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Industry specialization of Private Equity firms, a source of target companies' operational outperformance

Master thesis Financial Economics

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Abstract
This paper investigates whether, and under which circumstances, industry specialization is associated with higher operational improvements among target companies of Private Equity (PE) firms. The potential advantages of industry specialization include industry networks, enhanced target evaluation and selection capabilities, and more industry-specific operational expertise. Based on a sample of 192 UK buyouts completed from 2014 to 2018, industry specialization is related to a 6.4% higher increase in operating profitability among target companies. Furthermore, for every 1.0% additional buyout experience that industry specialized PE firms accumulate, a 0.21% to 0.25% higher turnover growth is realized, compared to non-industry specialized PE firms. The operating profitability improvements among targets are concentrated in buyouts that pose challenges to value creation for PE firms, such as secondary buyouts (SBOs) and buyouts completed during an economic downturn. In SBOs, the added value of industry specialization is an additional 14.1% improvement in operating profitability. In an additional analysis for 85 buyouts completed between February 1st, 2020, and December 31st, 2020 (the COVID-19 pandemic), it is found that industry specialization is associated with an additional 18.5% improvement in operating profitability. The results of this paper shed new light on the added value of industry specialization and can provide guidelines for PE firms' strategic choices, but also for the management of future target companies in choosing their financial partners.

Keywords: Private Equity, Industry Specialization, Operating Performance, Conceptual Model, Buyout Experience, Stage Specialization, Secondary Buyouts, COVID-19 Pandemic.

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1. Introduction

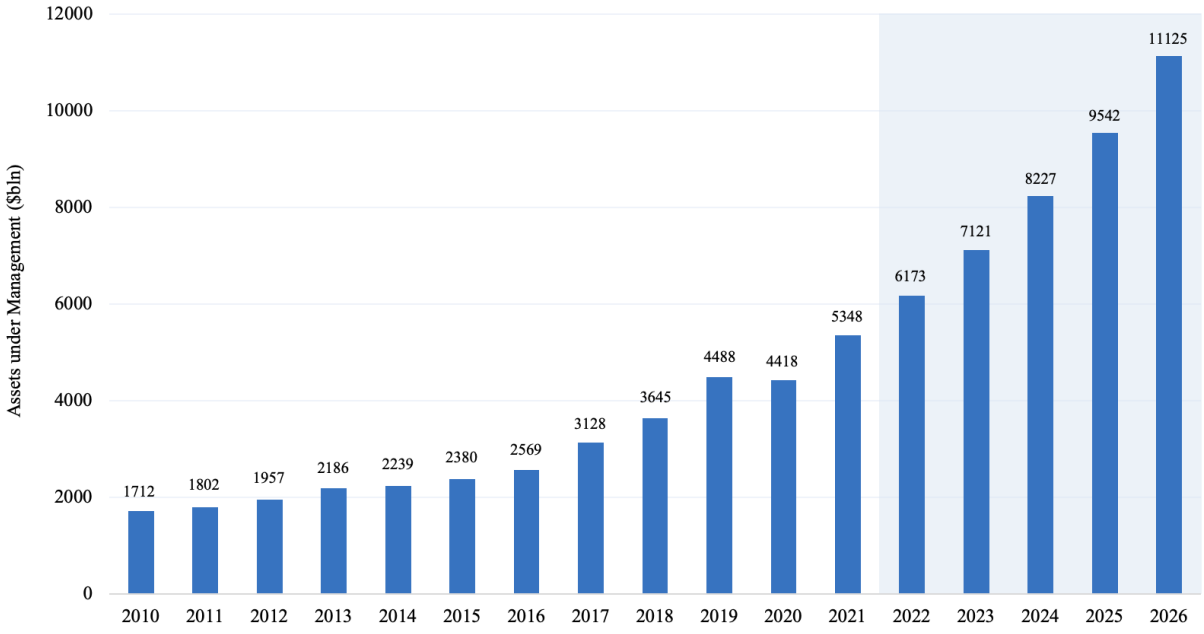
"*The glory days of private equity are over: too many funds are chasing too few opportunities, and many of those will be too expensive. It won't end well*."

The Wall Street Journal, March 29, 2015

The Private Equity (PE) industry has seen tremendous growth over the past decade. By just about any measure, whether it be global buyout deal value, buyout exit value or funds raised, 2021 has been a record year (Bain & Company, 2022a). Global Assets under Management (AuM) stood at $5.3 trillion by the end of 2021 and are forecasted to grow to more than $11.0 trillion by 2026 (Preqin, 2022).

Figure 1

Private Equity Assets under Management and forecast, 2010-2026*



*2022-2026 are Preqin's forecasted figures

Source: Preqin (2022)

The amount of funds chasing after the same investment opportunities gives rise to an ever-increasing level of competition among PE firms. Therefore, there is an increasing need for PE firms to differentiate themselves from competitors through their unique operating capabilities to realize consistent and satisfactory returns on investment (Ghai, Kehoe, & Pinkus, 2014; Wright et al., 2006). Castellaneta and Gottschalg (2016) demonstrate that PE firms are heterogeneous in their resource endowments, which in turn translates into heterogeneity among PE buyout targets' operating performance improvements. The current research focuses on one such source of heterogeneity among PE firms, namely industry specialization.

