, accounting for 13% of exits, are often used early in a fund's life as a marketing tool for GPs and to realise high IRRs (Strömberg, 2008; Fürth and

Rauch, 2015; Jenkinson and Sousa, 2015; Ljungqvist and Richardson, 2003a).

Industry specialisation of a GP increases the likelihood of a successful exit, minimising information asymmetry and leveraging a superior network (Cressy et al., 2007; Uddin and Chowdhury, 2021; Rigamonti et al., 2016). Portfolio company characteristics, such as stable cash flows and monitoring needs, also dictate the choice of exit strategy (Da Rin et al., 2013; Jenkinson and Sousa, 2015; Wright Robbie, 1998; Bienz and Leite, 2008).

In summary, the exit strategy is pivotal in private equity, with trade sales and SBOs as primary routes. Factors like market conditions, fund structure and portfolio company specifics significantly influence the choice and timing of exits, impacting the GP's reputation and future fundraising efforts.

2.2 Private equity value creation

Having gained a comprehensive understanding of the PE industry, the dynamics between players and the investment process it entails, the focus of this section turns towards dissecting the fundamental value drives within PE. Generally, two sources of value creation in the context of PE are improved resources on the one hand and decreased agency costs on the other (Ireland et al., 2003; Jensen and Meckling, 2019). More specifically, PE firms create value in terms of three aspects of a portfolio company. Firstly, a company's operations are improved. Secondly, governance initiatives can create value for portfolio companies. Finally, capital structure implemented by GPs can be a source of value creation.

It is important to note that these methods may vary depending on the type of deal (Meuleman et al., 2009a). In value creation, SBOs often result in less value generation, as the first GP typically has already implemented many value-creating mechanisms associated with private equity (Meuleman et al., 2009a). In contrast, if a GP acquires a public company, significant agency cost reductions can be realised, leading to significant value creation. Therefore, relatively small public companies that are easier to acquire have been taken private by PE firms at an increasing rate (Kim, 2011).

2.2.1 Operational improvement

In recent years, operational improvements have emerged as the paramount contributor to the outperformance observed within the PE sector (Acharya et al., 2013). This finding leads to the assertion that the enduring excellence demonstrated by PE firms, as examined by Kaplan and Schoar (2005), finds its origins in those PE firms that prioritise operational enhancements. The consensus among several researchers supports the notion that operational improvements have become a prominent factor in generating returns of buyout funds (Gompers et al., 2016; Kaplan and Strömberg, 2009).

Sources of operational improvement

Strong resources in the shape of human capital help PE companies to drive performance in their portfolio companies (Lerner, 1994).This resource-based view on value creation of private equity will increasingly become more important as most agency cost-related improvements are more relevant in the context of public companies acquired by a GP (Jensen, 1989). However, PE is becoming more focused on the middle market, as the number of private buyouts over the past decade outnumbers buyouts of publicly traded firms by more than thirty to one (Cohn et al., 2022). Consequently, operational value creation will become increasingly important compared to alleviating agency costs through improved governance associated with taking public companies private.

These operational improvements can stem from a competitive advantage that is derived from access to superior resources that PE companies enjoy (Ireland et al., 2003). Increased human capital in private equity stems from the financial investors at a GP that provide support to the portfolio companies in the shape of operational advice (Lerner, 1994). Besides management assistance, GPs also provide their portfolio companies with reputational capital (Black and Gilson, 1998). After a buyout, portfolio companies can profit towards third parties from the credibility and trust that GPs have accumulated.

Organic growth: efficiency and productivity

As value creation by GPs revolves around operational improvement, the need for GPs with product and operational management skills grows (Cumming et al., 2007). Besides an entrepreneurial approach to growth, buyouts are hailed to bring innovation to a company's strategy (Wright et al., 2000). These skills tend to be more prevalent amongst PE founders with a background in PE or strategy consulting, whereas PE founders with a background in banking focus more on financial engineering (Gompers et al., 2016). GPs with a preference for operational improvement act as efficiency tools that streamline organisations whilst reducing expenses such as the Cost of Goods Sold (COGS) and PEX (Harris et al., 2005; Wright et al., 2000). By operating more efficiently, GPs have been found to increase the ratio of EBIT to revenue by 10% to 20% (Kaplan, 1989). This efficiency improvement can be realised through the divestiture of inefficient divisions within target companies, (Davis et al., 2014). By implementing various efficiency-improving measures and employing entrepreneurial growth strategies, GPs are able to achieve organic growth for portfolio companies (Paglia and Harjoto, 2014; Wright et al., 2000). Furthermore, productivity increases after buyouts as a consequence of reduced agency costs and increased efficiency (Harris et al., 2005). If the nursing home sector responds to PE investment in a comparable manner, it is reasonable to hypothesise that both revenue and profitability will increase as a result of

the PE investment. The increased growth rate of net sales may be realised after some time due to the strategic changes that are implemented in the portfolio companies over time.

Inorganic growth: add-ons and buy-and-build

Sales growth increases significantly among firms that have been acquired by PE firms (Cohn et al., 2022). Besides implementing efficiency improvements, PE firms also perform add-on acquisitions after a buyout to grow a company. This is especially true for GPs who are implementing a buy-and-build strategy. Cohn et al. (2022) confirm the growing popularity of the buy-and-build strategy among PE firms as almost every add-on acquisition in their sample is in the same industry as the original buyout target. Moreover, many of the add-on acquisitions occur within one year of the buyout, which indicates that the original buyout target functions as a platform. When considering several GPs in an auction setting, international GPs are more interesting for entrepreneurs who look to expand their business internationally. In terms of the background of partners at a GP, ex-bankers display outperformance through inorganic growth, whereas ex-consultants or ex-PE managers achieve outperformance by organic growth (Acharya et al., 2013).

GPs strategically target companies with high growth potential but weak operating profitability (Cohn et al., 2022). By implementing both organic and inorganic growth strategies, combined with operational enhancements, GPs generate substantial value for their portfolio companies. These growth strategies lead to economies of scale, further bolstering profitability (Shah and Wolfe, 2022). Independent and specialised PE firms, in particular, reap significant operating profits from buyouts (Cressy et al., 2007). In essence, the success of PE firms hinges on the effective pursuit of both organic and inorganic growth avenues while optimising operational efficiency.

In summary, operational improvements have assumed paramount importance in driving the PE sector's outperformance compared to other asset classes, with both organic and inorganic growth strategies playing pivotal roles in creating value for portfolio companies. This transformation underscores the multifaceted strategies employed by PE firms to enhance operational efficiency and overall growth prospects, which should lead to improved revenue and profitability for acquired nursing homes.

2.2.2 Governance improvement

Besides operational improvement, PE companies create value by implementing strong governance mechanisms in their portfolio companies that reduce agency costs. Buyout transactions are an important governance mechanism that swiftly restructures organisations (Cumming et al., 2007; Wright et al., 2007). Buyouts are characterised by mechanisms of direct control together with the alignment

of incentives, which creates value for portfolio companies (Wright et al., 2009a; Prowse, 1998).

Incentives

Jensen (1989) recognised that PE provides a better alternative to public corporations in terms of governance. Where public firms suffered from weak corporate governance and managerial incentives, leading to value destruction, private equity seeks to mitigate the agency costs arising from the separation of ownership and control by aligning them more closely. (Jensen and Meckling, 2019). One method for aligning incentives between shareholders and managers is done by giving the management team substantial equity upside through stock options (Jensen, 1989; Jensen and Murphy, 1990). LBOs rose to popularity in the 1980s due to these governance features. However, when public corporations started to implement similar features combined with more active governance by institutional investors, the market for LBOs slowed down significantly (Strömberg, 2008).

Monitoring

Moreover, GPs improve governance in their portfolio firms by monitoring firms during the holding period, which, as discussed previously, decreases agency costs between GPs and portfolio firms. By owning and then monitoring their portfolio companies, sometimes directly by requesting a seat on the board of directors, GPs reduce agency problems that originate from the separation between ownership and control (Bertoni et al., 2013; Dai, 2011; Martin et al., 2019).

Replacing management

PE firms act as an external governance mechanism in the buyout market for public companies, addressing moral hazard issues when internal governance fails. The threat of a buyout often arises from management inefficiencies, leading shareholders to sell their shares and potentially attract a PE firm's offer (Jensen, 1989; Jensen and Ruback, 1983). Post-buyout, governance improvements often include replacing entrenched CEOs to reduce agency costs. About 51% of CEOs are replaced within two years of an LBO announcement, double the rate compared to non-buyout firms (Gong and Wu, 2011; Kaplan, 1989). These replacements typically occur in firms with high agency costs. Newly installed boards by GPs meet more frequently and are more proactive in corporate governance, actively scrutinising and replacing incumbent management with more competent managers if necessary (Acharya et al., 2013; Harris et al., 2005; Kaplan and Strömberg, 2009). However, in public sectors that are not yet privatised, like the Dutch nursing home sector, PE investors might lack sector-specific experience. Therefore, retaining existing management could be advantageous to offset this inexperience (Stevenson and Grabowski, 2008). Moreover, PE firms possess the potential to enhance the governance of

traditionally hierarchical healthcare organisations, such as nursing homes. This enhancement can be achieved by streamlining organisational structures characterised by the removal of multi-tiered, often inefficient, management systems. Such restructuring can lead to a reduction in bureaucratic layers, potentially fostering an environment that leads to heightened innovation and cost efficiency. If PE firms successfully implement these changes in nursing homes, it could serve as a catalyst for significant improvements in the sector (Asiri, 2020).

In summation, PE firms enhance governance in their portfolio companies through swiftly restructuring and aligning incentives with mechanisms like stock options. Furthermore, active monitoring during the holding period, often with secured board seats, also mitigates agency costs stemming from ownership-control separation. Moreover, GPs establish new boards that are more actively engaging in corporate governance. They scrutinise and, if necessary, replace incumbent management teams and potentially increase efficiency in bureaucratic, hierarchical organisations in sectors such as the nursing home industry. These multifaceted governance strategies collectively ensure effective governance and enhance value within portfolio companies, underpinning the success of PE.

2.2.3 Financial engineering

Traditional corporate finance considers optimal capital structure in terms of ownership division between managers and outsiders and the positions of debt and equity holders (Jensen and Meckling, 2019). As a governance tool, debt is used in portfolio companies to discipline management, as high free cash flows can lead to agency costs. Adding debt constrains these cash flows, reducing agency costs (Jensen, 1989). However, critics of leverage argue it may lead to bankruptcy due to burdensome interest payments, combined with costs of insolvency (Jensen, 1989). However, LBO targets often undergo reorganisation rather than bankruptcy, as creditors are motivated to preserve the company's value (Jensen, 1989; Andrade and Kaplan, 1998). Despite the high debt levels in PE investments, these investments do not appear to contribute to deeper recessions (Strömberg, 2009).

PE investments increasingly target unlisted companies that face financing constraints. Leveraged private companies may miss positive NPV investments due to debt overhang, but a PE buyout can alleviate these constraints through operational improvements (Cohn et al., 2022; Myers, 1977; Cohn et al., 2014; Erel et al., 2015). However, Cohn et al. (2022) find that with a shift towards middle-market targets, PE firms are using less leverage. The debt-to-assets ratio post-buyout increases, but not as significantly as in public company buyouts, implying that the drawbacks of leverage might outweigh its benefits in private markets. This could indicate that the agency costs due to a lack of financial constraints are more significant than those from capital constraints in private companies. Excessive

use of leverage might also hinder strategic innovation and growth-focused entrepreneurial strategies in PE firms (Jensen and Meckling, 2019).

In summary, the balance of debt and equity is critical for PE firms, with debt used as a governance tool to control agency costs. While leverage can pose financial challenges, it's typically managed through reorganization, which should avoid increased bankruptcy among nursing homes. PE firms focus on middle-market, unlisted companies, which reflects a trend towards less reliance on leverage, suggesting a reassessment of its impact on agency costs and strategic innovation.

2.3 Private Equity investments in the public sector

2.3.1 Leveraging the use of public policy and institutions

Demaria (2013) describes the importance of public policy as well as infrastructure to draw PE investments. In the context of Dutch nursing homes, this is apparent as nursing homes owned by PE firms rely more on public infrastructure, such as external specialist care than their non-PE-owned counterparts (Bos et al., 2020). Moreover, general business conditions within a country are also beneficial for welcoming PE investment, as PE fund returns positively correlate with GDP growth and negatively correlated with a country's credit spread (Jegadeesh et al., 2009; Valkama et al., 2013). This partially explains why nursing home markets in countries such as the US and the UK have received high investment from PE firms. In the context of the public sector, the involvement of governments can have more impact on increasing PE investments. Government contracts attract GPs as they significantly increase the probability of successfully raising capital from LPs (Paglia and Harjoto, 2014). Therefore, governments can stimulate PE investments in sectors of interest by increasing government contracts in these sectors. This is specifically relevant for public sectors, where, in industries like defence, government contracts are more common (Berrios, 2006). However, governments can also deter PE investment by introducing legislation (Cumming and Zambelli, 2013). The reason that PE investment in the Dutch nursing home sector is currently at relatively low levels can likely be attributed to this. The Dutch Long-Term Care Act is an example of legislation that deters PE investment to an extent, as it excludes a profit motive and the distribution of profits for nursing homes (Dutch Long-Term Care Act, 2020).

2.3.2 Regulatory arbitrage

The privacy of the limited partnership allows buyout funds to stay below the regulatory radar, leading to regulatory arbitrage among PE firms (Spindler, 2009). This should be an incentive for policymakers to introduce legislation that removes the possibility of regulatory arbitrage. As a response to the lack of regulation at the fund level or portfolio company level after the buyout, pressure has increased to

implement regulation for PE firms (Payne, 2011). However, in the Netherlands, implementing legislation that targets PE firms has proved difficult. Following the enactment of the Dutch Long-Term Care Act, certain companies have found methods to extort profits from corporations in the scope of this legislation nonetheless (Bos et al., 2020; Dutch Long-Term Care Act, 2020). McCahery et al. (2012) advocate for a balanced approach in the regulation of private equity investment. On the one hand, increased regulation reduces systemic risk and increases transparency (McCahery et al., 2012; Payne, 2011). On the other hand, if the regulatory burden is too high, this will lead to increased costs and decreased investment (Burrows, 2013; Wang, 2013).

2.3.3 *Allocation of labour*

Davis et al. (2014) find that expanding industries display a greater creation of new jobs than non-buyout companies. This implies that if PE firms are not able to be more efficient in terms of staffing requirements, their entrance into nursing home markets will increase the demand for nursing staff. If this demand is not met in the local market, possibilities for the import of labour are explored (Nazareno et al., 2021). Moreover, buyout targets experience significant job re-allocations due to GPs acting as restructuring agents that realise organic growth, acquisitions and divestitures (Davis et al., 2014). In the context of nursing homes, GPs acting as restructuring agents may be extremely beneficial, as the sector could benefit from restructuring towards organisations that can handle more patients per employee due to improved facilities.

2.3.4 *Privatisation and innovation*

Besides restructuring benefits, a more entrepreneurial approach to business may be a reason for governments to privatise the public sector. Privatisation of the public sector may stem from dissatisfaction with the performance achieved in this sector. By allowing private investments in these underperforming sectors, three kinds of improvements can be realised: efficiency, catching up with innovations and introducing radical innovation (Farsi and Filippini, 2004; Wright et al., 2000). Efficiency can be achieved through the operational improvements that GPs tend to implement, as discussed in section 2.2.1. Innovation often struggles to thrive in environments dominated by bureaucratic measures aimed at ensuring performance, as these contracts typically do not favour innovation due to the lack of room for experimentation in such contexts (Francis and Smith, 1995; Holmstrom, 1989). The amount of investment in innovation is restricted due to the nature of the costs that are associated with it. As innovation is high-risk, long-term, unpredictable and labour-intensive, governments tend to shy away from making these types of investments (Holmstrom, 1989). Within the context of the nursing home

sector, there is also no direct need for innovation as a means of survival. As demographics evolve, there is an expanding customer base, reducing competition among nursing homes to a level where the necessity for innovation to guard against market competition becomes negligible. However, as this market grows, it becomes more rewarding for one player to innovate and break into the market using its innovative product as a competitive advantage. This innovation could also alleviate the growing pressure on the staff within the nursing home industry. Furthermore, innovation can also take place in terms of service offerings, where PE firms may offer a service in a more premium segment of the market for a higher price.

2.3.5 *Stakeholder theory and Private Equity*

Classic agency theory, focusing on relationships between principals and agents, often overlooks stakeholders like employees, healthcare service recipients and local communities, particularly in public sector goods like nursing homes (Morrell and Clark, 2010). Stakeholder theory, expanding this scope, emphasises considering the wider impact of PE investments, including societal externalities (Freeman, 2010). This study evaluates these externalities by quantifying the impact on staffing and efficiency, essential for evaluating the broader costs and benefits of PE ownership in the public sector (Morrell and Clark, 2010).

Research indicates diverse effects of PE-backed buyouts. Meuleman et al. (2009a) argue that besides growth opportunities, these buyouts contribute to broader economic and social benefits. Conversely, Folkman et al. (2007) highlight ethical concerns, noting that GPs may limit the claims of external stakeholders. Strömberg (2009) finds PE investments in Europe to impact productivity and innovation, positively enhancing economic growth.

However, Paglia and Harjoto (2014) observe that women or minority-led portfolio companies receive less investment from GPs, suggesting a need for legislation to address discrimination in PE financing.

In summary, while PE investments in public sector services like nursing homes have potential economic and social benefits, their broader societal impacts, including ethical considerations and investment biases, warrant careful evaluation and possible legislative intervention.

2.4 *Private Equity investments in nursing homes*

2.4.1 *Institutional configuration*

Having previously discussed the implications of PE investments in the public sector, this section will focus specifically on the nursing home sector. Before delving into previous empirical research on PE

ownership in the nursing home sector, it is important to understand the institutional framework of this sector. The nursing home sector is a vital component of the healthcare industry, providing long-term care and support for elderly individuals who require assistance with daily activities. Nursing homes are predominantly funded by a combination of public sources, such as Medicare and Medicaid in the US, and private payments from individuals or their families.Either for-profit or non-profit organizations operate these facilities. For-profit organizations receive funding from the government and charging inhabitants for extra provided services (Rabobank, 2024). As governmental organisations in the public sector are non-profit, this study considers markets with high levels of for-profit organisations to be more 'privatised' than those where many nursing homes are non-profit organisations.

Nursing home sectors are usually non-profit originally but are moving into a mixed market gradually (Bos et al., 2020). According to Marwell and McInerney (2005), for-profit nursing homes enter the market after adopting innovative solutions that have been developed by non-profit nursing homes. This view opposes the view that PE investment stimulates innovation. After the adoption of innovative measures by PE-owned nursing homes, a market exists where both profit and non-profit nursing homes look alike to customers and, therefore, compete on price for clients. In contrast to this view, Grabowski and Hirth (2003) hypothesise that non-profit nursing homes crowd out high quality for-profit nursing homes. This may happen because non-profit nursing homes provide a signal of low cost and delivery of promised quality due to the religious or charitable characteristics of the non-profit organisation. In turn this can lead to a reduction in the number of high-quality for-profit nursing homes in the market, which may negatively impact the quality of care provided by for-profit nursing homes. The crowding out of for-profit nursing homes by non-profit nursing homes has yet to materialise, which may be attributed to the rise of chain nursing homes. The brand names of these nursing homes may have a similar impact in terms of quality assurance as the character of a non-profit institution.

Public institutions heavily influence the demand for nursing home care. Nursing homes are mostly paid for by third-party organisations, which are usually governmental (Gupta et al., 2021). In the US, 95% of facilities treat patients whose care is covered by government-led programs (Harrington et al., 2012). However, the coverage for these clients does not incorporate service offering, reputation or other variables that would be taken into account in a well-functioning market (Gupta et al., 2021). Furthermore, a large percentage of costs in the nursing home sector relate to personnel. About half of a nursing home's costs can be attributed to its staffing (Braun et al., 2021). Generally, there are three levels of qualifications for nursing staff. Firstly, Registered Nurses (RNs) are the most experienced, skilled and expensive; after that, Licensed Practical Nurses (LPNs) follow, and Certified Nurse Assistants (CNAs) are the least skilled or experienced (Gupta et al., 2021). This distinction in nurse qualifications in the

US allows for research on the so-called "staffing mix" of nursing homes.

The clientele of a nursing home is described as its "patient mix" or "payer mix". Apart from demand, the type of patients that nursing homes cater to is an important determinant of generated revenue. This is especially the case for nursing homes that differentiate their service offering in order to increase prices. Within the United States, the patient mix is often divided into the following categories: Medicare, Medicaid and Private Residents (Pradhan et al., 2013; Stevenson and Grabowski, 2008). Both Medicare and Medicaid are government-sponsored healthcare programs. However, Medicaid caters to care recipients with a lower income. This translates to lower rates paid to nursing homes for Medicaid patients (Konetzka et al., 2006). The institutional environment in the United States allows for research into changes in patients in nursing homes, which will be discussed in the following section.

2.4.2 Empirical research on Private Equity ownership in the nursing home sector

This section will describe the development of the academic literature relating to the impact of PE ownership on nursing homes. For a succinct summary of the findings of relevant academic literature between 2008 and today, please refer to table **1**.

Table **1**: Chronological summary of literature on PE ownership of nursing homes
This table presents an overview of the literature that is written on the subject of the impact of PE ownership on nursing homes. The literature is categorised in branches of academic discourse and is presented in chronological order.

Author(s) (Publication Year)	Time Period	Region	Method	Control Variables	Results
United States Studies (Before 2016)					
Stevenson and Grabowski (2008)	1999-2007	US	Multivariate framework: Ordinary Least Squares (OLS), negative binomial model, logit	Time-varying nursing home traits, Facility-level fixed effects, year dummies	RN staffing -3.14 (p<.05)
Pradhan et al. (2013)	2000-2007	US	Panel data regression, OLS, gamma distribution, logit, logistic regression	Size, payer mix, occupancy rate, acuity index, market competition, metropolitan location, per capita income	Operating margin: 0.02 (p<.01), Operating Revenue per patient day: 0.17 (p<.01), Operating Cost per patient day 0.15 (p<.01)
Pradhan et al. (2014)	2000-2007	US	OLS, gamma distribution, logit, logistic regression	Firm size, occupancy rate, acuity index, market competition, location, per capita income	-0.292 nursing hours per patient day (p<.01), 0.214 total deficiencies (p<.05)

Continued on next page

Table **1** – *Chronological Summary of Literature on PE ownership of Nursing Homes*

Author(s) (Publication Year)	Time Period	Region	Method	Control Variables	Results
Harrington et al. (2012)	2003-2008	US	Generalised Estimation Equations panel regression model	Facility characteristics, resident acuity, market factors	RN Hours per resident day -0.018 (p<.1), Total nurse hours per day -.111 (p<.05), number of deficiencies .205 (p<.01), number of deficiencies causing harm: .393 (p<.05)
United States Studies (2016 and After)					
Grabowski et al. (2016)	1993-2010	US	DiD, linear regressions	Acuity index, ownership status, chain membership, size, state fixed effects	Health deficiencies of any nursing home acquired by a chain; 1st year before transaction: 0.37 (p<.01), 5th year and after transaction: -.2 (p<.01), Independent to chain owned; 1st year before transaction: 0.48 (p<.01), 5th year and after: -.51 (p<.01)
Bos and Harrington (2017)	2000-2012	US	Mann-Whitney U tests, Wilcoxon signed rank tests, Sattertwhaite t tests	Control for industry trends	Increased ICT investment, postpurchase operating margin significantly higher every year (p<.05)
Huang and Bowblis (2019)	2005-2010	US	Instrumental variable (IV) regressions, OLS, OLS with fixed effects	Controls at resident and facility level, economic and demographic controls	8 out of 17 variables for quality of nursing homes are significantly better at PE-owned nursing homes
Gandhi et al. (2020)	1993-2017	US	Difference-in-difference, triple-difference regression, fixed effects, IV regressions, matching procedure	Vector of local demographic controls, cohort-year fixed effects, cohort-facility fixed effects	Total staffing expenditure; Moderate reduction in LPN and CNA expenditure per patient day (3.5 and 1.9% of mean respectively) and substantial increase in RN expenditure per day (14.7% of mean) Total impact on expenditure is insignificant
Gupta et al. (2021)	2000-2017	US	OLS, Two-stage least squares regressions, IV regressions, fixed effects	Patient risk controls, year fixed effects, Facility and patient fixed effects, control for patient mix	Mortality: OLS: 0.003 (p<.1), IV: 0.0195 (p<.05), Log amount Billed Per Patient Stay: OLS +8%
Braun et al. (2021)	2012-2018	US	DiD	Age group, race and ethnicity, sex, dual eligibility for Medicare and Medicaid, indicators for chronic and disabling conditions, activities of daily living score and severe cognitive impairment	Differential change after PE acquisitions: Quality measures: +11.1% emergency department visits (p<.05), +8.7% hospitalisation (p<.01), Cost measures: Total costs +3.9% (p<.05)
COVID-19 Related Studies (US)					

Continued on next page

Table **1** – *Chronological Summary of Literature on PE ownership of Nursing Homes*

Author(s) (Publication Year)	Time Period	Region	Method	Control Variables	Results
Braun et al. (2020)	May 2020	US	1-way analysis of variance, linear regression models	Nursing home characteristics (e.g., mean age, % women, occupancy rate), Medicaid or Medicare coverage, rural location	Staffing shortages: Government probability compared to PE-owned: 95% CI, 0.0 – 13.9 %, p<.05
Gandhi et al. (2020)	May 2020	US	Logistic regression model	Facility ownership (e.g., chain/for-profit), facility characteristics, resident composition	Confirmed resident cases: Non-PE: mean 0.27 SD 0.44, PE: mean 0.18, SD 0.38, t-stat 3.93
European Studies					
Stolt et al. (2011)	2007	SE	T-tests, logistic regression	3-year average municipal net income, population density, political affiliation, number of residents	Employees per resident -9%, Residents participating in care plan formulation (+7%), Elderly offered different food alternatives (+26%)
Winblad et al. (2017)	2010-2011	SE	OLS	Municipality population density, political majorities, socio-demographic and financial differences	Employees per resident: public: 0.9, For-Profit: 0.8, Individual accommodation: public: 50.9%, For-Profit: 43.9%
Hjelmar et al. (2018)	2014-2016	DK	OLS	Six variables at the nursing home level (number of residents, patient mix) and four variables at the municipal level	Employees between 8pm-11pm: For-Profit: -0.02 (p<0.1), Process quality assessment: Not For-Profit: -0.116, For-Profit: 0.302, Difference: (p<0.1)
Bos et al. (2020)	2015-2017	NL	Welch t test	Not mentioned	Client ratings: Non-PE vs PE-owned for-profit nursing homes: Accommodation (8.84 vs 8.63, P<.1), Employees (8.91 vs 8.46, P<.01), Listening (8.62 vs 8.01, P<.01), Information (8.44 vs 7.88 P<.01), Recommendation (8.44 vs 7.88 P<.01)
Patwardhan et al. (2022)	January 2020	UK	Spearman's rank tests, generalised ordered logistic estimator, Wald tests	Several covariates from the institutional directory	PE-owned: 2.6% inadequate, 23.6% requires improvement

First branch of research

The earliest literature on the impact of PE investment in the nursing home sector hails from the US, where substantial PE investment entered the sector at the beginning of the 21st century. For instance, Pradhan et al. (2014) investigate the impact of these investments on organisational changes such as the quality of services offered. The first branch of research finds that PE-owned nursing homes have lower

staffing intensity and lower skill mix of employees, as well as a higher number, albeit less serious, deficiencies. A possible explanation is that PE-managed nursing homes are more focused on severe deficiencies as they are more likely to attract regulatory actions.

Moreover, the number of hours spent by nurses per patient per day decreases by 29%. Consequently, PE-owned nursing homes are able to provide services to 41% more patients with the same number of employees. The impact of this efficiency improvement on the quality of care is unclear. Although staffing levels are lower, PE-owned nursing homes report 15% higher operating costs (Pradhan et al., 2013). The costs do not grow at a significantly higher percentage afterwards, in contrast to revenues, which grow significantly 3% more than non-PE-owned nursing homes (Pradhan et al., 2013). As operating margins are also significantly higher for PE-owned nursing homes, the positive impact of PE ownership on financial performance is evident for the first period of PE ownership in the US. It is interesting to see what costs would increase significantly if not related to staffing levels. These may be costs that PE companies make to make the business more efficient and less reliant on high numbers of nurses without necessarily sacrificing quality.

Stevenson and Grabowski (2008) find evidence that suggests that nursing home quality worsens as a consequence of a PE buyout, although PE-owned nursing homes have significantly lower staffing levels for registered nurses. In contrast to the staffing mix, the patient mix is unaltered for PE-owned nursing homes (Pradhan et al., 2014; Stevenson and Grabowski, 2008). Furthermore, experienced RNs are replaced by less expensive "aid staffing", implicating a preference by PE-owned nursing homes for "hands" over "brains" in terms of staffing mix (Stevenson and Grabowski, 2008). Lower staffing levels for RNs and higher levels of deficiencies are found in research by Harrington et al. (2012). Harrington et al. (2012) link the observed lower staffing levels to the fact that PE-owned nursing homes had higher rates of chain membership. Chains may use economies of scale to negotiate lower wages and benefits for staff, which in turn may lead to lower staffing levels and higher turnover rates. In contrast to Pradhan et al. (2014), Harrington et al. (2012) find a higher rate of serious deficiencies, which could be linked to nursing home chains using market power to pressure regulators to reduce oversight and enforcement of quality standards. However, the reason for this could also be that PE companies in the sample target nursing homes that already displayed lower staffing levels than non-profit nursing homes. Non-profit nursing homes dedicate significantly more nursing hours per patient but also experience a significantly lower number of (serious) deficiencies. This suggests that privatisation of the nursing home sector may be more efficient but at the cost of increased deficiencies. The first branch of research into the impact of PE investment on nursing homes is characterised by limited information on the long-term implications for quality in the sector (Harrington et al., 2012).

Second branch of research

As more data on the long term implications of PE investment in the nursing home sector built up over the years, a second branch of research into the subject formed around 2020. This branch was also fueled by the public consensus that viewed PE firms negatively, which is, among other things, attributable to the workforce reductions implemented in pursuit of a reduction in PEX (Brown et al., 2020; Daniel et al., 2016). Furthermore, specifically interesting in the context of nursing homes and healthcare was the COVID-19 pandemic that struck around this time, which also sparked an interest in how PE-owned nursing homes handle this crisis. Consistent with the first branch of research, PE-owned nursing homes display lower staffing levels (Gandhi et al., 2023; Gupta et al., 2021). Gandhi et al. (2023) garnered valuable insights by assessing PEX rather than focusing solely on absolute staffing levels. They find that PEX increase in competitive markets whilst PEX decrease in non-competitive markets (Gandhi et al., 2023). Therefore, it is anticipated that PE investment in private markets, both in PEX and OPEX, will significantly exceed that in public nursing home markets. By looking at expenses instead of absolute staffing levels, Gandhi et al. (2023) find that the level of competition in a nursing home market matters. In a competitive environment, PE-owned nursing homes seem to invest more in nursing homes. However, in both markets, PE firms change their staffing mix towards more experienced personnel, resulting in decreased staffing levels (Gandhi et al., 2023; Gupta et al., 2021). Bos and Harrington (2017) find that PE firms try to alleviate the lower staffing levels with the use of higher skilled personnel and innovation through increased investment in the use of ICT. This is in line with earlier findings on increased operational expenses and decreased staffing levels (Gupta et al., 2021). The findings of Bos and Harrington (2017) combined with increased costs as found by Braun et al. (2021), implies a lower staffing level, combined with higher-skilled staff and increased ICT investment that leads to higher operational expenses. Gupta et al. (2021) find a similar shift towards more skilled staff. However, total PEX does not significantly change in their study. The increased cost found by Braun et al. (2021) may, in that case, be attributed to increased investment in ICT.

In contrast to the first branch of research, the second branch of research finds that the patient mix and the charged prices change. PE-owned nursing homes display a preference for clients that are at lower risk of mortality (Gupta et al., 2021). By taking on clients that are lower risk, nursing homes may improve profits if taking care of lower-risk patients is less costly. In line with this, PE-owned nursing homes are expected to charge less costs to institutions such as Medicare. However, the evidence on this is mixed, with some research even indicating PE-owned nursing homes increase costs by as much as 8% (Gupta et al., 2021). This suggests that PE-owned nursing homes increase prices due to increased service offerings whilst the high-risk clients who cannot afford these nursing homes remain at gov-

ernmental nursing homes (Herr and Hottenrott, 2016). This dynamic mirrors the concept of adverse selection, where higher prices and improved services in PE-owned homes result in the segregation of clientele based on financial capability, thereby concentrating higher-risk individuals in government facilities. This phenomenon not only impacts the demographic distribution across different types of nursing homes but also poses challenges to resource allocation and quality management in the public sector. Braun et al. (2020, 2021) conducted extensive research into the cost behaviour of PE-owned nursing homes. PE nursing homes report a 3.9% increase in quarterly costs compared to for-profit nursing homes without PE ownership (Braun et al., 2021). This cost increase is driven by an increased amount of emergency department visits and hospitalisations, respectively 11.1% and 8.7% more than at non-PE nursing homes (Braun et al., 2021). These findings align with the research of Bos et al. (2020), which suggests that PE-owned nursing homes use healthcare facilities such as general practitioners to reduce costs at the nursing home. Instead of caring for patients at the nursing home, it may be cheaper to hospitalise a patient and charge the costs to Medicare.

The first branch of staffing makes use of the number of reported deficiencies as a measure of quality (Harrington et al., 2012; Pradhan et al., 2014; Stevenson and Grabowski, 2008). Interestingly, Grabowski et al. (2016) find that the association between a higher number of deficiencies and PE ownership can be attributed to the fact that PE firms tend to buy nursing homes that already report high deficiencies. In terms of medium to long-term impact, PE firms seem to positively impact the service of these nursing homes as the targets report lower deficiencies from five years after the transaction and onwards (Grabowski et al., 2016). Huang and Bowblis (2019) evaluate various publicly reported healthcare statistics, such as falls with injury and pressure ulcers, finding that PE ownership also does not deteriorate in the medium term. Quality, as measured by healthcare statistics like the hospitalisation rate, does show significant improvement in the medium term. However, the overall impact on quality, based on these healthcare metrics, remains uncertain (Braun et al., 2021). Other findings from the second branch of research are characterised by PE ownership for around six to eight years post-buyout. They can also be interpreted as medium to long-term effects of PE ownership (Bos and Harrington, 2017; Gupta et al., 2021). Gupta et al. (2021) use mortality to evaluate nursing home quality and finds that mortality increases slightly for PE-owned nursing homes.