The academic community has become aware of the tendency of PE firms to organize around specific industries (Kaplan & Strömberg, 2009). Several empirical studies aimed to establish the effect of industry specialization on targets' operating performance improvements, but these report mixed results. Cressy, Munari, and Malipiero (2007) find an 8.5% higher operating profitability among UK targets backed by industry specialized PE firms during the three post-buyout years. However, as these authors solely consider post-buyout operating performance, no conclusions can be drawn on the effect of industry specialization on operating performance *improvements* before and after the PE firm's entry. Meuleman et al. (2009) do not report any significantly higher improvements in operating performance among UK targets backed by industry specialized PE firms. Contrastingly, Nadant, Perdreau, and Bruining (2018), using a sample of French buyouts, report significantly higher improvements in both operating profitability (7.5%) and turnover (33.6%) among targets backed by industry specialized PE firms. In addition, these authors demonstrate that the added value of industry specialization increases when challenges to value creation, measured as a target's initial low or initial high operating profitability, force PE firms to execute more complex value creation strategies.

The present research attempts to give insight into the contradicting results reported in existing literature by focusing on the effect of industry specialization on operating performance improvements on a sample of UK buyouts. Furthermore, this research advances novel perspectives on the effect of industry specialization on operating performance improvements that were hitherto largely unaddressed in the academic literature. This research addresses the heterogeneity among industry specialized PE firms in terms of the amount of buyout experience they possess. Arguably, the degree to which a PE firm can reap the supposed benefits of industry specialization, such as building industry specific networks, leading to better access to tailored proprietary deal flow, smaller information asymmetries between the PE firm and potential targets, and industry-specific operational expertise is inextricably linked to the amount of industry specific and general buyout experience the PE firm has accumulated.

Next to industry specialization, PE firms have been known to specialize in investment stages (Norton & Tenenbaum, 1993). Stage specialization can bring many of the benefits that industry specialization also aims to bring about, such as cultivating a close-knit deal flow, lower information asymmetries as a PE firm leans more about the dynamics of a specific stage, and the accumulation of knowledge and expertise about the same stage-specific value creation activities. This paper argues that combining industry and stage specialization allows PE firms to make their value creation strategies even more compressible and focused, leading to superior operating performance improvements, relative to being specialized on either dimension.

Building upon the work of Nadant, Perdreau, and Bruining (2018), this paper further argues that industry specialization can be a mitigating factor in the negative relationship between challenges to value creation and operating performance improvements. PE firms are likely to face challenges to value creation when a target is bought from another PE firm, commonly referred to as a secondary buyout (SBO), as all clear-cut avenues of value creation will already have been exploited by the primary PE firm. Hypothetically, therefore, the benefits of industry specialization are larger in SBOs. SBOs have emerged from being an uncommon phenomenon in the 1990s to accounting for more than half of all buyout deals completed in 2020 (Bonini, 2015; Eschenröder, 2020), which underlines the necessity to include them in research on buyout performance. Cressy, Munari, and Malipiero (2007), Meuleman et al. (2009), and Nadant, Perdreau, and Bruining (2018) all examine only primary buyouts (PBOs) and therefore do not provide a reliable picture of the current PE landscape.

Economic downturns also pose challenges to value creation, as these make it more difficult for PE firms to reach the required threshold of returns on equity, forcing them to execute more complex avenues of value creation (Wright et al., 2001; Wright, Hoskisson, & Busenitz, 2001). The most recent economic downturn, caused by the COVID-19 pandemic (henceforth: pandemic), has had a profound impact on the PE landscape. In a survey of over 200 US buyout funds, nearly 40% of all portfolio companies reported to have been adversely affected by the pandemic (Gompers, Kaplan, & Mukharlyamov, 2022). This paper sheds light on whether industry specialized PE firms indeed outperformed in this challenging environment.

A further contribution to the existing literature is made by not only studying improvements in financial returns (operating profitability, turnover, and NWC/turnover), but also in real returns (turnover per employee and number of employees). The results suggest that industry specialization is related to a 6.4% higher increase in operating profitability. Furthermore, for every 1.0% additional buyout experience that industry specialized PE firms accumulate, a 0.21% to 0.25% higher turnover growth is realized, compared to non-industry specialized PE firms. In SBOs, the added value of industry specialization is an additional 14.1% improvement in operating profitability, while for buyouts completed during the pandemic, industry specialization is related to an additional 18.5% operating profitability improvement.

This paper has the following structure. In Chapter 2, literature is reviewed to provide a comprehensive picture of the contemporary PE landscape. Chapter 3 introduces a conceptual model, from which the hypotheses are subsequently derived. Chapter 4 elaborates on the data and methodology employed to test the hypotheses. Chapter 5 discusses the results of the current research, as well as their interpretation. Chapter 6 concludes.

2. Literature review

To gain an adequate understanding of the PE industry and its developments, the following chapter starts with a description of PE investing. Subsequently, the performance of PE is discussed, followed by different ways in which PE firms create value. Thereafter, industry specialization of PE firms is elaborated on. Based on this extensive literature review, the conceptual model is introduced in the next chapter, from which the hypotheses will be derived.