In terms of quality and staffing levels, the second branch of research extends its focus beyond the measurement of absolute staffing levels. This is important given the skill mix changes that PE firms seem to implement in nursing homes. The staffing mix of PE-owned nursing homes has shifted from a focus on “hands” towards a focus on “brains”. By looking at staffing expenses, Gandhi et al. (2023) deduce that total staffing levels may decrease; however, this decrease can be offset by a relative increase

in high-level nurses. This leads to higher PEX in concentrated areas for PE-owned nursing homes. In the second branch, the narrative becomes more positive regarding the impact of PE investments on nursing homes. The findings of the second branch of research have important implications for the impact of PE ownership on nursing homes across various markets. For markets where there are lots of public institutions, which are known to be unresponsive to market signals such as high demand, there is a lower incentive for PE-owned nursing homes to increase quality in terms of staffing expenses (Bos et al., 2020; Gandhi et al., 2023).

COVID-19 presented a challenging environment for healthcare companies and nursing homes, especially as a great portion of the vulnerable population lives in nursing homes. This ignited interest in research on how PE ownership affects the performance of nursing homes during the pandemic. Braun et al. (2020) find that nursing homes acquired by PE firms did not experience higher rates of COVID-19 cases or deaths compared to other nursing homes. Furthermore, research by Gandhi et al. (2020) indicates that PE ownership during COVID-19 was associated with a 7.1% lower number of cases as well as decreased equipment shortages. This supports the view that GPs possess superior resources that allow them to manage the companies more efficiently. The previously observed slight underperformance in mortality rates seems to vanish in stressful environments, where public nursing homes may actually lag behind those owned by PE firms. In support of this view, government-owned nursing homes were 45.8% more likely to experience staffing shortages compared to PE-owned nursing homes (Braun et al., 2020). It appears that the advantages of PE ownership do not extend beyond the long term, as nursing homes formerly owned by PE companies did not experience the same benefits during COVID-19 as those under PE ownership at the time (Gandhi et al., 2020).

Third branch of research: Europe

Similar to the United States, a parallel line of research exploring the impact of PE investment in the nursing home sector emerged in Europe around the 2020s. By this time, the UK nursing home sector had received considerable investment from PE firms, which gave rise to this third branch of research. The metrics for measuring nursing home quality shift away from deficiencies to other measures. This is likely because data regarding reported deficiencies are not as available for European nursing homes. Patwardhan et al. (2022) replace the US deficiencies metric with a UK domestic ratings system: a quality rating based on safety, effectiveness, caring, responsiveness and management. It is important to note that the impact on healthcare staffing may vary notably between the UK and the US versus continental Europe. The latter faces greater challenges in attracting immigrant workers due to language barriers, potentially leading to a more significant decline in staffing levels because of these labour

constraints (Nazareno et al., 2021).

PE-backed nursing homes in the UK are concentrated in urban areas as 87% of PE-owned nursing homes can be found here (Patwardhan et al., 2022). This percentage is 78% for non-PE-owned nursing homes and even less for non-profit nursing homes. Should the behaviour of PE firms in the UK follow those in the US, then this implies an increase of PEX due to higher levels of competition in urban areas, leading to increased salaries (Gandhi et al., 2023). Moreover, the effectiveness of potential policy might be more as Gandhi et al. (2023) find that PE-owned nursing homes in concentrated areas are more aligned with policy measures due to competitive pressures. Although Patwardhan et al. (2022) find that PE-owned nursing homes are rated slightly lower than their peers, this might be related to increased investment in ICT and more highly skilled staff. For example, one of the five criteria is “care”, which relates to how residents are treated with compassion and kindness. The choice of PE to focus on the quality of staff instead of the quantity of staff, otherwise described as the choice for "brains" over "hands", relates to PE-owned nursing homes scoring lower for this aspect of the UK’s rating system (Bos and Harrington, 2017). However, a cause for concern arises from the finding that nursing homes under PE ownership demonstrated a heightened probability of receiving an inadequate score on the "safe" criterion. This criterion specifically evaluates the proficiency of staff training and the effectiveness of safeguards in place to protect residents from abuse and harm. This implies that the switch to brains has a negative, albeit small, impact on nursing home services in the UK. In contrast to the theory on efficiency and superior resources that PE firms have access to, this has not led to better scores on “effective” or “well-led”.

Whereas the UK has received considerable PE investment thus far, leading to one in ten beds in the sector being owned by a PE-backed nursing home, this is less the case in the Netherlands. However, the recent rise in PE investments in the Netherlands has inspired research into its impact thus far. Firstly, Bos et al. (2020) dedicate the growth of PE-owned nursing homes to the unresponsiveness of the non-profit nursing home sector to demographically driven demand increase. Secondly, Bos et al. (2020) address regulatory arbitrage among for-profit nursing homes. Client selection rules do not bind for-profit nursing homes, so they are more flexible in funding their growth and selection of clients.

In addition to explicit PE ownership of nursing homes, research has explored the broader implications of private ownership’s impact on nursing homes in Europe. Private ownership does not appear to be problematic, as Winblad et al. (2017) find no significant differences in terms of quality between different private ownership types. Farsi and Filippini (2004) find that private ownership leads to cost efficiency, as synergies can be achieved through joining operations and operating at larger capacities. Furthermore, private nursing homes score better in terms of quality for how individualised the care is

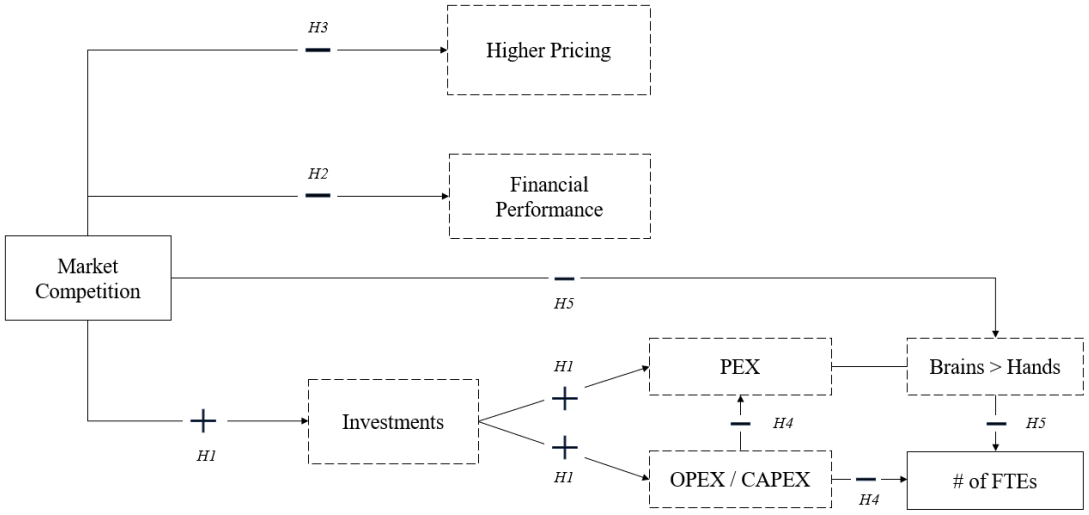
in comparison with public or non-profit institutions (Bos et al., 2020; Hjelmar et al., 2018). Also, for-profit firms seem to be more efficient as they score significantly higher on quality measures that relate to process quality, even though staffing levels are higher for non-profit organisations (Hjelmar et al., 2018; Stolt et al., 2011; Winblad et al., 2017). This aligns with the observed strategy in PE-owned nursing homes in the US, which favours lower staffing levels and prioritises expertise ("brains") over workforce size ("hands"). The improved process quality indicators uncovered in European research concerning the impact of PE-owned/for-profit nursing homes may be caused by the operational efficiency typically associated with PE firms. Furthermore, public nursing homes offer more individual accommodation, which may explain increased prices at PE-owned nursing homes (Winblad et al., 2017). No research shows how staffing expenses are impacted by PE ownership in Europe. This will be included in this research to evaluate whether PE-owned nursing homes are cutting costs with regard to the highest cost of the nursing home business or are re-calibrating business to accommodate more clients with fewer nurses.

This study builds on previous branches of research regarding the impact of PE ownership on nursing homes. Firstly, it will expand the findings of the impact of PE ownership on nursing homes towards markets that are less privatised. This can have significant implications for the impact of PE ownership as previous research has found PE to be beneficial in environments that are more competitive (Gandhi et al., 2023). As PE-owned nursing homes likely experience less competitive pressure in a market with a higher presence of governmental institutions, the policy implications for nursing home markets with a low degree of privatisation may differ from more privatised markets. Furthermore, this study tries to capture the efficiency of PE not only in terms of financial performance but also in terms of personnel. Previous research seems to suggest a preference for “brains” over “hands”, which has an ambiguous impact on PEX. This research combines data on PEX and the number of Full-Time Equivalents (FTEs) at nursing homes to gauge the impact of PE ownership on PEX, staffing levels, and the staffing mix. Additionally, OPEX and CAPEX will be evaluated to see whether PE-owned nursing homes are investing in nursing homes that can potentially support a larger number of clients with a smaller number of nurses and lower total PEX.

3 Conceptual model and hypotheses development

Drawing upon a thorough review of existing literature, this study puts forth a conceptual model. This conceptual model illustrates how market competition is related to the impact of PE investment in nursing homes. The model not only forms the basis for deriving hypotheses but also helps illustrate how the different hypotheses are interconnected. The hypotheses proposed in this chapter introduce a new perspective on governmental policy based on privatising its nursing home sector.

Figure 3: Conceptual model



3.1 Hypothesis 1 (H1): investment in nursing homes

No academic consensus exists regarding the impact of PE ownership of nursing homes on various measures of quality, such as PEX. Research by Gandhi et al. (2023) can explain this lack of consensus, as there are certain environments that provide more incentives for increased investment into nursing homes. A competitive environment encourages PE-owned nursing homes to boost their investments in portfolio companies, while a less competitive environment results in stagnant or even reduced investment levels (Gandhi et al., 2023). Gandhi et al. (2023) examine competition within a privatised nursing home market, specifically the US. However, competitive pressure may also differ across various levels of privatisation. In contrast to the US nursing home market, many of today's nursing home markets are in a much less privatised state. The increased presence of public institutions in a nursing home market has several implications for the impact of investments by PE firms.

Consistent with the findings of Gandhi et al. (2023), a more privatised nursing home market is likely to provide PE-owned nursing homes with stronger incentives to invest more in their businesses. While this can be achieved through enhancing personnel, which may help attract additional customers,

it is also anticipated that there will be a general increase in facility investments to draw in more customers and ease the burden on nursing staff. In markets dominated by public institutions, the need for investment to attract customers is less pressing, possibly due to a mismatch between supply and demand for nursing homes. However, even in public markets, an increase in investment is expected as a means of realising organic growth as described in section 2.2.1, as well as alleviating staff (Bos and Harrington, 2017; Gupta et al., 2021). As nursing home markets privatise, it is increasingly difficult to attract customers because service diversification compared to public institutions is already present among other for-profit nursing homes that have entered the market. Consequently, it is more difficult to operate at a higher price point, attracting customers by offering more individualised care (Bos et al., 2020; Hjelmar et al., 2018). Therefore, in markets with a higher degree of privatisation, PE-owned nursing homes will require more substantial investments to establish and maintain a customer base. The following hypothesis can be formulated:

H1: PE ownership increases investment in nursing homes after a buyout and is higher within privatised markets.

3.2 Hypothesis 2 (H2): improvement of financial performance

Similarly, an increased level of privatisation will give new entrants to the market less room for improvement of financial performance. A PE-owned nursing home entering a market that is in a public state will face relatively little competition from incumbent non-profit public institutions. In such a market, PE-owned nursing homes have ample opportunity to realise significant profit and revenue improvements through mechanisms of value creation such as efficiency improvements and organic growth (Harris et al., 2005; Wright et al., 2000). PE-owned nursing homes are also more likely to grow their patient file more in a public market because governmental institutions are less reactive to increasing demand within the nursing home market (Bos et al., 2020). As an increasing number of for-profit and PE-owned nursing homes enter this market, leveraging value-creating mechanisms will become progressively challenging, given the intensifying competition among numerous rivals deploying similar tactics. Furthermore, competition for potential clients will also increase due to the increased entry of for-profit (PE-owned) nursing homes. For this reason, the financial performance improvement will decrease with increased privatisation of nursing home markets. Therefore, this study hypothesises the following:

H2: PE ownership increases profitability and revenue, where improvements are higher for PE-owned nursing homes within less privatised nursing home markets.

3.3 Hypothesis 3 (H3): price point

Furthermore, an abundance of public institutions within any nursing home market entails less competition for customers, as public institutions have been shown to be less adaptable to increasing demand (Bos et al., 2020). Since public institutions tend to cater to a general audience, this allows PE-owned and other for-profit nursing homes to offer more individualised care (Bos et al., 2020; Hjelmar et al., 2018). The provision of individualised care affords PE-owned nursing homes the opportunity to establish premium pricing for their services. As other for-profit nursing homes enter the market, the possibility of PE-owned nursing homes positioning themselves at a premium price point will decrease as competition increases. Therefore, it is expected that within less privatised markets, the impact of a buyout by a PE company on the pricing of a nursing home will be greater. The hypothesis that can be derived is as follows:

H3: PE-owned nursing homes operate at a higher price point, especially in less privatised nursing home markets.

3.4 Hypothesis 4 (H4): alleviating nursing staff

In previous research, it has been deemed impossible to find the perfect formula for measuring the quality at nursing homes (Kruse, 2021). This is evident due to the myriad contradictory conclusions observed in research on the impact of PE ownership on nursing home quality, as well as the divergent effects of PE investment in different environments. Given the increasing pressure on nursing homes, this study assesses the potential role of PE ownership in mitigating the demand for nursing personnel. Besides being an important part of finding a solution for the increased pressure on nurses, a great monetary incentive exists for (PE-owned) nursing homes as PEX make up around 50% of the total costs of a nursing home (Braun et al., 2021). This figure is set to increase as demand rises for nurses' services in the future. Previous research indicates that PE firms invest in nursing homes' facilities to support their staff, which warrants these nursing homes to care for the same number of patients with less staff (Bos and Harrington, 2017). Based on these findings, PE-owned nursing homes are expected to decrease their PEX due to increased investments in facilities such as ICT. Besides PEX, there is also a great incentive to decrease the number of employed FTEs under increasing labour supply shortages in the future. As competition for personnel grows with increased competition in nursing home markets, the investments to alleviate nursing staff are expected to be more pronounced in more privatised nursing home industries. Therefore, the following hypothesis is formulated:

H4: PE-owned nursing homes invest more in facilities to reduce dependence on staffing, especially in

highly privatised nursing home markets.

3.5 Hypothesis 5 (H5): staffing mix

Besides investing in operations to support nurses, a decreased demand for nursing staff is also realised by changing the staffing mix towards a staffing model that is more reliant on "brains" than it is on "hands". Previous research suggests that PE-owned nursing homes favour a staffing strategy that leans towards employing fewer but more experienced nurses rather than a larger number of less experienced staff, such as immigrants (Bos and Harrington, 2017; Braun et al., 2021; Gandhi et al., 2023; Gupta et al., 2021; Hjelmar et al., 2018; Nazareno et al., 2021). This preference in staffing mix likely contributes to decreased absolute staffing level in several works of research (Bos and Harrington, 2017; Stevenson and Grabowski, 2008). A reason for this preference could be found in the fact that it takes less effort to coordinate a smaller group of employees. This staffing preference should decrease the demanded number of nurses per patient as the market becomes increasingly private. However, at the same time, this increased privatisation will make it more difficult for players to implement this staffing strategy because competition for experienced nurses will increase. This could mean that at a certain level of privatisation, new entrants switch to a staffing strategy that prioritises "hands" over "brains" as the demand for "brains" has increased to such an extent that it is no longer profitable to implement this strategy. However, this is not necessarily the case, as an increased demand for RNs could spur less experienced nurses to invest in their education to increase the supply of better-educated nursing staff. There is significant room for improvement in this area as less than a quarter of nurses in OECD countries have received tertiary-level education (Llena-Nozal et al., 2022). The following hypothesis is advanced:

H5: PE-owned nursing homes implement a "brains" over "hands" staffing mix, the impact of which decreases as markets become increasingly more private.

4 Data and methodology

This chapter provides an overview of this study's research design, data and methods used to answer the hypotheses from chapter 3. The datasets used, as well as the dependent and independent variables are discussed together with the regressions used to answer the hypotheses. The choice of methodology and the concerns related to the chosen methodology are also elaborated on. Furthermore, an overview of the relevant descriptive statistics is provided at the end of the chapter.

4.1 Research design

As discussed in chapter 3, this study adds to the current standing of academic literature by observing the impact of PE investment on nursing homes across different markets that are characterised by different levels of privatisation. This research design expands on previous research by Gandhi et al. (2023) by measuring the impact of competition on PE investment on the scale of a national market.

A DiD analysis is performed to discern the impact of PE investment on nursing homes in general, not accounting for differences in competition on the market level. The DiD analysis is an important identification strategy in applied economics as it allows for the estimation of effects by comparing changes over time between a treatment group and a control group in a quasi-experimental setting. In the case of this research, the treatment group consists of PE buyouts of nursing homes, and the control group consists of similar nursing home companies that have not been acquired. A DDD analysis enhances the DiD approach by adding a third layer of comparison, specifically privatisation (Berck and Villas-Boas, 2016). The data used for the variables of interest, as well as data on PE buyouts that allow for the DiD and DDD analysis, are described in section 4.2. Endogeneity concerns exist when using DiD and DDD analysis, which are discussed in section 4.3.4.

Firstly, the objective of the proposed hypotheses is to assess the general effect of PE ownership on nursing homes, independent of the market conditions. Secondly, this study also aims to assess whether the impact of PE ownership varies depending on the market environment in which it operates. DiD and DDD analyses are employed for every hypothesis in chapter 3 to achieve this dual aim. The analysis approach for each hypothesis is tailored by examining various relevant dependent variables, allowing for a comprehensive understanding of the influence of PE ownership on nursing homes.

In order to evaluate the impact of PE investment on nursing homes, a timeframe of five years has been selected, namely from the year before the PE buyout (*t-1*) up to three years after the PE buyout (*t+3*). The use of this timeframe is standard practice within research relating to the impact of PE investment on portfolio companies (Bertoni et al., 2013; Boubakri et al., 2005). *T-1* refers to the pre-

buyout period, whereas the period starting from the year after the buyout (*t+1*) up to three years after the buyout (*t+3*). The actual year in which the buyout takes place (*t*) has been removed as it cannot be ascertained whether the financial figures in this year are before or after a buyout.

As the dataset includes a wide range of nursing homes in terms of size and financial performance, this research addresses outliers by winsorising the total sample for many of the variables of interest. The raw, unwinsorised data, as shown in table **2** includes extreme outliers. This has been resolved by winsorising the dependent variables at 5% and 95%. Although somewhat higher than usual, these winsorisation bounds are not uncommon in academic research into PE and its impact on healthcare (Bruch et al., 2020; Castellaneta and Gottschalg, 2016; Huyghebaert and Priem, 2016). Additionally, the utilised regression analyses entail an average of 557 observations, a number that should sufficiently facilitate winsorisation within these specified bounds (Xiang et al., 2014). When using higher winsorisation bounds to account for outliers in the sample, the distribution must not be altered. As can be found in Appendix B.3, this is indeed not the case for the sample used in this study.

By winsorising all collected observations, including outliers, can still be used. All variables are winsorised at the 5th percentile (P_5) and 95th percentile (P_{95}). The following occurs for any variable X_i to observations outside of this range, whereas X_i' refers to the winsorised value of X:

$$X_i' = \begin{cases} P_5 & \text{if } X_i \leq P_5 \\ X_i & \text{if } P_5 < X_i \leq P_{95} \\ P_{95} & \text{if } X_i \geq P_{95} \end{cases} \tag{1}$$

4.2 Data

4.2.1 Dataset 1: Orbis M&A

The dataset from Orbis M&A (previously known as Zephyr), a Bureau van Dijk database, includes large amounts of data regarding PE buyouts. Because Orbis M&A includes a wide range of buyout forms, the following deal types have been included: institutional buyouts and management buyouts. This dataset includes 17 buyouts that include relevant financial figures for all years within the period of interest. Therefore, one buyout provides four observations per relevant dependent variable that can be analysed over time. The data narrowing procedure can be found in Appendix B.4. The Orbis M&A database offers data from 2013 to 2023. Consequently, the buyouts of interest for this study are selected from the period spanning 2014 to 2019, allowing for an evaluation within the relevant timeframe. However, no buyouts in 2019 fulfill the criteria for data collection. Therefore, there is no buyout for this year in the sample. Furthermore, to select the relevant buyouts relating to the nursing

home industry, several selection criteria have been combined to get to the specific deals of interest. Deal comments, deal headlines and target descriptions have been analysed to include “nursing”, “home care” or “elderly home”. Target companies that are part of NAICS 2017 code registration 623 (residential care) have been included in the dataset. However, the NAICS code 6232 has been removed because this code specifically pertains to facilities that provide residential care for individuals with intellectual and developmental disabilities, mental health issues and substance abuse disorders.

Most PE entry deals are deals of interest. Therefore, all deals related to the exit of an investment, including IPOs, are excluded from the sample. Deals in which a PE acquires a minority stake are excluded, as their impact on the nursing home is most likely not as profound as a PE company that acquires a controlling stake in a nursing home. The data from Orbis M&A includes developed economies worldwide, with a focus on Europe, as can be seen from table 4. This sample includes both nursing home sectors that are relatively privatised (e.g. UK, 80.0%), as well as nursing home sectors that are less subjected to private investment (e.g. France, 30.0%). Including both types of markets is crucial, as it enables the investigation of varying observations in markets that are privatised as well as those that are more public.

An illustrative example of a buyout in the UK nursing home industry is the 2015 management buyout of "Signature Senior Lifestyle Limited" by "D.E. Shaw" and "Värde Partners." This transaction, classified under NAICS code 623, represents a strategic acquisition in the private nursing home sector. Financially, the PEX of Signature Senior Lifestyle were notably high, constituting approximately 80% of total costs in the buyout year, presenting a substantial opportunity for the acquirers to tackle these high costs. The buyout resulted in marked improvements in both turnover and profitability (EBIT). Subsequently, there was a significant increase in PEX, along with the number of FTEs.

4.2.2 Dataset 2: Orbis

Orbis, also a Bureau van Dijk database, provides data for the financial figures of both the treatment and control groups in the DiD and DDD analyses. Financial statements between 2012 and 2022 are provided in this database and, therefore, are all for the companies in the used sample. Concerning industry, companies that have NAICS code 623 have been included. Once again, firms with NAICS code 6232 have been removed.

4.2.3 Dependent variables

Before diving into a more detailed discussion of the dependent and independent variables that are used in the DiD and DDD analyses, Appendix A.1 provides an overview of the dependent variables

that are used per hypothesis, as well as the expected results for the DiD and DDD analyses.

H1: Investments in nursing homes

Research suggests that PE companies invest in nursing home facilities to alleviate the nurses they employ (Bos and Harrington, 2017). As a consequence, an increase in operating costs has been witnessed among PE firms that buy nursing homes (Gupta et al., 2021). Firstly, to estimate the impact of PE ownership on investments in the facility, it is important to consider specific items on the Profit and Loss Statement (P&L): these variables of interest are OPEX such as General & Administrative Costs (G&A), as well as CAPEX and Research and Development Expenditure (R&D). It is probable that the investments in ICT will be categorised under G&A. However, should the project be considered big enough, it could be classified as CAPEX. Furthermore, CAPEX captures other large investments in the facilities that potentially decrease stress for nursing staff, such as improved healthcare infrastructure. An example is an investment in robotic aid to nurses that helps lift patients out of bed (Mukai et al., 2010). This is also an example of successful R&D; R&D measures efforts by nursing homes to innovate, which is of interest for public policy. This is particularly true since innovation typically escalates with increased competition, and nursing home chains, often owned by PE, are also frequently early adopters of such innovations (Castle, 2001; Harrington et al., 2012). Relevant results have policy implications regarding the introduction of PE ownership into nursing home markets. However, as Orbis does not explicitly provide R&D, this research is limited to CAPEX and OPEX, which includes G&A. CAPEX is calculated as follows: Total Fixed Assets (TFA) in year *t* minus TFA in year *t-1*, plus depreciation and amortisation in year *t*:

$$TFA_t - TFA_{t-1} + D\&A_t. \tag{2}$$

OPEX are calculated by subtracting the EBITDA from the gross profit.

The variables of interest for H1 are the following: *log (CAPEX), log (OPEX), log (OPEX - PEX)* and *log (PEX). Log (OPEX)* is used for the companies that do not include PEX in the OPEX, whereas *log (OPEX - PEX)* is used for companies that do include PEX in the OPEX. OPEX - PEX is a good representation of OPEX as both variables have a very high correlation, which can be found in Appendix A.2. Furthermore, Gandhi et al. (2023) found increased investment in terms of PEX when the environment of a PE-owned nursing home becomes increasingly competitive. PEX are readily available in the Orbis database and is analysed to estimate the impact of PE ownership on this variable in different levels of market privatisation.

H2: Improvement of financial performance

Academic literature accredits PE ownership with the realisation of improvement of financial performance (Harris et al., 2005; Kaplan, 1989; Wright et al., 2000). Furthermore, academic literature regarding the impact of PE ownership within the public sector also mentions possible improvements in financial performance caused by PE ownership (Bos et al., 2020; Gandhi et al., 2023). To measure profitability, the following metrics have been analysed: *EBITDA/Assets*, *EBITDA/Sales* as well as *EBIT/Assets* and *EBIT/Sales*. The improvement of these profitability ratios relates closely to the efficiency improvements discussed in section 2.2.1. These measures for profitability are highly correlated, as can be found in Appendix A.2, indicating that they provide a good measure of profitability. Since the hypothesis related to profitability regards efficiency improvements, the use of ratios is best suited to measure this. Next to efficiency improvements that lead to increased profitability, academic research also dedicates increased revenue growth through both organic and inorganic channels to PE ownership (Cohn et al., 2022; Paglia and Harjoto, 2014). With regard to revenue growth, be it organic or inorganic, the variable of interest is *log (Revenue)*. This variable aims to measure total growth realised by PE firms after a buyout has occurred by means of either organic or inorganic growth. The data on the financial figures required to construct the profitability variables are readily available in the Orbis database.

H3: Price point

PE firms are expected to make use of the lack of heterogeneity regarding the service offering of competing governmental institutions by increasing services and also the related price (Bos et al., 2020; Hjelmar et al., 2018). This shift in service offering that coincides with increased prices should best be reflected by an increase in turnover per customer. Unfortunately, Orbis does not provide data regarding the number of customers; therefore, a proxy is used for the price per customer. The use of the following metric is a suitable alternative: *log (Turnover/Material Costs)*. Material Costs (Mat. Cost), in this case, are a proxy for the number of customers, as it likely cannot be made significantly more efficient within COGS. Material costs are not likely to be used over more patients than before the buyout since this is not possible due to its characteristics. Material costs, such as bandages, represent a relatively small part of the costs, whilst sharing them over more customers would result in a disproportionate service decline. Material costs are therefore a good proxy for actual number of patients. Consequently, an increase in turnover relative to COGS for these companies indicates that prices for these nursing homes have risen. Similarly, the amount of TFA can be a good approximation of the number of patients in a nursing home since this will increase as the number of accommodations for the patients increases. For that reason, the second variable of interest for testing the hypothesis regarding patient mix is *log*

(Turnover/TFA).

H4: Impact of increased investment on staffing

As the world's population becomes older, increased investment in nursing home facilities may alleviate growing pressure on nursing staff. Several variables are constructed in order to consider the impact of PE ownership on the employment of nursing staff. As the investments in nursing home facilities, accounted for in OPEX or CAPEX, should decrease spending on nurses, the following variables have been considered in the DiD and DDD analyses: *PEX/OPEX* and *PEX/CAPEX*.

Furthermore, due to increased investments in OPEX and CAPEX, the number of FTEs at a nursing home will probably decrease due to the redundancy of some staffing hours. To account for this, the number of FTEs is considered through the following variable of interest for this hypothesis: *log (FTEs)*. Besides evaluating the number of FTEs on a standalone basis, the following variable of interest is also examined: *FTEs/OPEX*. It is expected that the number of FTEs employed will relatively decrease due to increased investment associated with PE ownership.

H5: Staffing mix

Besides decreasing the required support from nurses through investment in the facilities, PE firms may also decrease absolute staffing levels by switching their staff towards fewer but more experienced, better-educated nurses. However, there is no concrete indication of the staff certification level for most nursing home markets. Therefore, the staffing mix is observed through the following variable of interest: *log (PEX/FTEs)*. As more experienced and higher educated nurses receive a higher amount of compensation, this variable allows for the observation of the staffing mix at PE-owned nursing homes. The reduced number of FTEs in H4 may also be attributed to the shift towards employing more highly trained personnel.

4.2.4 Independent variables

Buyout

The DiD regression analysis that is used to evaluate the general impact of PE ownership on nursing homes is as follows:

$$Y_{s,t} = \beta_1 Post\ x\ Buyout_{s,t} + \beta_2 Post_t + \beta_3 Buyout_s + \beta_0 + Year\ FE_t + Strategy\ FE_s + \varepsilon_{s,t}, \quad (3)$$

where $Y_{s,t}$ refers to a dependent variable mentioned in section 4.2.3, used to answer the hypotheses of chapter 3. Appendix A.1 provides an overview of what dependent variables are evaluated per hy-

pothesis for the DiD and DDD regressions, evaluating the impact of PE buyouts on nursing homes. Regarding the subscripts, t refers to the fiscal year relative to the buyout, with control observations taking on the same value as the matched buyout observation. The subscript s refers to the strategy id: a unique combination of company ID and deal year, the latter being the deal year of the matched buyout for the control group. Each combination has four observations with the same fixed effect (*t-1, t+1, t+2, t+3*). By combining two dummy variables, the following variable is constructed: *Post x Buyout*. *Post x Buyout* is an independent variable of interest measuring the impact of PE ownership on nursing homes, independent of the market environment. If this variable is significant, then PE-owned nursing homes perform significantly differently from non-PE-owned nursing homes in the post-buyout period. *Post* is a dummy variable that refers to the period of *t+1* up to and including *t+3*, for both the treatment and control observations. *Buyout* is another dummy variable referring to whether a buyout has occurred. This dummy variable is equal to one for all the years in the sample if the company is acquired at some point in time. This variable separates the treatment group, companies under PE ownership from the control group, and their peers. β_0 refers to the fixed effect of the reference category with respect to fiscal year and strategy id. $Year\ FE_t$ and $Strategy\ FE_s$ refer to the use of year and strategy fixed effects, respectively. $\varepsilon_{s,t}$ represents the error term of the regression.

Market privatisation

The independent variable relating to the level of market privatisation is of great importance as this facilitates the measurement of varying levels of competitive intensity across markets. On the basis of Orbis data, a variable is constructed in order to get an idea of how privatised nursing home industries are in different countries. Based on the NAICS 2017 code relating to nursing homes, all nursing homes in the Orbis database are selected. Subsequently, these companies have been divided on the basis of their standardised legal form in Orbis. The following legal forms have been characterised as firms in the public domain: non-profit companies, public authorities, partnerships and other legal forms. The following legal forms are characterised as private companies: foreign companies, private limited companies and public limited companies. The findings regarding market privatisation align with prior research; for instance, the UK demonstrates a high degree of privatisation at 79.6%, in contrast to the Netherlands, which currently exhibits a much lower level of privatisation at only 20.2%. The privatisation variable for any given country (i) in any given year (t), is constructed as follows:

$$Privatisation_{it} = \begin{cases} 1, & \text{if private legal forms}_{it} \geq 50\% \\ 0, & \text{otherwise} \end{cases} \tag{4}$$

The DDD analysis adds the following variable: *Private*, allowing for the separation of the impact of PE ownership on nursing homes in private sectors from nursing homes in public nursing home sectors. The variable that accounts for this difference is: *Post x Buyout x Private*. This splits the treatment effect of the buyouts into a treatment effect for buyouts in private nursing home sectors and public nursing home sectors. The results of this variable quantify the disparity between two distinct competitive environments. Should any findings for this variable of interest prove to be significant, it would imply that variations in competitive dynamics significantly influence the effects of PE ownership across different markets. For the classification of a private nursing home sector, at least 50% or more of the companies in Orbis for a certain country have to be classified as a legal form that is a private organisation.[1]

The following equation displays the regression for the DDD analysis:

$$Y_{s,t} = \beta_1 Post\ x\ Buyout_{s,t} + \beta_2 Post_t + \beta_3 Buyout_s + \beta_4 Post\ x\ Buyout\ x\ Private_{s,t} + \beta_5 Post\ x\ Private_{s,t} + \beta_6 Private\ x\ Buyout_s + \beta_7 Private_s + \beta_0 + Year\ FE_t + Strategy\ FE_s + \varepsilon_{s,t}, \quad (5)$$

where the variable of interest is the following: *Post x Buyout x Private*. This variable takes on the value one for buyouts in private nursing home markets during the post-buyout period and zero otherwise. If this variable is significant, this means that there is a significant difference between the impact of PE ownership on nursing homes in private versus public nursing home markets. Furthermore, *Post x Private* is a dummy variable that is equal to one in the post-buyout period for companies in private nursing home markets, including both buyouts and control observations. *Private x Buyout* is a dummy variable that is equal to one for buyouts that are located in a privatised nursing home market, and zero otherwise. *Private* takes on the value one for observations in countries that are characterised as having a private nursing home market, and zero otherwise.

Appendix A.1 displays what variables are analysed per hypothesis in order to garner insight into the impact of PE ownership on nursing homes in different market environments. Furthermore, Appendix A.3 displays a table that summarises the interactions between the various independent variables and the regressions that have been performed for the DiD and DDD analyses.

4.3 Methodology and empirical concerns

The methodology for both DiD and DDD analyses are similar, as the DDD analysis can be seen as a DiD effect for the private buyouts minus a DiD effect for the public buyouts. It is estimated by analysing the treatment effect for the public buyouts and the treatment effects for the private buyouts

[1] Analyses have been performed that only include 70% or more privatised and 30% and less privatised markets. However, these do not impact the results. Similarly, dividing the sample by relative privatisation has no impact on results.

separately (Wooldridge, 2020). The DiD analysis is the most suitable method for comparing nursing home companies owned by PE parties with those that are not and for subsequently comparing those acquisitions within different competitive settings. By conducting a DiD analysis, nursing homes owned by PE firms can be compared to other nursing homes.

Two essential assumptions exist for DiD and DDD regressions: parallel trends and no spillover effects. Firstly, the parallel trends assumption implies that in the absence of a buyout, the average change in the dependent variable would be the same for the treatment group as for the control group. In other words, if a buyout company were not acquired, it would display the same development in outcome variables as the nursing homes in the control group that have not been acquired. Secondly, the assumption of no spillover effects states that the treatment of the treatment group does not affect the control group. In this research, the buyout of a nursing home should not impact nursing homes that are not acquired. By randomly selecting acquired entities and constructing an appropriate control group, the causal impact of PE ownership on nursing homes can be determined (Bansraj et al., 2022). To ensure this for this study, empirical methods are used, tailored to the setting of nursing homes (Roberts and Whited, 2013).