2.1 Private Equity investing

PE funds can be characterized as financial intermediaries that pool the capital committed by investors to make investments in portfolio companies (Kaplan & Sensoy, 2015). PE funds are legally organized as limited partnerships, with the investment management company taking up the role of the General Partner (GP). The investors of the partnership, such as pension funds, banks, insurance companies, family offices, sovereign wealth funds and endowment funds, are the Limited Partners (LPs) (Arundale & Mason, 2020). Both the GPs and LPs have their own set of responsibilities as governed by the partnership agreement (Brown, Harris, & Munday, 2021). The GPs manage the capital, decide what to invest in, and decide when the investments are returned to the LPs, subject to what the partnership agreement dictates. The LPs provide the capital when it is called upon by the GPs.

The lifetime of a PE fund is typically ten to twelve years (Fuchs et al., 2021). The GPs receive an annual management fee and a share of the profits, called the 'carry', provided the fund beats a certain 'hurdle rate', that is expressed in terms of Internal Rate of Return (IRR) and/or Multiple of Money (MoM) (Kaplan & Sensoy, 2015). Both through their direct compensation and the ability to raise subsequent funds, GPs are incentivized to generate as high returns on capital as possible (Chung et al., 2012; Gompers & Lerner, 1999; Metrick & Yasuda, 2010). Returns are realized after a successful exit out of the investment, which will typically be done after five to eight years (Stromberg, 2008; Thomson Reuters, 2014). Possible exit routes include a subsequent acquisition by a strategic company (trade sale) or another PE firm (SBO), or an Initial Public Offering (IPO) (Jenkinson & Sousa, 2015).

2.1.1 Venture Capital, growth capital and buyouts

The term 'Private Equity' is now often used to describe any 'not quoted' equity, but care should be taken which definition is used when discussing and researching Private Equity (Gilligan & Wright, 2020), as a lack of distinguishment between the different kinds of investments can lead

to faulty conclusions (BVCA, 2006; Moon 2006). The three main types of PE investments are Venture Capital (VC), growth capital, and buyouts. VC can be characterized as non-leveraged minority stakes in small businesses and start-ups that have long-term growth potential (Kaplan & Strömberg, 2009). Growth capital is typically provided for later-stage expansion and early-stage finance (Arundale & Mason, 2020). Defining features of buyouts include the acquisition of large majority stakes in mature companies that are either private or become private as a result of the transaction (Kaplan & Sensoy, 2015; Wood & Wright, 2009).

The current research focuses solely on buyouts, for several reasons. Firstly, buyouts represent the largest asset class among the different types of PE investments, both in the United Kingdom (UK) and worldwide (BVCA, 2020; Preqin, 2021). Secondly, the impact of buyouts on the real economy, including the impact on productivity and job growth, has been the topic of much public debate (Gulliver & Jiang, 2020). Thirdly, majority stake acquisitions allow the PE firm to assume control of the target company and make the financial, governance and operational changes and decisions that are relevant for the topic of this research (Bruining, Verwaal, & Wright, 2011).

Buyouts can be further distinguished into insider-driven buyouts and outsider-driven buyouts (Wood & Wright, 2009). Insider-driven buyouts include management buyouts (MBOs) and management-led employee buyouts (MEBOs). In MBOs, a company or unit is bought out by its incumbent management. In MEBOs, existing employees also assume an equity stake in the company, alongside management. Outsider-driven buyouts include leveraged buyouts (LBOs) and management buy-ins (MBIs). LBOs are, as the name suggests, transactions where substantial debt (leverage) is used to finance the transaction. An MBI occurs when an external management team acquires the company and becomes the new management (Robbie, Wright, & Thompson, 1992).

2.1.2 Buyout investment process

PE firms achieve their returns through different phases of the investment process (Baum & Silverman, 2004; Bottazzi, Da Rin, & Hellmann, 2008; Fitza, Matusik, & Mosakowski, 2009). The buyout investment process comprises of the sourcing and acquisition phase, the holding phase, and the exit phase (Berg & Gottschalg, 2005). Each phase is analyzed separately, as each phase offers different opportunities for industry specialized PE firms to differentiate themselves and outperform their non-industry specialized peers.

2.1.2.1 Sourcing and acquisition phase

To be successful, PE firms need to be able to identify the most attractive investment opportunities and successfully manage the negotiation and acquisition (Castellaneta & Gottschalg, 2016). To identify potential investment opportunities, GPs rely on their strategic and financial expertise (Kaplan & Strömberg, 2009). In addition, through experience, former professions, and even previous education, GPs often have an extensive network which has been shown to be a powerful source of deal flow generation (Fenn, Liang, & Prowse, 1997; Fuchs et al., 2021; Gompers, Kaplan, & Mukharlyamov, 2016; Teten & Farmer, 2010).

The acquisition part of the process entails negotiating and carrying out the due diligence process, during which the potential investors screen and familiarize themselves with the target company and start working on a value creation plan (Berg & Gottschalg, 2005). A crucial element of the acquisition phase is the determination of the acquisition price, which ultimately sets the hurdle above which the PE firm will profit from the investment upon exit. It could be argued that much of the buyout process is 'front loaded', as a significant proportion of the value generation is determined in this pre-investment phase (Baker & Montgomery, 1994).