4.3.1 Matching and parallel trends

The non-random selection of acquired nursing homes by PE firms is based on the pre-deal financial figures that are displayed by targets. The market cannot perfectly observe the acquisition probability as it only observes pre-acquisition fundamentals (Wang, 2018). Therefore, a priori, any company can be selected to be acquired (Bansraj et al., 2022). To solve for non-random selection of targets, each acquired nursing home is matched to non-acquired nursing homes from the control group that display similar pre-deal financial figures. As will be discussed in section 4.3.4, this technique also alleviates concerns regarding selection effects. Companies are matched using a propensity score (probability score) representing the estimated probability of undergoing a buyout, which is derived from a probit regression with the following pre-deal year financials: *log(TFA)*, *Debt/Assets* and *EBTIDA/Assets*. This propensity score refers to the probability that any firm is acquired based on the metrics of interest. These metrics represent important characteristics for the attractiveness of a potential target: size, leverage and profitability, respectively. Furthermore, the probability of an acquisition of any nursing home is assumed to follow a normal distribution. Each buyout is matched one-to-many, where for every buyout, fifteen control firms that are the nearest neighbours of the buyout company in terms of buyout probability are selected. By selecting fifteen matches for every treated observation, the average of these fifteen control observations is likely an accurate reflection of a company comparable to the

treated observation. The matched firms appear to be very similar to the acquired nursing homes based on the chosen three variables, as the estimated probability of being acquired for the control group is found to be very close to the probability of acquisition for the buyout sample. As can be seen in Appendix B.5, the parallel trends assumption holds for the selected controls and the buyout sample. The variables of both the treated observation and the control observations, show a similar trend during the pre-buyout period on average. As the parallel trends assumption holds, the performed matching process minimises the risk of time-variant Omitted Variable Bias (OVB) (Rassen et al., 2012).

Only buyouts with available data for the variables of interest in the pre-buyout year are eligible to match with the control group. Moreover, an additional filter is applied where buyouts with revenues less than € 500,000 in the year prior to the deal are excluded from the analysis. This threshold is established as buyouts below this figure are not representative of the overall PE buyout population.

4.3.2 *No spillover effects*

Regarding the second assumption of the adopted methodology, the dataset has been examined as to whether cases exist where the treatment group potentially impacts the control group matched to it. Tables **4** and **5** present tabulations summarising the countries and deal years of the buyouts and the matched control group. Spillover effects may exist if we see a small degree of variation in the sample. For instance, if all of the buyouts take place in France, and the control observations are also in France this means that the buyout of these French buyouts will likely have an impact on the control group. As observations in tables **4** and **5** are varied, the assumption can be made that spillover effects prove not to be any hindrance to the validity of the presented results.

4.3.3 *Fixed effects*

Year fixed effects are implemented in regressions to avoid overall macroeconomic movements in the dependent variables that can be correlated with the treatment estimator. This prevents OVB from macroeconomic developments that impact the dependent variables. For instance, the importance of year fixed effects becomes particularly evident when considering the impact of inflation on PEX. Inflation can significantly increase personnel costs over time, potentially skewing regression results if not accounted for. If PEX experience substantial growth in 2021 and 2022 due to inflation, then buyouts from 2018 and 2019, for example, would exhibit an exaggerated increase in PEX during the post-buyout period without the application of year fixed effects, compared to earlier buyouts.

Strategy fixed effects are a combination of deal year and company ID as described in section 4.2.4. These fixed effects capture time-invariant variation and filter out any time-invariant OVB. As the

geographic location of nursing homes is stable, strategy fixed effects also account for country differences, making the use of additional country fixed effects unnecessary. For instance, consider how a company's location influences its strategic decisions and, ultimately, its revenue growth. A company located in a high-growth, emerging market is likely to adopt aggressive expansion strategies, potentially resulting in higher revenue growth compared to a company in a mature, stable market, where the focus might be more on consolidating and optimising existing operations. Without accounting for these location-based strategic variations through strategy fixed effects, a regression analysis could inaccurately attribute the differences in revenue growth to other factors. The use of fixed effects in the performed regressions is expected to result in a high (Adjusted) R^2, as these fixed effects account for all time-invariant variation in the dependent variables.

Regarding the year fixed effects, no categories are significantly different from the reference category, which is 2013.[2] This is unexpected as the sample includes 2020, the year that the COVID-19 pandemic impacted the observations. However, this may be explained by the fact that nursing homes are highly non-cyclical; therefore, no significant difference is likely witnessed in the sample. In contrast, strategy fixed effects do differ significantly from the reference category, which is an Austrian control observation. With regard to the strategy fixed effects, certain fixed effects stand out. For instance, strategy fixed effects for observations in the US and the UK stand out in terms of revenue. These categories report significantly higher revenue figures than the reference category and other strategy fixed effects categories. However, in terms of profitability and efficiency, these firms lag the reference category and other strategy fixed effects categories. This implies that the growth of nursing homes may grow in privatised markets. However, they do not necessarily become more profitable or efficient.

4.3.4 Endogeneity

The aforementioned methodology, regarding the use of fixed effects and matching, aids in alleviating potential endogeneity concerns. Firstly, with regard to buyouts, selection effects endanger the validity of results. As presented in previous literature, PE firms are known to select buyout targets on the basis of certain characteristics, such as profitability (Cressy et al., 2007; Grabowski et al., 2016). If PE firms choose outstanding nursing homes, then the witnessed positive impact on revenue growth, for instance, would not reflect the impact of PE ownership nursing homes but would merely be due to the LP's skill in picking the best firms. However, buyout firms are matched to control firms that are similar in terms of profitability, size and leverage. Therefore, any post-buyout selection effects should be eliminated due to both control and treatment companies showing a similar trend leading up to the

[2] An overview of the output for the full fixed effects is available from the author on request.

year of the buyout. This parallel trend can be witnessed in Appendix B.5.

Besides selection effects, reverse causality or simultaneity may cause concern. The excellent performance of nursing homes may influence the decision of a PE firm to acquire a nursing home. However, this is only the case for performance that predates the acquisition. This study evaluates the impact of PE ownership through the independent variable *Post x Buyout*, which relates only to the post-buyout period. For that reason, any performance leading up to the moment of acquisition is not taken into consideration, effectively alleviating any concern of reverse causality or simultaneity. There can only be simultaneity or reverse causality if post-buyout performance impacts the possibility of a PE acquisition (Roberts and Whited, 2013). Under the assumption that GPs do not have private information regarding future performance, there should, therefore, be no reverse causality or simultaneity for the performed regressions. This also goes for privatisation, as it is assumed that post-buyout performance of nursing homes does not impact the privatisation rate of nursing home markets.

For privatisation, simultaneity may be more of a concern. If the financial performance of nursing homes is good in specific periods, this will entice other for-profit companies to enter the nursing home market. As a result, it is more likely that a market will be characterised as privatised. Therefore, while increased competition from a more privatised market impacts nursing home performance, at the same time, increased performance also increases the rate of privatisation. However, the impact of this reverse causality should be limited as entrance is usually hindered by legislation. This limits the possible impact of nursing home performance on the rate of privatisation. Should the assumption that privatisation impacts the performance of nursing homes be violated, then the aforementioned situation for simultaneity applies to the concept of reverse causality.

Furthermore, OVB can threaten the validity of results. OVB is present when variables in the error term impact the dependent variable whilst also being correlated with clarifying variables (Roberts and Whited, 2013). As discussed in section 4.3.3 combined with the performed robustness checks in section 5.6, it is unlikely that time-invariant OVB impacts the current results. Furthermore, it can be assumed that in the quasi-experimental setting of the DiD and DDD analyses, time-variant OVB is limited due to the matching process as described in section 4.3.1, combined with the parallel trends assumption that seems to hold according to Appendix section B.5. Moreover, time-variant OVB is further limited by the use of year fixed effects. As discussed in section 4.3.3, this removes the impact of time-varying omitted variables such as inflation.

Moreover, the combined use of strategy fixed effects and privatisation variables may suffer from endogeneity. Part of the strategy fixed effects represent a country where a nursing home is located, which is also included in the *Private* independent variable. However, strategy fixed effects are removed,

and the results for the variables of interest remain as good as unaltered, as seen in Appendix A.4. Therefore, this combination does not threaten the validity of the results of this research.

Furthermore, measurement errors also do not pose a threat to the validity of this research. The variables used are easy to quantify and observable, as argued in section 4.2 (Roberts and Whited, 2013). Should a mistake have been made by Orbis, where observations have been recorded falsely, these are corrected through the process of winsorisation described in section 4.1.

4.3.5 *Multicollinearity*

The occurrence of collinearity, also known as multicollinearity, refers to a situation where there is a high degree of correlation among two or more independent variables within a model. This high correlation can lead to challenges in accurately identifying the distinct impact of each variable on the dependent variable (Alin, 2010). However, in this research, the correlation among the independent variables has been assessed, and it has been determined that they are not completely correlated. This lack of complete correlation means the used sample has no perfect collinearity.

4.4 *Descriptive statistics*

This section presents a summary of the descriptive statistics regarding the datasets and performed regressions. This initial analysis provides an overview of the fundamental characteristics of this dataset, encompassing aspects such as the number of countries, amount of privatised and public nursing home sectors, the size and financial health of the nursing homes involved, and the prevalent types of buyouts, whether public or private. While this section will not delve into the intricate causative relationships or predictive analytics, it establishes a clear picture of the current state of nursing home buyouts, forming a basis for further, more detailed econometric analyses.

Table **2** presents an overview of the raw descriptive statistics. The results presented in table **2** clearly show the necessity for winsorisation in this sample. Firstly, CAPEX takes on extremely negative values, which is likely due to TFA being sold in certain years. Secondly, as for certain ratios, the observation for the denominator approaches zero, ratios such as *FTEs/Mat. Cost* and *PEX/CAPEX* take on extreme values. As can be seen in table **3**, these extreme values are resolved. Furthermore, results for revenues, FTEs, PEX, CAPEX, OPEX and OPEX - PEX take on extreme values. This is the reason for using the natural logarithm of these variables in the regressions. Moreover, the data shows quite large differences between PEX and OPEX - PEX, which is unexpected as both should represent OPEX. This is because, in this overview, the companies for which PEX is larger than OPEX have not yet been removed. These companies report a negative OPEX - PEX figure, leading to the difference.

Table 3 presents an overview of the winsorised observations for all dependent variables. This table shows higher mean values across most variables for the buyouts, including OPEX, CAPEX and EBIT, suggesting that these companies are larger or have more substantial operations than those in the control group. However, efficiency ratios like *EBITDA/REV* and *REV/TFA* are generally lower for the buyout group, which may indicate less efficient use of resources despite higher absolute financial figures. The higher payroll expenses per employee in the buyout group could reflect a strategy of investing in higher-skilled or higher-paid labour.

Table 4 encompasses 222 companies in 20 countries, with a strong presence in Spain, Italy and the UK, representing a significant European focus in the dataset. The level of privatisation of the countries in the datasets varies between 7.55% (Lithuania) and 99.87% (New Zealand).

Table 5 displays that over the period from 2014 to 2018, there was a clear peak in buyout activity in 2014, with a decline by 2018. This downward trend could reflect market cycles or external economic factors affecting buyout decisions. However, this image is likely distorted as the sample does not include all buyouts, but merely those that provide financial figures between *t-1* and *t+3*. The control group is matched with a treated entity and subsequently adopts the corresponding deal year.

Table **2**: Raw data on financial figures

This table provides a summary of the raw, unwinsorised financial figures extracted from the Orbis database, encompassing both the complete sample and the subset used in the DiD analysis. Each variable listed is associated with the relevant hypothesis as detailed in section 4.2.3. Negative numbers are displayed in parentheses. All financial figures are in thousands of euros, and ratios are written in decimal numbers.

		Total						DiD - Buyouts						DiD - Control Group					
	Variable	N	Mean	σ	Median	Min	Max	N	Mean	σ	Median	Min	Max	N	Mean	σ	Median	Min	Max
H1	OPEX	578	73039	379485	2468	(12531)	4773358	51	37088	70150	10068	(12531)	305836	527	76518	396695	2196	(4641)	4773358
	CAPEX	800	5795	101672	64	(1833560)	1123384	65	4744	11313	1094	(9911)	63510	735	5888	106025	51	(1833560)	1123384
	PEX	852	35596	200710	2425	11	3196769	62	30037	44202	11610	202	195777	790	36032	208078	2127	11	3196769
	OPEX - PEX	553	24448	145215	481	(241572)	1576589	46	9820	29883	3098	(26281)	110059	507	25776	151340	426	(241572)	1576589
H2	EBIT	873	5090	35842	183	(200884)	422296	68	4751	12585	662	(23722)	73400	805	5119	37149	166	(200884)	422296
	EBITDA	885	8654	50665	399	(20775)	664866	68	9011	22674	1526	(20775)	131777	817	8624	52332	361	(8852)	664866
	REV	888	74215	375692	4093	517	5438224	68	68886	141954	20215	734	728816	820	74657	388860	3885	517	5438224
	EBIT/Assets	873	0.04	0.20	0.04	(3.07)	1.52	68	0.07	0.23	0.03	(0.22)	1.52	805	0.04	0.20	0.04	(3.07)	1.02
	EBIT/REV	873	0.05	0.16	0.04	(2.62)	1.24	68	0.07	0.23	0.07	(0.40)	1.08	805	0.05	0.15	0.04	(2.62)	1.24
	EBITDA/Assets	885	0.08	0.19	0.07	(2.85)	1.54	68	0.11	0.23	0.06	(0.20)	1.54	817	0.07	0.19	0.07	(2.85)	1.05
	EBITDA/REV	885	0.10	0.18	0.09	(2.60)	2.86	68	0.12	0.23	0.13	(0.37)	1.11	817	0.09	0.18	0.08	(2.60)	2.86
H3	TFA	886	59181	312777	2387	0	3572142	68	14188	20881	3470	16	69218	818	62921	325198	2254	0	3572142
	Mat. Cost	548	2475	7018	503	(0)	113859	29	15292	24214	4154	1	113859	519	1759	3256	434	(0)	20639
	REV/TFA	885	20.99	72.90	2.10	0.03	982.74	68	22.86	29.80	11.85	0.31	171.96	817	20.83	75.39	1.91	0.03	982.74
	REV/Mat. Cost	548	(211.92)	5026.43	11.26	(115273.66)	5658.24	29	42.14	190.49	5.95	1.48	1032.22	519	(226.11)	5164.65	11.57	(115273.66)	5658.24
H4	FTE	809	1304	6108	76	0	82000	59	861	963	411	1	3428	750	1339	6337	72	0	82000
	FTEs/OPEX	542	0.13	1.55	0.03	(2.12)	35.78	46	0.08	0.21	0.02	(0.04)	1.39	496	0.13	1.61	0.03	(2.12)	35.78
	PEX/OPEX	553	1.34	4.19	0.78	(51.05)	36.39	46	1.74	4.68	0.73	(0.63)	32.15	507	1.30	4.14	0.79	(51.05)	36.39
	PEX/CAPEX	773	1.65e+15	4.28e+16	12.98	(4.68e+17)	8.52e+17	59	16.93	22.22	10.20	(2.33)	105.26	714	1.79e+15	4.46e+16	13.50	(4.68e+17)	8.52e+17
H5	PEX/FTEs	790	39.47	70.51	28.69	0.34	1080.39	59	44.29	36.96	31.71	3.91	201.57	731	39.08	72.55	28.51	0.34	1080.39

Table **3**: Data on financial figures

This table provides a summary of the financial figures extracted from the Orbis database, after the data has been winsorized, encompassing both the complete sample and the subset used in the DiD analysis. Each variable listed is associated with the relevant hypothesis as detailed in section 4.2.3. Negative numbers are displayed in parentheses. All financial figures are in thousands of euros, ratios are written in decimal numbers.