PE firms that are superior at the sourcing and acquisition phase can potentially generate value through financial arbitrage, which occurs when a target is bought at a lower valuation multiple than at which it is sold, independent of changes to the underlying business (Berg & Gottschalg, 2005; Capron & Shen, 2007). Bain & Company (2022b) report that this so-called 'multiple expansion' has been a significant driver behind PE returns between 2010 and 2021. However, rising interest rates in the years ahead have cast doubts on whether PE firms will be able to sell targets at even higher multiple valuations five to eight years from now.

2.1.2.2 Holding phase

During the holding phase, the strategic, organizational, and operational changes laid out in the value creation plan are implemented (Berg & Gottschalg, 2005). This plan often contains rigorous strategic and performance improvement initiatives and carefully defined Key Performance Indicators (KPIs) (Acharya, Kehoe, & Reyner, 2009). PE firms often hire consultants and other external advisors to help devise and implement these strategic plans (Gompers, Kaplan, & Mukharlyamov, 2016). During the first 100 days, which is commonly referred to as 'the honeymoon period', the most drastic changes are typically made to the target company (McKinsey & Company, 2021). For example, Acharya, Kehoe, and Reyner (2009) show that during this period, 39% of incumbent CEOs and 33% of CFOs are replaced. The

management of the target company, which is either kept in place or (partly) replaced, will then realize the strategic plan under the supervision of the PE firm.

Although the levers of value creation are largely predetermined during the sourcing and acquisition phase, the actual value creation happens during the holding phase, primarily through governance engineering and operational engineering, and to a lesser extent, financial engineering (Berg & Gottschalg, 2005). These different levers of value creation are further elaborated on in section 2.2.

2.1.2.3 Exit phase

The exit phase determines the way of divesting the target company, such as a trade sale, SBO or IPO (Berg & Gottschalg, 2005; Rigamonti et al., 2016). Assuming that the majority of the cash flows accrue to the buyout investors upon exit, rather than through intermediate dividend recapitalizations, the divestment, and more specifically, the exit price, ultimately determines the return achieved by the PE firm (Cumming & MacIntosh, 2003; Lerner, Leamon, & Hardymon, 2012; Uddin & Chowdhury, 2021).

An exit through a trade sale requires a profound knowledge of the products, market trends, and competitors of the target to present it as an attractive investment, with ample avenues of growth, to prospective strategic buyers (Rigamonti et al., 2016). After all, strategic buyers also possess an in-depth knowledge of the target's market. Arguably, therefore, a trade sale requires a deeper level of understanding of the target's industry, compared to an SBO.

SBOs have evolved from being an unconventional exit route in the 1990s to a critical entry and exit option to PE firms nowadays (Bonini, 2015; Hammer, Kick, & Schwetzler, 2021; Strömberg, 2008). As SBOs accounted for more than 50 percent of buyout deals in 2020, they have become an important part of the buyout landscape (Eschenröder, 2020).

To exit an investment through an IPO, the target company needs to exhibit strong profitability, long-term growth potential, and substantial managerial support to ensure stability (Rigamoniti et al., 2016). Furthermore, due to the substantial fixed costs involved, only target companies above a certain threshold dimension typically consider exiting through an IPO (Cumming & Macintosh, 2003; Gompers, 1995; Schwienbacher, 2008). Given the requirements for an LBO, they occur relatively infrequently (Jenkinson & Sousa, 2015).

The preferred exit route often depends on the specific buyout and PE firm in question. PE firms have been known to time their exits around market conditions and cater their exit

routes to the timing of their exit (Jenkinson & Sousa, 2015). For example, an IPO may not be considered in times of a 'cold' IPO market.

2.1.3 Critiques to Private Equity

There have been various critiques from policymakers, politicians, and scholars on the supposed adverse effects of PE (e.g., Ayash & Rastad, 2019; Walker, Druckman, & Jackson, 2022), and LBOs in particular. PE investors have even been dubbed 'locusts' (The Economist, 2005).

Criticisms include burdening target companies with a 'crippling' amount of debt, leaving these companies unable to carry out their daily operations (Rasmussen, 2008), and leading to a significant number of bankruptcies (Ayash & Rastad, 2019). A related argument against LBOs is the limited amount of risk that buyout investors personally assume, as their liability is limited when a bankruptcy occurs (Davidoff, 2008).

Furthermore, a much-cited criticism to PE is that long-term growth is sacrificed to achieve short-term results, also coined *short termism* (Lerner, Sorensen, & Strömberg, 2011; Wright et al., 2019; Young & Scott, 2004). It is argued in the literature, but also by policymakers and members of the financial press, that this short termism results in a wealth transfer from long-term financial claimants, counterparties, and other stakeholders of the target company to the PE firm in the short term (see, e.g., Der Spiegel, 2006; Harford & Kolasinski, 2014; The Times, 2006; Weinberg & Vardi, 2006; Ydstie, 2012). One particular stakeholder frequently cited as being disadvantaged by buyouts are employees, as it is often alleged that PE firms cut costs through layoffs, leaving workers unemployed (Olsson & Tåg, 2017).

To appreciate these criticisms, academics have conducted a great deal of research on the ability of PE firms to create value (Kaplan & Sensoy, 2015). The ways in which PE firms can create value is discussed in the next section, followed by the extent to which these potential levers of value creation have empirically been shown to translate into PE performance.

2.2 Value creation by Private Equity

Kaplan and Strömberg (2009) classify three different types of value creating actions taken by PE firms, namely financial engineering, governance engineering, and operational engineering. These actions taken by PE firms are not necessarily mutually exclusive (Gompers, Kaplan, & Mukharlyamov, 2016). Financial and governance engineering, in particular, are interrelated.

2.2.1 Financial engineering

Buyout transactions are typically financed with a substantial amount of debt, also referred to as leverage. There are several reasons why PE firms use leverage in their transactions. Buying assets 'on margin' allows PE firms to amplify their returns. The smaller the equity contribution of the PE firm and thus, the higher the debt contribution, the higher the PE firm's returns upon exit. In addition, a higher level of leverage enables the PE firm to compete more effectively for assets (Brown, Harris, & Munday, 2021). Furthermore, leverage reduces the 'free cash flow problem' (Jensen, 1986), where managers use excess free cash flows to pursue non-profitable opportunities and projects instead of returning the cash to shareholders. High interest payments 'force' managers to service them, mitigating this free cash flow problem (Nadant, Perdreau, & Bruining, 2018; Renneboog, Simons, & Wright, 2007). Finally, because interest payments are tax-deductible in the UK (and in most other western countries), leverage results in a debt tax shield, which increases firm value (Cooper & Nyborg, 2007; Jenkinson & Stucke, 2011).

Next to the advantages mentioned above, various authors have identified disadvantages of using (too much) leverage. Modigliani and Miller (1963) were the first to point out the tradeoff between the benefit of the tax debt shield and the costs of financial distress and bankruptcy risk that is derived from taking on debt. If the leverage is sufficiently high, the costs of financial distress can start to outweigh the benefit of the debt tax shield from the perspective of the target company (Jensen, 1986; Le & Phan, 2017; Modigliani & Miller, 1963). Note, however, that there are more benefits to using leverage than just the tax debt shield from the perspective of the PE firm. Another disadvantage of using leverage posed in the literature is less (long-term) growth, as promising avenues of growth may be shunned when managers are too focused on servicing the debt (Anton, 2019; Coricelli et al., 2012; Stulz, 1990).

Because of these negative effects of leverage, some authors question whether leverage truly adds value. Several authors argue that financial leverage is detrimental to the value of the target company because of the high interest costs (Barry & Mihov, 2015; Dawar, 2014; Majumdar & Chhibber, 1999; Ramli, Latan, & Solovida, 2019; Zhang & Chen, 2017). Others point towards the benefits of leverage and argue that the overall effect on firm value is positive (Kaplan & Strömberg, 2009; Liu, 2006; Raju & Roy, 2000; Ross, 1977).

In the wake of the Great Financial Crisis (GFC), many financial institutions needed to reduce their leverage, mainly due to higher capital reserve requirements and increased regulation that restricted banks from funding highly leveraged buyouts (Brown, Harris & Munday, 2021). Nowadays, the importance of leverage, although still widely used, seems to be relatively smaller than before the GFC.

2.2.2 Governance engineering

Agency theory describes the conflict that occurs between shareholders and management, stemming from the separation between ownership and control, resulting in a misalignment of goals between them (Jensen & Meckling, 1976). One of the key practices that is characterized as governance engineering that PE firms engage in is aligning the incentives between the target company's shareholders and its management.

To this end, management is generally offered a substantial potential upside through stock or options on the target company (Jensen & Murphy, 1990; Nikoskelainen & Wright, 2007). To be exposed to both a significant upside as well as a significant downside, PE firms also often require managers to invest a meaningful proportion of their personal wealth into the target company (Kaplan & Strömberg, 2009). Some PE firms also implement extensive incentive programs for top management (Leslie & Oyer, 2008; Wright, Gilligan, & Amess, 2009). These measures are designed to make management act like owners of the business, thereby aligning their incentives with those of the PE firm. Here, the interrelatedness between financial and governance engineering can be seen. By essentially making the managers co-owners of the business, the free cash flow problem is attenuated. After all, managers now have an incentive not to pursue (potentially) value-destroying activities such as empire building and other opportunistic behavior, as they are incentivized to secure positive returns on their investment in the business (Jensen, 1989; Kaplan & Strömberg, 2009). As such, both financial and governance engineering aim to mitigate this agency problem.

Another important set of governance engineering measures often employed by PE firms concerns assuming control of the boards of target companies (Gompers, Kaplan, & Mukharlyamov, 2016). Buyout companies regularly replace (members of) boards (Acharya, Kehoe, & Reyner, 2009; Nikoskelainen & Wright, 2007). In addition, buyout investors frequently take seats in the boards of the companies in which they invest (Cornelli & Karakas, 2008). This allows these outside board members to monitor management on behalf of the PE firm (Berg & Gottschalg, 2005; Cotter & Peck, 2001). PE-dominated boards also tend to meet more frequently and are often composed of a relatively small number of board members (Acharya, Kehoe, & Reyner, 2009; Coles, Daniels, & Naveen, 2008).

Management equity participation plans are found to be a significant driver of buyout returns (Kaplan, 1989; Wright, Gilligan, & Amess, 2009). In addition, the effectiveness of buyout investors intervening in the composition of boards is exemplarily illustrated by Heel and Kehoe (2005), who show that in more than 80% of the best performing buyouts, incumbent boards of target companies were strengthened before the deal was closed.