		Total						DiD - Buyouts						DiD - Control Group					
	Variable	N	Mean	σ	Median	Min	Max	N	Mean	σ	Median	Min	Max	N	Mean	σ	Median	Min	Max
H1	OPEX	578	24325	48197	2468	332	203803	51	32015	52624	10068	467	203803	527	23580	47735	2196	332	203803
	CAPEX	800	2248	5922	64	(1482)	34285	65	3757	6301	1094	(1482)	26462	735	2115	5873	51	(1482)	34285
	PEX	852	14447	28210	2425	292	132313	62	26957	34810	11610	292	132313	790	13465	27412	2127	292	132313
	OPEX-PEX	553	5928	15059	481	(12813)	66140	46	8205	19444	3098	(12813)	66140	507	5722	14603	426	(12813)	66140
H2	EBIT	873	1301	3032	183	(908)	13651	68	3120	4564	662	(908)	13651	805	1148	2816	166	(908)	13651
	EBITDA	885	2539	5477	399	(249)	24251	68	5438	7476	1526	(249)	24251	817	2297	5211	361	(249)	24251
	REV	888	28312	60648	4093	678	312822	68	50076	74657	20215	734	312822	820	26508	59034	3885	678	312822
	EBIT/Assets	873	0.05	0.09	0.04	(0.19)	0.29	68	0.04	0.09	0.03	(0.19)	0.29	805	0.05	0.09	0.04	(0.19)	0.29
	EBIT/REV	873	0.06	0.08	0.04	(0.13)	0.24	68	0.05	0.11	0.07	(0.13)	0.24	805	0.06	0.08	0.04	(0.13)	0.24
	EBITDA/Assets	885	0.08	0.09	0.07	(0.11)	0.32	68	0.08	0.10	0.06	(0.11)	0.32	817	0.08	0.09	0.07	(0.11)	0.32
	EBITDA/REV	885	0.10	0.09	0.09	(0.09)	0.30	68	0.11	0.12	0.13	(0.09)	0.30	817	0.10	0.09	0.08	(0.09)	0.30
H3	TFA	886	20975	47844	2387	20	252279	68	14188	20881	3470	22	69218	818	21540	49392	2254	20	252279
	Mat. Cost	548	2022	3483	503	32	15030	29	7470	5553	4154	32	15030	519	1717	3064	434	32	15030
	REV/TFA	885	11.23	18.45	2.10	0.30	67.23	68	20.35	22.03	11.85	0.31	67.23	817	10.47	17.93	1.91	0.30	67.23
	REV/Mat. Cost	548	14.66	12.24	11.26	1.92	53.76	29	8.41	9.92	5.95	1.92	52.30	519	15.01	12.27	11.57	1.92	53.76
H4	FTEs	809	476	917	76	9	3596	59	861	963	411	9	3416	750	446	907	72	9	3596
	FTEs/OPEX	542	0.06	0.07	0.03	0.00	0.32	46	0.05	0.07	0.02	0.00	0.32	496	0.06	0.07	0.03	0.00	0.32
	PEX/OPEX	553	1.13	1.08	0.78	0.05	4.69	46	1.15	1.06	0.73	0.05	4.29	507	1.13	1.09	0.79	0.05	4.69
	PEX/CAPEX	773	38.58	78.98	12.98	(75.35)	413.74	59	16.93	22.22	10.20	(2.33)	105.26	714	40.37	81.69	13.50	(75.35)	413.74
H5	PEX/FTEs	790	33.17	14.78	28.69	14.40	68.55	59	38.11	19.04	31.71	14.40	68.55	731	32.78	14.33	28.51	14.40	68.55

Table 4: Distribution of represented countries in both the control and treatment group
This table provides the frequencies for the geographies for the companies in both the treatment and control group, as well as the level of privatization of the nursing home market in these countries.

	Total		Buyout		Control Group		Privatization
Country	Frequency	Percent	Frequency	Percent	Frequency	Percent	Percent
Austria	4	1.80	-	-	4	1.95	72.34
Belgium	29	13.06	-	-	29	14.15	23.28
Croatia	1	0.45	-	-	1	0.49	42.71
Finland	6	2.70	4	23.53	2	0.98	65.21
France	22	9.91	3	17.65	19	9.27	29.58
Germany	21	9.46	-	-	21	10.24	80.97
Hungary	1	0.45	-	-	1	0.49	27.75
Ireland	2	0.90	-	-	2	0.98	37.50
Italy	27	12.16	1	5.88	26	12.68	43.54
Lithuania	1	0.45	-	-	1	0.49	7.55
Netherlands	1	0.45	-	-	1	0.49	20.19
Norway	3	1.35	-	-	3	1.46	43.31
New Zealand	1	0.45	-	-	1	0.49	99.87
Portugal	3	1.35	-	-	3	1.46	41.86
Slovenia	1	0.45	-	-	1	0.49	32.92
Spain	38	17.12	5	29.41	33	16.10	61.01
Sweden	10	4.50	-	-	10	4.88	81.94
Thailand	1	0.45	-	-	1	0.49	80.32
UK	44	19.82	4	23.53	40	19.51	79.59
US	6	2.70	-	-	6	2.93	66.31
Total	222	100.00	17	100.00	205	100.00	

Table 5: Distribution of the years represented in buyout sample
This table provides the frequencies for the annual buyouts for the companies in the buyout group. Matched control groups follow the buyout year of the treated observation to which they are matched

	Total		Buyout		Control Group	
Year	Frequency	Percent	Frequency	Percent	Frequency	Percent
2014	93	41.89	7	41.18	86	41.95
2015	61	27.48	5	29.41	56	27.32
2016	12	5.41	1	5.88	11	5.37
2017	40	18.02	3	17.65	37	18.05
2018	16	7.21	1	5.88	15	7.32
Total	222	100.00	17	100.00	205	100.00

5 Results and discussion

This chapter analyses the results grounded in the DiD and DDD regression approaches, revealing nuanced insights into the performance of PE-owned nursing homes post-buyout. The results for the hypotheses of chapter 3 are presented, after which this chapter concludes with a discussion of the results.

5.1 Testing hypothesis 1

This section provides a detailed analysis of H1: PE ownership increases investment in nursing homes after a buyout and is higher within privatised markets.

Table **6**: DiD and DDD models of PE ownership's impact on investments in nursing homes
This table shows the impact of PE ownership on investment in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects. The constant is omitted as it reflects the fixed effects of the reference category.

	Log CAPEX		Log OPEX min PEX		Log OPEX		Log PEX	
Post x Buyout	0.037	0.376	0.515**	-0.440**	0.660**	-0.064	0.499**	0.628
	(0.447)	(0.966)	(0.252)	(0.217)	(0.259)	(0.162)	(0.231)	(0.581)
Post	-0.122	-0.380	-0.142	-0.354	0.020	-0.118	0.129	0.172
	(0.450)	(0.487)	(0.168)	(0.251)	(0.207)	(0.241)	(0.233)	(0.274)
Buyout	5.023***	-1.815***	1.413***	1.711***	1.188***	0.685***	0.961***	-1.424***
	(0.335)	(0.677)	(0.153)	(0.247)	(0.185)	(0.172)	(0.215)	(0.481)
Post x Buyout x Private		-0.668		1.043***		0.768**		-0.168
		(0.996)		(0.358)		(0.303)		(0.599)
Post x Private		0.545		0.176		0.127		-0.059
		(0.414)		(0.189)		(0.099)		(0.095)
Private x Buyout		2.639***		-2.041***		-0.473*		3.863***
		(0.718)		(0.389)		(0.251)		(0.503)
Private		-6.993***		-0.604***		-1.166***		-2.239***
		(0.457)		(0.210)		(0.074)		(0.086)
Constant	2.583**	9.332***	6.591***	7.166***	7.460***	8.624***	7.203***	9.471***
	(1.008)	(0.954)	(0.195)	(0.073)	(0.116)	(0.100)	(0.173)	(0.185)
Observations	284	284	220	220	400	400	692	692
R^2	0.931	0.932	0.984	0.988	0.978	0.980	0.971	0.972
Adjusted R^2	0.904	0.904	0.977	0.983	0.970	0.972	0.961	0.961
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6 displays the results for the DiD and DDD analyses concerning investment in the nursing

homes that PE firms acquire. These findings largely align with the proposed hypothesis, particularly in relation to OPEX. However, CAPEX does not yield significant results. The explanation could be that the PE firms do not undertake great infrastructure projects associated with CAPEX; instead, they opt for improvements relating to day-to-day operations, which are more associated with OPEX. This aligns with the academic viewpoint of PE firms as value creators by making daily operations more efficient (Harris et al., 2005; Wright et al., 2000). For both variables relating to OPEX, there is a significant impact of market competition on the level of investment. Overall, after a PE buyout OPEX and OPEX excluding PEX increase 66.0% and 51.5%, respectively, indicating an overall positive impact of PE ownership on investment in nursing home operations. While PE ownership generally positively impacts investment, the DDD analysis reveals a notable distinction between investment patterns in private and public nursing home markets. Whereas PE investment in a relatively public nursing home market is associated with OPEX excluding PEX declining 44.0%, OPEX investment by PE in a private nursing home market increases significantly relative to public counterparts, rising between 60.3% and 76.8% for OPEX excluding PEX and OPEX respectively.

PEX is similar to OPEX, as PEX are positively impacted by PE investment in general. Whereas OPEX rise up to 66.0% as a consequence of PE investment, PEX increase by 49.9% on a general level. Therefore, the investment made by PE firms into facilities appears to be similar to the investments made into nursing homes' staff. However, for PEX there is no significant difference between PE ownership in public and private markets. On the basis of the coefficient, the overall positive impact does seem to stem from buyouts in public markets, whereas PEX appear to decrease as a result of PE investment in private markets.

In summation, the hypothesis that PE ownership increases investment in nursing homes after a buyout and is higher within privatised markets is confirmed for operating expenses as it increases between 51.5% and 66.0% overall. This result is driven by private markets, where investment increases between 60.3% and 76.8%, whereas for public markets, OPEX decrease up to 44.0%. This hypothesis is partially confirmed for PEX, as PE ownership increases investment by 49.9%. However, there is no significant difference between relatively public and relatively private nursing home markets. The hypothesis is rejected for CAPEX, as PE ownership does not significantly impact CAPEX. This seems to be due to PE firms' preference to focus on daily operations over more long-term projects.

5.2 Testing hypothesis 2

To see whether any potential increase of investment influences profitability or revenues at nursing homes, this section delves into an in-depth examination of H2: PE ownership increases profitability and

revenue, where improvements are higher for PE-owned nursing homes within less privatised nursing home markets.

Table 7: DiD and DDD models of PE ownership's impact on revenue and profitability
This table shows the impact of PE ownership on profitability and revenue growth of nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects. The constant is omitted as it reflects the fixed effects of the reference category.

	EBITDA/Assets		EBITDA/REV		EBIT/Assets		EBIT/REV		Log REV	
Post x Buyout	-0.001	-0.022	-0.009	-0.014	-0.010	-0.043	-0.013	-0.047	0.349*	0.731*
	(0.023)	(0.035)	(0.032)	(0.044)	(0.027)	(0.040)	(0.029)	(0.034)	(0.211)	(0.431)
Post	0.011	0.008	-0.029	-0.024	0.020	0.020	0.010	0.016	0.098	0.079
	(0.031)	(0.033)	(0.039)	(0.039)	(0.030)	(0.032)	(0.037)	(0.038)	(0.172)	(0.173)
Buyout	0.147***	0.172***	-0.013	0.143**	-0.051**	0.074**	0.058***	0.092*	1.534***	-0.917***
	(0.026)	(0.034)	(0.030)	(0.059)	(0.020)	(0.034)	(0.022)	(0.050)	(0.162)	(0.344)
Post x Buyout x Private		0.026		0.008		0.043		0.047		-0.510
		(0.043)		(0.061)		(0.049)		(0.050)		(0.488)
Post x Private		0.005		-0.008		-0.001		-0.011		0.047
		(0.016)		(0.014)		(0.018)		(0.014)		(0.065)
Private x Buyout		-0.160**		-0.336***		-0.170***		-0.100		3.145***
		(0.064)		(0.112)		(0.057)		(0.098)		(0.449)
Private		0.006		0.158***		0.102***		0.017		-2.202***
		(0.031)		(0.047)		(0.026)		(0.044)		(0.100)
Constant	0.033***	0.025	0.284***	0.129***	0.093***	-0.010	0.013	-0.001	7.890***	10.083***
	(0.011)	(0.031)	(0.014)	(0.043)	(0.025)	(0.030)	(0.022)	(0.042)	(0.089)	(0.162)
Observations	880	880	880	880	860	860	860	860	888	888
R^2	0.634	0.636	0.584	0.584	0.586	0.590	0.514	0.517	0.973	0.974
Adjusted R^2	0.505	0.506	0.437	0.435	0.440	0.444	0.343	0.344	0.963	0.965
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In contrast to the general academic viewpoint that PE ownership stimulates profitability, this does not appear to be the case for nursing homes (Harris et al., 2005; Kaplan, 1989; Wright et al., 2000). As shown in table 7, profitability is not significantly impacted by PE ownership, nor is there a significantly different impact on profitability in public or private nursing home markets. There does seem to be a more positive impact on profitability among buyouts in private settings. Nonetheless, the difference is negligible.

However, in line with academic literature, PE firms significantly increase revenue. Revenue growth in the post-buyout period increases significantly by 34.9%. There seems to be no difference in revenue growth in private or public markets. However, the sign of the coefficient for privatisation, *Post x Buyout x Private* suggests that the majority of the revenue growth is realised in public nursing home markets.

This is in line with the presented view in current research that highly public markets respond slowly to changes in demand (Bos et al., 2020).

To conclude, the hypothesis that PE ownership increases profitability and revenue, where improvements are higher for PE-owned nursing homes within privatised nursing home markets, is partially accepted. For revenues, PE ownership does have a significant positive impact, increasing revenues by 34.9%. However, the impact of PE ownership on revenue does not change in different market environments. Furthermore, for profitability, there appears to be no significant impact. There is also no significantly different impact on revenue within different levels of market privatisation.

5.3 Testing hypothesis 3

Given the increased OPEX and revenues for H1 and H2, respectively, it is interesting to see if these investments increase the prices and whether price changes drive the revenue increase. This section is dedicated to exploring and analysing H3: PE-owned nursing homes operate at a higher price point, especially in less privatised nursing home markets.

Table **8**: DiD and DDD models of PE ownership's impact on pricing
This table shows the impact of PE ownership on price changes per customer in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects. The constant is omitted as it reflects the fixed effects of the reference category.

	Log REV/TFA		Log REV/Mat. Cost	
Post x Buyout	0.148	-0.224*	-0.136	-0.434*
	(0.329)	(0.135)	(0.186)	(0.231)
Post	-0.062	-0.180	0.247	0.441*
	(0.193)	(0.247)	(0.179)	(0.237)
Buyout	2.059***	2.561***	-1.362***	-1.159***
	(0.311)	(0.135)	(0.112)	(0.138)
Post x Buyout x Private		0.446		0.674**
		(0.402)		(0.267)
Post x Private		0.166		-0.126
		(0.134)		(0.098)
Private x Buyout		-2.225***		0.826***
		(0.348)		(0.200)
Private		0.110		-0.627***
		(0.123)		(0.074)
Constant	-1.243***	-1.427***	3.519***	3.459***
	(0.170)	(0.238)	(0.079)	(0.059)
Observations	880	880	220	220
R^2	0.926	0.929	0.967	0.976
Adjusted R^2	0.900	0.903	0.954	0.966
Year FE	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓

Clustered standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The results in table **8** are insignificant for the overall impact of PE buyouts. However, the DDD analysis offers insights into a potential difference with regard to price setting in different market environments. The analysis shows that buyouts in private settings increase prices by 24.0%, potentially coinciding with a higher service offering. In contrast, revenues over material costs decrease significantly by 43.4% for PE-owned nursing homes in public nursing home markets. A possible explanation for this phenomenon can be found in PE firms employing price competition at the beginning of the post-buyout period in public markets, as discussed by Marwell and McInerney (2005). In a relatively public market there is a lower degree of heterogeneity in terms of service offerings. Therefore, the nursing home that has just been acquired likely does not support the facility needed to support a higher service quality until after investment has been made. Until this is the case, nursing homes may compete on price compared to public institutions, which explains the significantly decreasing revenues over material costs. In contrast, for more privatised markets, more buyout targets that offer a higher quality of service are available, which warrants a higher price point. After the buyout, there is therefore no need for increased price competition, which could explain why buyouts in a private market do display a significant increase in revenues over material costs.

A comparable representation is observed for revenue over TFA. In this case, no general findings can be made about PE buyouts because *Post x Buyout* is again insignificant. For revenue over TFA, however, there is no significant difference between private and public nursing home markets as *Post x Buyout x Private* is also insignificant. However, in public markets, prices are decreased by 22.4%. In contrast, the coefficient for *Post x Buyout x Private* indicates that prices increase in privatised markets, as was the case with revenue over material costs.

In summary, the hypothesis that PE-owned nursing homes operate at a higher price point, especially in less privatised nursing home markets, is rejected. PE ownership does not have an overall incremental impact on pricing. However, the results suggest a price increase of 24.0% in private markets whilst showing a decline between 22.4% and 43.4% in public markets. This may be explained by employed price competition, as the acquired nursing homes in a public market may not possess the capabilities that warrant a higher price point.

5.4 Testing hypothesis 4

To evaluate whether increased investments in OPEX lead to reduced dependence on staffing, this section evaluates H4: PE-owned nursing homes invest more in facilities to reduce dependence on staffing, especially in highly privatised nursing home markets.

The DiD analysis of table **9** seems to indicate a negative impact of PE-owned nursing homes'

investments in facilities on PEX. The overall finding in the DiD analysis is not significant, however, and the findings of the DDD analysis show the reason for this. Similar to other general findings regarding PE investment, general results can be inconsistent if the competitive environment is not considered (Gandhi et al., 2023).

The DDD analysis suggests a significant difference between buyouts in privatised and public markets. In contrast to private markets, public market buyout targets seem to increase PEX per OPEX spent. This likely is due to the fact that for these firms, OPEX decrease significantly in the post-buyout period, whereas their counterparts in private markets increase OPEX. As a result, buyouts in private nursing home sectors relatively decrease PEX to OPEX by 41.4 percentage points compared to their counterparts in a public market. Combining these findings indicates that PE firms in private markets can decrease PEX due to increased investment in facilities.

Furthermore, whilst investments in nursing home facilities decrease PEX, the same cannot be said for the number of FTEs employed at these facilities. The DiD presents the number of FTEs to increase significantly by 27.0% following a buyout. This is likely related to the increase in PEX of 49.9% found for H1, suggesting that PE firms hire more nursing staff to facilitate revenue growth. There appears to be no significant difference between the increase in the number of FTEs in private and public markets. Furthermore, although PE investment in nursing significantly impacts PEX, the same cannot be said for FTEs. Employed FTEs increase by 27.0% overall, which is likely influenced by the overall revenue growth of 34.9% found for H2. Similar to revenue growth, there is no significant difference in the growth of the number of FTEs in private and public markets.

To conclude, the hypothesis that PE-owned nursing homes invest more in facilities to reduce dependence on staffing, especially in highly privatised nursing home markets, is partially accepted. For PEX over OPEX, the results display that although in public markets, PE firms do not have any meaningful impact, this ratio decreases in a private setting by 41.4 percentage points. In light of the increased OPEX investments found for H1, the impact of PE ownership therefore seems to reduce PEX in private markets. However, the results do not imply a reduced employed workforce in terms of the number of FTEs. The number of FTEs generally increases by 27.0% under PE ownership, likely influenced by the revenue growth that is witnessed for H2, which grows by a similar percentage overall. In contrast to PEX, OPEX investments do not influence the number of FTEs employed at PE nursing homes, which may be explained by a staffing mix that is reliant on more but less experienced nurses.

Table **9**: DiD and DDD models of the impact of investments on staffing

This table shows the impact of PE ownership investment on staffing requirements in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects. The constant is omitted as it reflects the fixed effects of the reference category.

	PEX over OPEX		PEX/CAPEX		FTEs/OPEX		Log FTEs	
Post x Buyout	-0.229	0.111	12.660	13.176	-0.037	0.024	0.270**	0.070
	(0.149)	(0.073)	(20.766)	(36.454)	(0.023)	(0.024)	(0.125)	(0.150)
Post	0.011	-0.280	1.307	12.356	-0.013	-0.015	-0.074	-0.079
	(0.148)	(0.305)	(23.147)	(25.545)	(0.027)	(0.031)	(0.132)	(0.158)
Buyout	0.112	-0.364***	-67.335***	-68.222**	0.014	-0.034	-0.706***	-0.547***
	(0.146)	(0.075)	(14.525)	(26.647)	(0.014)	(0.026)	(0.097)	(0.134)
Post x Buyout x Private		-0.414**		0.840		-0.069		0.247
		(0.166)		(43.026)		(0.045)		(0.209)
Post x Private		0.169*		-19.046		0.007		-0.022
		(0.094)		(35.626)		(0.011)		(0.071)
Private x Buyout		3.327***		72.178**		0.233***		-0.867***
		(0.117)		(33.434)		(0.042)		(0.184)
Private		-0.394**		-40.673		-0.011		3.005***
		(0.165)		(27.593)		(0.020)		(0.069)
Constant	0.425***	0.714***	96.862**	97.648**	0.006	0.007	4.963***	4.951***
	(0.097)	(0.033)	(40.471)	(45.640)	(0.009)	(0.007)	(0.116)	(0.111)
Observations	320	312	200	200	296	296	524	524
R^2	0.933	0.970	0.647	0.652	0.876	0.882	0.981	0.981
Adjusted R^2	0.907	0.958	0.498	0.498	0.827	0.834	0.973	0.974
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓

Clustered standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.5 Testing hypothesis 5

To investigate the impact of PE ownership on possible changes in staffing mix, this section delves into a comprehensive assessment of H5: PE-owned nursing homes implement a “brains” over “hands” staffing mix, the impact of which decreases as markets become increasingly more private.

Table **10**: DiD and DDD models of the impact of PE ownership on staffing mix
This table shows the impact of PE ownership on the staffing mix in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects. The constant is omitted as it reflects the fixed effects of the reference category.

	Log PEX/FTEs	
Post x Buyout	0.026	-0.051
	(0.059)	(0.051)
Post	0.015	-0.045
	(0.042)	(0.055)
Buyout	-0.018	0.046
	(0.048)	(0.041)
Post x Buyout x Private		0.070
		(0.082)
Post x Private		0.076*
		(0.045)
Private x Buyout		0.300***
		(0.063)
Private		-1.289***
		(0.036)
Constant	3.943***	3.968***
	(0.047)	(0.047)
Observations	504	504
R^2	0.953	0.955
Adjusted R^2	0.936	0.938
Year FE	✓	✓
Strategy FE	✓	✓

Clustered standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table **10** implies that in terms of staffing mix, there seems to be very little change in the post-buyout period for the nursing homes that experienced a buyout. However, the coefficients of the DDD analysis do indicate that in a public setting, the staffing mix changes slightly more towards "hands". In contrast, the coefficient in private nursing home markets implies that a staffing mix based on "brains"

is preferred. Nevertheless, these results are not significant.

The hypothesis that PE-owned nursing homes implement a "brains" over "hands" staffing mix, the impact of which decreases as markets become increasingly more private, is rejected. The results present no significant impact of PE ownership on PEX over FTEs, nor any significant difference between this impact in private or public nursing home markets.

5.6 Robustness checks

In order to reinforce the aforementioned results and the insights that these bring to the academic discourse regarding PE, this section presents several robustness checks on these results. As mentioned earlier, Appendix B.5 displays checks on the parallel trends assumption. No results are found that imply that this assumption is violated for the nursing home sample.

Additionally, to assess the sensitivity of the results to variations in certain parameters, the analysis was conducted under two modifications: employing robust standard errors and excluding the use of year and strategy fixed effects. Appendix A.4 displays the impact of omitting both year and strategy fixed effects from the used regressions. No significant changes exist in this model compared to the original model. Although coefficients are changed to some extent, this version of the model does not produce significantly different results. Overall, the use of fixed effects seems to increase the impact of the independent variable of interest for the DiD analysis: *Post x Buyout*. This is likely because the employed fixed effects remove time-invariant OVB for the companies and years in the sample.

Moreover, to further test the robustness of the model, the use of clustered standard errors has been replaced with robust standard errors in Appendix A.5. The significance of results does not change as standard errors do not move significantly. Therefore, the use of clustered standard errors has not been problematic.

6 Conclusion

The global population, especially in the Western world, experiences an increasing amount of grey pressure, putting a strain on nursing homes. As nursing homes become increasingly owned by for-profit parties, such as PE firms, this study has aimed to evaluate the impact of PE ownership on acquired nursing homes. By investigating a sample of 17 nursing home buyouts and 205 matched companies worldwide between 2014 and 2018, this research finds a significant difference in buyouts that occur in private nursing home sectors compared to nursing home sectors that are more publicly owned. This chapter concludes on the findings of the DiD and DDD analyses, affirming certain conventional viewpoints while challenging others. Furthermore, the limitations of this research are discussed, together with suggestions for future research.

6.1 Discussion of the findings of this study

Building further upon the work of Gandhi et al. (2023) and Gupta et al. (2021), this study demonstrates that PE investment in nursing homes leads to an increase in OPEX, particularly in highly privatised markets, driven by market competition. This increase in OPEX, while CAPEX appears not to be impacted by PE ownership, suggests that PE firms primarily enhance value through operational efforts rather than significant infrastructure investments. OPEX in private markets increase between 60.3% and 76.8%. In contrast, in public markets, OPEX decline up to 44.0%. This indicates that private nursing home markets could benefit from PE ownership in terms of investment. Conversely, policymakers overseeing publicly owned nursing home markets should be cautious regarding PE ownership. Similar to OPEX, PEX also generally increases at nursing homes that PE firms acquire.

Increased OPEX and PEX can partially be attributed to the finding that revenues generally increase under PE ownership by 34.9%. Revenue growth in public settings appears to be higher, as reduced competition from public nursing homes offers more possibilities for growth. In line with revenue growth, FTEs employed at nursing homes also increase by 27.0% overall. Regardless of increased investment and revenue growth, PE ownership does not seem to impact profitability improvements during the post-buyout period. This contrasts with the academic literature (Harris et al., 2005; Kaplan, 1989; Wright et al., 2000).

Regarding price changes, the results are mixed. While PE-owned nursing homes in private markets seem to leverage their position to enhance service offerings and patient mix, thereby commanding higher prices, those in public markets face challenges in achieving similar outcomes. In public markets, PE firms demonstrate a tendency to enter the market with strategies focused on price competition.

As a result, revenues over material costs of PE-owned nursing homes decrease in public markets by 43.4%, whereas nursing home markets in private markets increase revenues over material cost by 24.0%. The implications of this on policy are ambiguous; should the policy be aimed at realising lower prices within the nursing home sector, then the introduction of PE ownership in a public market should be preferred. However, this advice is to be taken with caution since the price decrease may disappear once the nursing homes receive the necessary investment to operate at a higher price point. If policymakers aim to increase heterogeneity among nursing homes, then introduction of PE ownership in a private market should be welcomed. However, a potential increased service offering comes at increased prices. Furthermore, there is no indication of an increase in expertise among nurses employed at PE-owned nursing homes regarding received wage increases.

Interestingly, this study finds that the investment in OPEX that comes with PE ownership can significantly decrease the relative amount of PEX. As a result of the OPEX investment made by PE firms, the PEX over OPEX increase by 41.4 percentage points in private markets. This is a positive signal towards introducing PE ownership in a private market that is going to experience strain in terms of staffing due to increasing grey pressure in the future as PE firms appear successful at replacing PEX with OPEX. The investment patterns of PE-owned nursing homes suggest a strategic shift towards reducing reliance on staffing in privatised markets.

In summary, this study contributes to the understanding of the complex dynamics of PE ownership in the nursing home sector. It highlights the heterogeneity of PE investment strategies and outcomes across different market environments. The insights gained from this research can inform policymakers, industry stakeholders, and academics about the multifaceted role of PE in healthcare services, paving the way for more informed decisions and strategies in the future.

6.2 Limitations and recommendations

The most evident limitation of this study lies in the small sample size of the nursing home buyout sample. As the current sample includes 17 buyouts, the results can be further reinforced in future research by expanding research with an increased number of buyouts. Expanding the sample size in future research could substantially reinforce the study's findings. With more buyouts included, the results would likely be more robust and representative of the broader population of nursing home buyouts. This expansion would not only enhance the reliability of the conclusions drawn but also allow for more complex statistical analyses. Furthermore, the data can also be winsorised at lower bounds. Additionally, more observations together with a larger timeframe would also bring interesting insights. Orbis provides a dataset covering a duration of ten years, which is relatively limited. When evaluating

a greater period, for example, by expanding to *t-2 and t-3* as well as evaluating the impact over a longer post-buyout period, the impact of PE ownership can be measured over a greater period of time. In which for instance more add-on acquisitions can be performed, which has significant implications for H2 of this study.

Regarding efficiency improvements, previous research has specifically mentioned investment into ICT infrastructure by PE companies as a source of efficiency regarding personnel use. This research has utilised total OPEX as a proxy measure for these types of investments. However, should specific cost data related to ICT become available, it would present an intriguing avenue for further research. Besides ICT, there are other that innovations that can be achieved in nursing homes. The impact of PE ownership on innovation in the nursing home sector is, therefore, an interesting field for future research. Should data on R&D be available, then this allows measurement of how much PE-owned nursing homes put into innovating in the public sector in which they are active.

Furthermore, detailed information on customers per nursing home allows for a more detailed understanding of turnover per customer than the proxy used in this study. If customer data is available for use, then this can replace material costs for more confidence in the findings regarding increased price per customer. As Orbis or other databases include more PE nursing home buyouts in the future, it is advisable to go back to this study and see whether results change, as the current study includes a relatively small amount of buyouts.

Moreover, this study has specifically decided to omit quality implications as part of its scope as there has so far not been any consistent standard that can be applied in this context. Should the data or metrics come into existence that can reliably measure the overall quality of a nursing home, then this provides a reason to also evaluate the impact of PE ownership on these quality metrics.

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A Tables

A.1 Overview variables

Table **11**: Expected impact of buyout and privatisation on dependent variables
This table provides an overview of the expected impact of independent variables used in the DiD and DDD regressions on dependent variables per hypothesis. The first + or - refers to the general impact of PE ownership on a dependent variable, whereas the second + or - refers to how this impact changes in a privatised setting.

		Expected Impact of Independent Variables	
	Dependent Variables	Buyout	Privatisation
H1	OPEX	+	++
	CAPEX	+	++
	PEX	+	++
	OPEX - PEX	+	++
H2	EBIT	+	+-
	EBITDA	+	+-
	REV	+	+-
	EBIT/Assets	+	+-
	EBIT/REV	+	+-
	EBITDA/Assets	+	+-
	EBITDA/REV	+	+-
H3	REV/TFA	+	+-
	REV/Mat. Cost	+	+-
H4	FTEs	-	--
	FTEs/OPEX	-	--
	PEX/OPEX	-	--
	PEX/CAPEX	-	--
H5	PEX/FTEs	+	+-

A.2 Correlation matrix

Table **12**: Correlation matrix
This table provides a correlation matrix between the dependent variables that are used in the DiD and DDD analyses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) OPEX	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(2) CAPEX	0.72	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(3) PEX	0.99	0.72	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(4) OPEX - PEX	0.95	0.65	0.91	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(5) EBIT	0.78	0.54	0.77	0.74	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.
(6) EBITDA	0.88	0.68	0.87	0.84	0.95	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.
(7) REV	0.99	0.74	0.99	0.95	0.80	0.90	1.00	.	.	.	.	.	.	.	.	.	.	.	.
(8) TFA	0.83	0.75	0.82	0.81	0.74	0.86	0.86	1.00	.	.	.	.	.	.	.	.	.	.	.
(9) EBIT/Assets	-0.04	-0.05	-0.03	-0.06	0.13	0.06	-0.03	-0.06	1.00	.	.	.	.	.	.	.	.	.	.
(10) EBIT/REV	-0.03	-0.02	-0.03	-0.05	0.26	0.17	-0.02	0.04	0.71	1.00	.	.	.	.	.	.	.	.	.
(11) EBITDA/REV	0.01	0.08	0.01	-0.00	0.26	0.24	0.03	0.13	0.55	0.89	1.00	.	.	.	.	.	.	.	.
(12) EBITDA/Assets	-0.00	-0.01	0.00	-0.02	0.12	0.09	0.01	-0.04	0.94	0.61	0.55	1.00	.	.	.	.	.	.	.
(13) Mat. Cost	0.92	0.70	0.92	0.86	0.76	0.87	0.93	0.83	-0.04	-0.00	0.07	0.01	1.00	.	.	.	.	.	.
(14) REV/TFA	-0.21	-0.20	-0.22	-0.17	-0.21	-0.25	-0.22	-0.25	0.08	-0.16	-0.33	0.03	-0.24	1.00	.	.	.	.	.
(15) REV/Mat. Cost	0.03	-0.04	0.03	0.03	-0.02	-0.05	0.01	-0.07	-0.01	-0.05	-0.11	-0.05	-0.14	0.10	1.00	.	.	.	.
(16) FTEs	0.95	0.64	0.95	0.90	0.80	0.87	0.93	0.76	-0.01	0.03	0.05	0.01	0.89	-0.22	0.02	1.00	.	.	.
(17) FTEs/OPEX	-0.03	-0.04	-0.02	-0.08	0.07	0.02	-0.03	0.00	0.13	0.31	0.26	0.07	-0.01	-0.21	-0.23	0.13	1.00	.	.
(18) PEX/OPEX	0.19	0.14	0.23	0.06	0.17	0.17	0.19	0.17	0.11	0.18	0.18	0.11	0.19	-0.32	-0.28	0.22	0.65	1.00	.
(19) PEX/CAPEX	-0.23	-0.21	-0.23	-0.21	-0.21	-0.24	-0.23	-0.21	0.07	-0.04	-0.13	0.03	-0.23	0.22	-0.07	-0.23	0.16	0.16	1.00
(20) PEX/FTE	0.14	0.16	0.15	0.12	-0.01	0.08	0.15	0.13	-0.19	-0.31	-0.16	-0.08	0.14	0.07	0.13	0.00	-0.57	-0.27	-0.18

A.3 Interaction independent variables

Table **13**: Independent variable interaction of DiD and DDD analysis
This table shows how a treated observation and a control observation in a private nursing home market, interact with the independent variables of interest.

	Time Period				
	$t-1$	t	$t+1$	$t+2$	$t+3$
Treated Observation					
Post x Buyout	0	0	1	1	1
Post	0	0	1	1	1
Buyout	1	1	1	1	1
Post x Buyout x Private	0	0	1	1	1
Post x Private	0	0	1	1	1
Private x Buyout	1	1	1	1	1
Private	1	1	1	1	1
Constant	1	1	1	1	1
Year FE	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓
Control Observation					
Post x Buyout	0	0	0	0	0
Post	0	0	1	1	1
Buyout	0	0	0	0	0
Post x Buyout x Private	0	0	0	0	0
Post x Private	0	0	1	1	1
Private x Buyout	0	0	0	0	0
Private	1	1	1	1	1
Constant	1	1	1	1	1
Year FE	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓

A.4 Regression without the use of fixed effects

Table **14**: PE ownership's impact on investments in nursing homes, without fixed effects
This table shows the impact of PE ownership on investment in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control.