2.2.3 Operational engineering

Operational engineering refers to how the operational expertise and experience that the buyout investors possess is used to optimize the target company's operations. Buyout investors use their industry and operational expertise to identify attractive investment opportunities and to develop and implement a value creation plan (Kaplan & Strömberg, 2009). A value creation plan might entail growing revenues, cutting costs, improving operational margins, strategic changes and repositioning, and non-organic growth through acquisitions (Acharya, Kehoe, & Reyner, 2009; Gadiesh & MacArthur, 2008; Von Laskowski, 2012). Operational engineering also entails providing strategic advice to the target company's management and assisting them hands on with the day-to-day operations.

The extent to which buyout investors rely on operational engineering has been found to be (partly) contingent upon the professional background of the buyout investors. Gompers, Kaplan, and Mukharlyamov (2016) find that PE firm founders with a background in PE, consulting, and operations place most focus on operational engineering, while those with a background in investment banking, commercial banking, or investment management place most focus on financial engineering. In a similar vein, Acharya et al. (2013) find that PE firm partners with an operational background, for example ex-consultants or ex-industry managers, show higher outperformance through organic growth. In other words, these partners realize internal operational improvements such as revenue growth, cost cutting and geographic expansion. By contrast, partners of PE firms with a financial background, such as ex-bankers and ex-accountants, achieve outperformance through inorganic growth, in other words, through acquisitions.

Acharya et al. (2013) find that operational engineering contributes most significantly to the outperformance of PE, overall. This leads the authors to argue that the highest performance persistence of PE firms, as studied by Kaplan and Schoar (2005), is achieved by those PE firms that focus on operational improvements. Various other authors agree that operational improvements are increasingly becoming the predominant levers of returns to buyout funds (Acharya, Kehoe, & Reyner, 2009; Biesinger, Bircan, & Ljungqvist, 2020; Gompers, Kaplan, & Mukharlyamov, 2016; Heel & Kehoe, 2005; Kaplan & Strömberg, 2009). The increasing emphasis on optimizing the operations of target companies to create value fits well with the subject of the current research, namely industry specialization of PE firms.

Now that a picture of the levers of value creation of PE firms has been provided, the stage is set to examine whether these value creation opportunities are reflected in the empirical results of existing academic research on PE performance.

2.3 Performance of Private Equity

In their pivotal paper, Cumming, Siegel, and Wright (2007) distinguish between two different types of returns that PE firms can generate from their investments, which are financial returns and real returns. Financial returns can be expressed in either outperformance of a (public market) benchmark or accounting measures (Kaplan & Schoar, 2005). Real returns are non-monetary measures of performance, such as productivity, employment, wages, innovation, and entrepreneurial activity (Groh & Gottschalg, 2006; Kaplan & Schoar, 2005; Renneboog, Simons, & Wright, 2007).

Critics argue that PE firms realize short-term financial returns by sacrificing real returns, which relate to the long-term prospects of the target (Harford & Kolasinski, 2014). Therefore, to provide a comprehensive analysis of the performance of PE firms, existing literature on PE performance, both in terms of financial and real returns, is reviewed. It is preferred to look at real return metrics to measure the long-term prospects of the target company, rather than long-term financial returns, as the latter, post-exit (whether good or bad), are difficult to attribute to the influence of the PE firm (Alperovych, Amess, & Wright, 2013).

2.3.1 Financial returns of Private Equity

Research has found mixed results when comparing financial buyout returns with public market benchmarks (Harris, Jenkinson, & Kaplan, 2014). Much seems to depend on the quality of available data, how continuing and dead funds are valued, whether performance is measured gross or net of fees, and the choice of benchmark (Wright et al., 2019). Harrison, Jenksinson, and Kaplan (2014), Higson and Stucke (2012), and Robinson and Sensoy (2011) all find an average outperformance of buyout funds in the order of 20% compared to a public market benchmark over the buyout fund's lifetime. Other authors find that buyout funds only barely beat public market benchmarks (Driessen, Lin, & Phalippou, 2012; Franzoni, Nowak, & Phalippou 2012; Jegadeesh, Kräussl, & Pollet 2015; Sørensen, Wang, & Yang 2014).

Authors of more recent papers do seem to agree on the fact that the outperformance of PE has declined somewhat in recent years (Braun, Jenkinsson, & Stoff, 2017; Korteweg & Sorensen, 2017). Bain & Company (2021a) reports that the returns of PE firms have been declining towards public markets since 2016. J.P. Morgan (2021) also reports that the outperformance of PE funds over public equities is narrowing. While various explanations are offered, such as monetary and fiscal stimuli that benefit all markets, a recurring explanation given is a significant increase in competition among PE firms in recent years.

In terms of financial returns that concern accounting measures, an important remark beforehand is that these measures are prone to manipulation around PE firm ownership, for example, to boost valuations (Dokas et al., 2021; Mao & Renneboog, 2015). As there is no way to adequately correct for these potentially misleading financial reports, these findings should be treated with some care.

Financial metrics most frequently examined in existing literature include EBIT(DA) (earnings before interest, taxes, (depreciation, and amortization)) margins, turnover growth, net cash flow, and working capital efficiency (Acharya et al., 2013; Cressy, Munari, & Malipiero, 2007; Davis et al., 2014; Kaplan, 1989; Weir, Jones, & Wright, 2015). Kaplan (1989) reports increases in EBITDA, decreases in capital expenditures, and increases in net cash flow in the three years after the buyout. Cressy, Munari, and Malipiero, (2007) find that post-buyout operating profitability of PE-backed targets is significantly higher compared to comparable non-PE-backed companies. Weir, Jones, and Wright (2015) report significant improvements in working capital efficiency, and both Acharya et al. (2013) and Davis et al. (2014) report that PE ownership significantly improves EBITDA margins. Although these studies differ in terms of time periods, geographies, and accounting measures considered, the general consensus is that, on average, PE ownership positively impacts the aforementioned accounting measures. However, there seems to be a lack of more recent research that reports on these performance measures of PE-backed targets.

In conclusion, research on the (magnitude of the) outperformance of PE firms, compared to public market benchmarks, reports mixed findings. Results from more recent research indicates that while, on average, PE firms are still outperforming public benchmarks, this outperformance is narrowing. Scholars do seem to agree that PE ownership can enhance operational performance in terms of accounting measures.

2.3.2 Real returns of Private Equity

Among the real return measures that are discussed most in the literature are productivity, employment, and innovation. These performance measures are therefore further elaborated on.

Gulliver and Jiang (2020) summarize and compare the results of 22 European and US-focused empirical studies that measured the effect of PE ownership on target productivity and employment. In the studies examined, productivity is measured primarily as sales per employee and return on assets (ROA). The majority of the 22 studies find that PE ownership significantly enhances productivity (e.g., Brav et al., 2018; Brav, Jiang, & Kim, 2015; Davis et al., 2019;

Guo, Hotchkiss, & Song, 2011), while a minority find little (e.g., Bernstein et al., 2017; Cohn, Mills, & Towery, 2014) or no statistically significant productivity improvement (e.g., Bharath, Dittmar, & Sivadasan, 2014; Leslie & Oyer, 2008). None of the reviewed studies establish a negative relationship between PE ownership and productivity. The most recent and most comprehensive study is that by Davis et al. (2019), who examine 3,600 US buyouts completed between 1980 and 2011 and report an average increase in sales per employee of 7.5% in the two years following the buyout, compared to control firms. The overall results of the studies reviewed by Gulliver and Jiang (2020) indicate that buyouts increase productivity.

If productivity gains were primarily the result of job cuts, the net productivity benefit of PE may be less clear, which leads Gulliver and Jiang (2020) to also address the effect of buyouts on employment growth in their meta-study. Davis et al. (2019) report that in the two post-transaction years of *private* buyouts, which constitutes the largest part of transactions in their sample, employment growth is 3.1% higher, relative to control firms, whereas buyouts of *public* companies generally lead to a reduction in employment. Biesinger, Bircan, and Ljungqvist (2020) track job growth up to five years post-exit in 1,580 global buyouts and find employment growth levels that are even higher than those found by Davis et al. (2019), plausibly due to the longer examination window of the former study. Gulliver and Jiang (2020) conclude that the majority of empirical studies on buyouts in Europe and the US report a positive effect on employment growth.

In terms of innovation, Amess, Stiebale, and Wright (2016) find that for target companies in private transactions, the quality adjusted patent stock increases by 14% within three years after the transaction. Similarly, Lerner, Sorensen, and Strömberg (2011) report that private buyout target companies' patents are cited more often, no shift in the fundamental nature of the research is observed, and the target companies show increased concentration in important areas of the companies' innovative portfolios. On the other hand, Amess, Stiebale, and Wright (2016), Ayash and Egan (2019), and Cumming, Peter, and Tarsalewska (2020) find that public to private buyouts are associated with a reduction in patents and citations.

In short, these findings suggest that buyouts are associated with enhanced productivity, employment growth, and an increased focus on innovation, in private-to-private transactions. Contrarily, public-to-private buyouts have been found to be negatively associated with employment growth and innovation. These results thus attenuate, but not completely negate the argument put forward in literature that buyouts sacrifice long-term (real) returns for short-term (financial) returns.

2.4 Industry specialization of Private Equity firms

Given that GPs need to ensure an adequate return on investment during the fund's lifetime, there is a profound incentive for PE firms to differentiate to stay ahead of competition (Harper & Schneider, 2004). Financial and governance engineering, although still widely used, provide limited opportunities for differentiation, as the leveraging of buyouts and aligning of incentives between management and ownership have become common practice among PE firms (Brown et al., 2020; Ghai, Gehoe, & Pinkus, 2014; Kaplan & Strömberg, 2009). Therefore, in recent years, PE firms have focused primarily on differentiation through operational engineering (Gompers, Kaplan, & Mukharlyamov, 2016). Knowing how to perfectly optimize the operations of a target company requires industry-specific knowledge and experience. As such, many top PE firms have started to organize around specific industries (Kaplan & Strömberg, 2009). At the same time, however, focusing on a limited number of industries may limit the available investable universe and may give rise to increased concentration risk.