	Log CAPEX		Log OPEX min PEX		Log OPEX		Log PEX	
Post * Buyout	0.037	0.486	0.515**	-0.362***	0.660***	-0.060	0.499**	0.691
	(0.383)	(0.886)	(0.221)	(0.060)	(0.227)	(0.068)	(0.212)	(0.588)
Post	0.280	0.060	0.082	-0.001	0.091***	-0.018	0.137***	0.111***
	(0.189)	(0.291)	(0.058)	(0.060)	(0.032)	(0.068)	(0.019)	(0.024)
Buyout	1.755**	2.590***	0.879	1.986***	0.520	1.527***	1.085***	1.087***
	(0.797)	(0.958)	(0.619)	(0.356)	(0.518)	(0.270)	(0.308)	(0.362)
Post * Buyout * Private		-0.819		0.966***		0.761***		-0.278
		(0.937)		(0.218)		(0.245)		(0.615)
Post * Private		0.460		0.131		0.144*		0.046
		(0.369)		(0.098)		(0.076)		(0.036)
Private * Buyout		-1.402		-1.505*		-1.188*		-0.158
		(1.491)		(0.823)		(0.637)		(0.543)
Private		0.361		0.860		0.528		0.716***
		(0.789)		(0.543)		(0.365)		(0.250)
Constant	4.750***	4.577***	7.420***	6.878***	8.184***	7.782***	8.090***	7.690***
	(0.390)	(0.498)	(0.301)	(0.356)	(0.198)	(0.270)	(0.130)	(0.167)
Observations	284	284	220	220	400	400	692	692
R^2	0.113	0.151	0.128	0.164	0.093	0.105	0.224	0.257
Adjusted R^2	0.104	0.129	0.116	0.136	0.086	0.089	0.221	0.250
Year FE	✗	✗	✗	✗	✗	✗	✗	✗
Strategy FE	✗	✗	✗	✗	✗	✗	✗	✗

Clustered standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A.5 Regression with the use of robust standard errors

Table **15**: PE ownership's impact on investments in nursing homes, using robust standard errors
This table shows the impact of PE ownership on investment in nursing home facilities. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3, with t being the year of acquisition of the nursing home. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Buyout* is an indicator for the treated sample of buyouts. *Private* is equal to one if the nursing home market in which the buyout takes place is considered privatized, and zero otherwise. For the control sample, *Private* takes on the value of the country of the control. All specifications include year and strategy fixed effects.

	Log CAPEX		Log OPEX min PEX		Log OPEX		Log PEX	
Post * Buyout	0.037	0.376	0.515***	-0.440***	0.660***	-0.064	0.499***	0.628
	(0.359)	(0.745)	(0.193)	(0.168)	(0.198)	(0.130)	(0.179)	(0.444)
Post	-0.122	-0.380	-0.142	-0.354*	0.020	-0.118	0.129	0.172
	(0.343)	(0.396)	(0.155)	(0.197)	(0.184)	(0.206)	(0.193)	(0.221)
Buyout	5.023***	-1.815***	1.413***	1.711***	1.188***	0.685***	0.961***	-1.424***
	(0.337)	(0.640)	(0.329)	(0.184)	(0.260)	(0.133)	(0.211)	(0.448)
Post * Buyout * Private		-0.668		1.043***		0.768***		-0.168
		(0.779)		(0.276)		(0.236)		(0.460)
Post * Private		0.545		0.176		0.127		-0.059
		(0.364)		(0.148)		(0.079)		(0.074)
Private * Buyout		2.639***		-2.041***		-0.473		3.863***
		(0.722)		(0.325)		(0.546)		(0.515)
Private		-6.993***		-0.604***		-1.166***		-2.239***
		(0.427)		(0.208)		(0.107)		(0.128)
Constant	2.583***	9.332***	6.591***	7.166***	7.460***	8.624***	7.203***	9.471***
	(0.786)	(0.789)	(0.192)	(0.067)	(0.122)	(0.086)	(0.139)	(0.186)
Observations	284	284	220	220	400	400	692	692
R^2	0.931	0.932	0.984	0.988	0.978	0.980	0.971	0.972
Adjusted R^2	0.904	0.904	0.977	0.983	0.970	0.972	0.961	0.961
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓

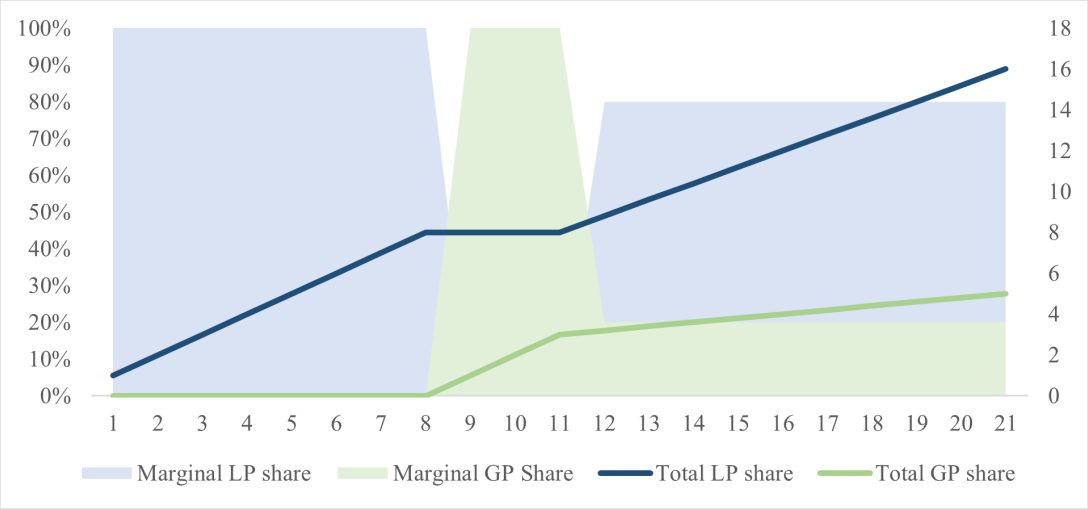
Robust standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

B Figures

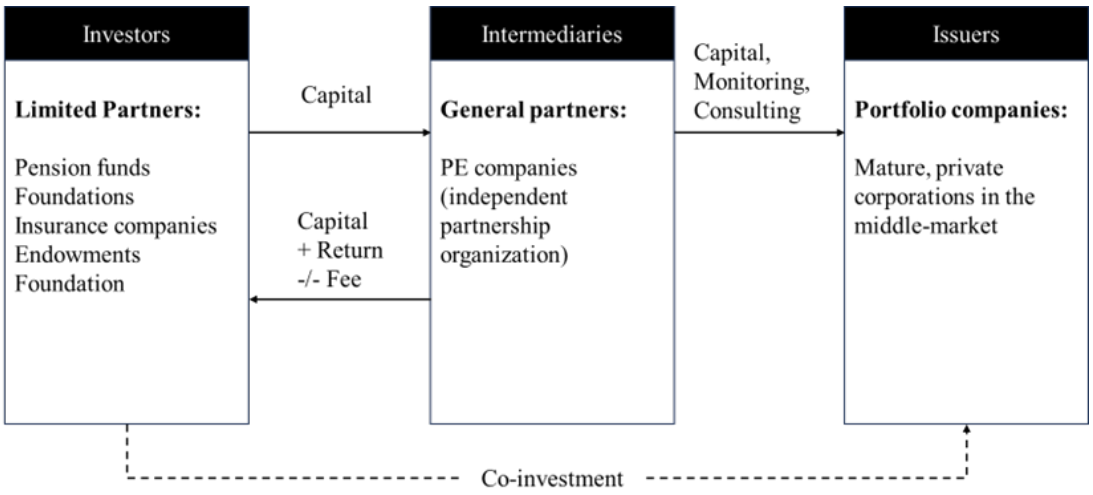
B.1 The mechanism of carried interest as returns increase

Figure 4: The mechanism of carried interest under increasing returns



B.2 Organisation of players in the Private Equity industry

Figure 5: Organisation of the Private Equity industry



B.3 Impact of winsorisation of dependent variables on distribution

Figure **6**: Impact of winsorisation on the distribution of EBIT/Assets

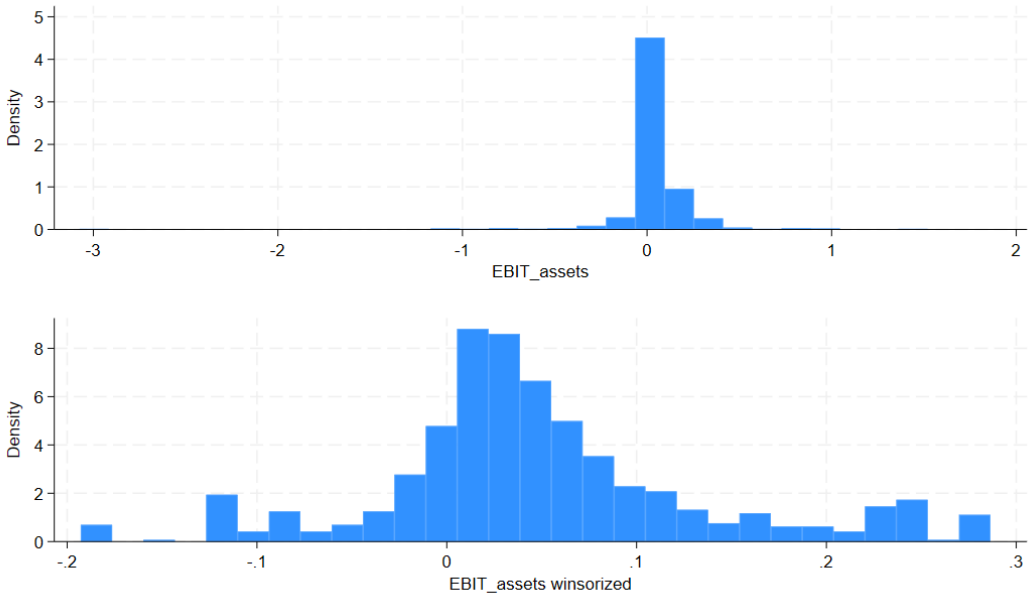
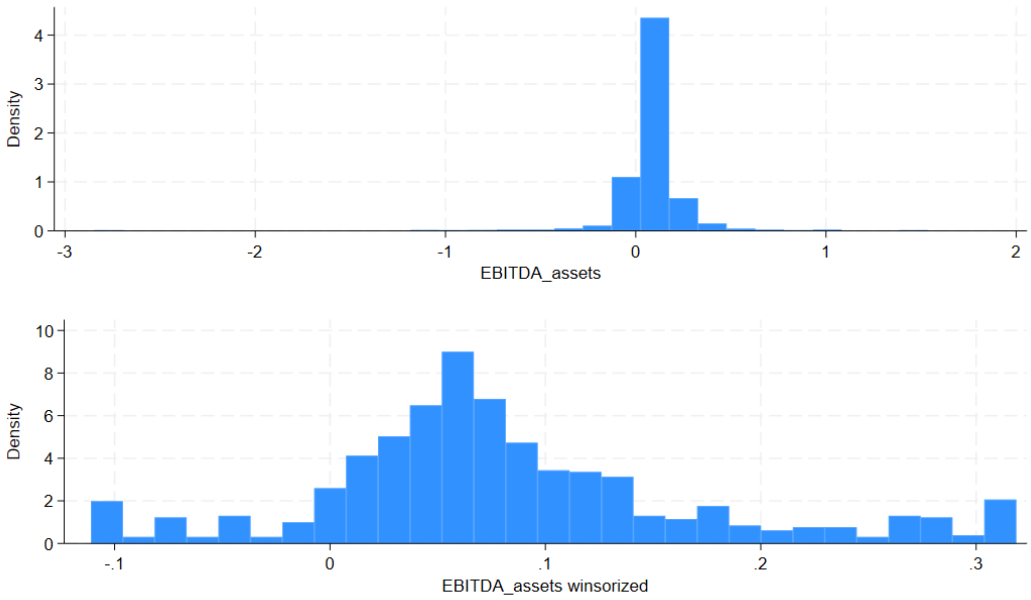
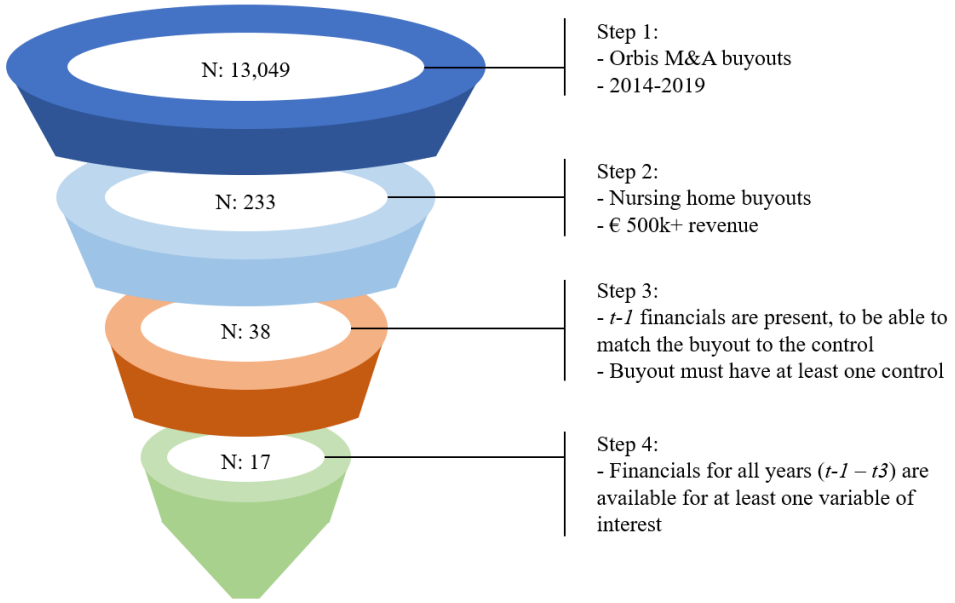


Figure **7**: Impact of winsorisation on the distribution of EBITDA/Assets



B.4 Data narrowing: dataset buyouts

Figure **8**: Data selection criteria and their impact on the buyout sample



B.5 Trends for DiD analyses of various variables of interest

Figure **9**: Development of the number of FTEs for buyouts and control group for *t-3* up to and including *t+3*

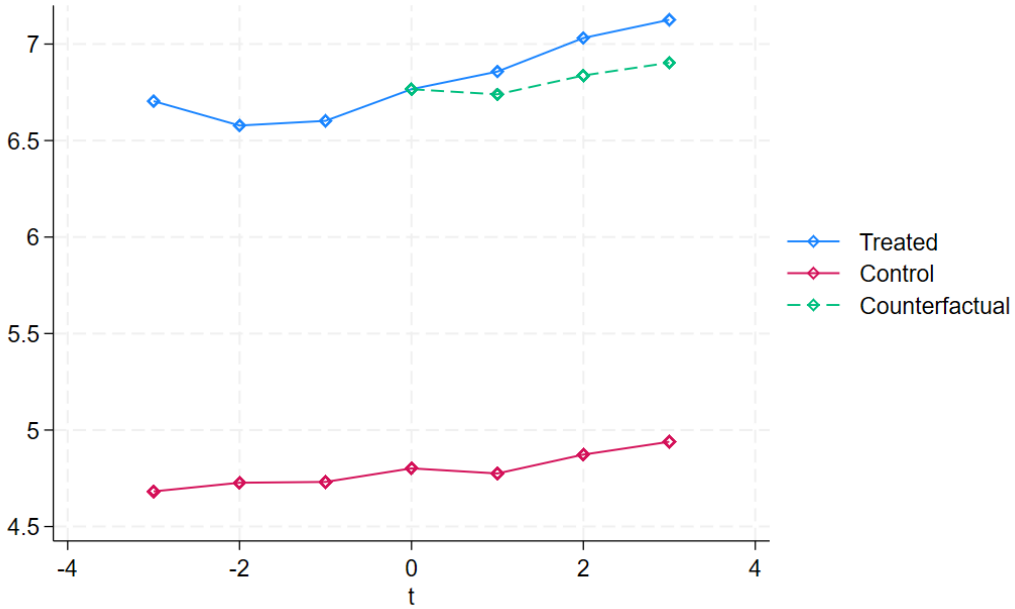


Figure **10**: Development of PEX for buyouts and control group for *t-3* up to and including *t+3*

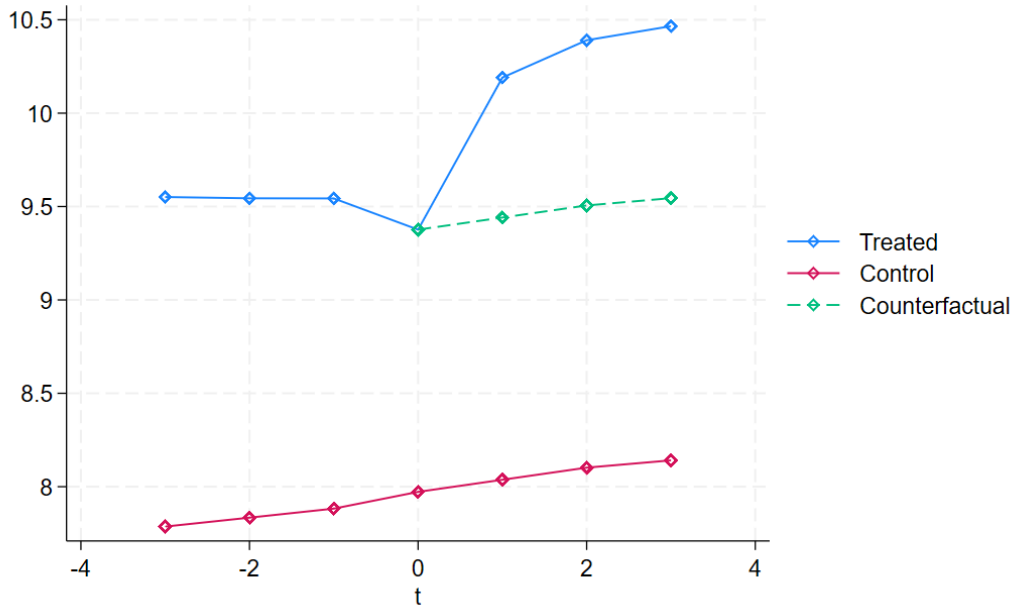


Figure **11**: Development of revenue over material costs for buyouts and control group for *t-3* up to and including *t+3*