2.4.1 Existing literature on industry specialization

While studies that examine the industry specialization effects of VC funds are plentiful (Gompers et al., 2005; Gompers, Kovner, & Lerner, 2009; Hochberg, Ljungqvist, & Lu, 2007; Hochberg, Mazzeo, & McDevitt, 2015; Makarevich, 2018; Norton & Tenenbaum, 1993), research that specifically focuses on the effect of industry specialization on the operating performance (improvements) of buyout targets is relatively scarce.

Cressy, Munari, and Malipiero (2007), using a sample of UK buyouts completed between 1995 and 2002, report an 8.5% higher post-buyout operating profitability among targets backed by industry specialized PE firms, compared to targets backed by non-industry specialized PE firms. Their results also suggest that this higher operating profitability is not accompanied by higher turnover, as industry specialization does not appear to be associated with higher turnover. Meuleman et al. (2009), using a sample of UK buyouts completed between 1993 and 2003, find no significant relationship between industry specialization and operating performance improvements. Furthermore, Gottschalg and Wright (2011) examine a sample of US buyouts and do not find the industry focus of PE firms to impact value creation or the IRR of PE firms. In a more recent study, Nadant, Perdreau, and Bruining (2018) find that industry specialization of PE firms is positively related to both higher profitability (7.5%) and turnover (33.6%) improvements among a sample of French buyouts that were completed between 2001 and 2007. In addition, they find that the effect of industry specialization on

turnover growth is stronger for initially low as well as initially high performers, in terms of profitability, compared to initially medium performers.

Existing literature thus reports mixed results, which may (partly) lie in the different time frames and geographic areas examined in the different studies. In addition, Nadant, Perdreau, and Bruining (2018) find that the advantages to industry specialization are greater when there are challenges to value creation, the degree to which this is the case may differ across the different samples. Also, Nadant, Perdreau, and Bruining (2018) use Multilevel Mixed Effects (MLME) models, whereas the other authors use regular Ordinary Least Square (OLS) regressions. Finally, as the shift towards value creation through operational engineering started by the end of the 1990s (Ghai, Gehoe, & Pinkus, 2014), one would expect the benefits of industry specialization to manifest themselves through operational improvements to a larger degree in more recent samples. This may also explain the difference in results found by Meuleman et al. (2009) and Nadant, Perdreau, and Bruining (2018).

However, this does not explain the discrepant findings of Cressy, Munari, and Malipiero (2007) and Meuleman et al. (2009), where buyouts in the same geographic area and during roughly the same period are studied by means of regular OLS regressions. In addition, the same measures for industry specialization, profitability, and turnover are used. Yet, a crucial difference between the two studies is that Cressy, Munari, and Malipiero (2007) look solely at the post-buyout operating performance, whereas Meuleman et al. (2009) review the *change* in operating performance before and after the buyout. The post-buyout operating profitability that Cressy, Munari, and Malipiero (2007) observe is largely determined by the target's pre-buyout operating profitability. Ironically, these authors themselves seem to bypass the issue of causality, after having pointed out the same problem in other studies. It cannot be concluded with certainty whether industry specialized PE firms manage to enhance their targets' operating profitability or whether they are merely better at 'picking winners', meaning targets with high initial profitability, which arguably, doesn't require much skill.

Thus, existing literature does not show academic consensus on the effect of PE firm industry specialization on targets' operating performance improvements. It should be noted that the most recent dataset used in any of the studies discussed contains buyouts completed between 2001 and 2007, which raises questions about the studies' representativeness of the current competitive PE landscape, wherein arguably, the benefits of industry specialization may be greater. The current research therefore contributes to the existing body of literature by examining a recent UK sample, thereby providing insights into the largest and most mature buyout market in Europe (BVCA, 2020).

2.4.2 Industry specialization as a source of competitive advantage

There are several potential advantages to industry specialization, which relate to different phases of the buyout investment process as discussed in section 2.1.2. Industry specialized PE firms are able to build up industry-specific networks through which they are likely to identify the most attractive opportunities in the sourcing and acquisition phase (Cressy, Munari, & Malipiero, 2007; Fuchs et al., 2021; Teten & Farmer, 2010). One caveat here is that industry specialization may (severely) limit the investable universe. In addition, Modern Portfolio Theory (MPT) prescribes that investors should select a diversified set of securities to optimize expected returns, given a certain level of risk (Markowitz, 1952). Arguably, industry specialization increases PE firms' exposure to concentration risk because of a lack of diversification (Nadant, Perdreau, & Bruining, 2018).

However, while the MPT was developed for the portfolio construction of minority positions in publicly listed companies on which the investor has little to no influence, buyout investors can be characterized as active investors that exert a profound level of influence on their portfolio companies. Industry specialization may therefore actually reduce risk, as it enhances the knowledge buyout investors possess about the investments they make. Gompers, Kovner, and Lerner (2009) and Norton and Tenenbaum (1993) find empirically that the advantages of industry specialization through improved access to networks, information, and deal flow outweigh the concentration risk for VC funds.

Secondly, industry specialized PE firms are better at evaluating opportunities when they appear (Gompers, Kaplan, and Mukharlyamov, 2016). This relates to the due diligence process within the sourcing and acquisition phase. Industry specialized PE firms can likely familiarize themselves with the target more comprehensively and efficiently, due to smaller information asymmetries between the PE firm and potential targets (Cressy, Munari, & Malipiero, 2007; Meuleman et al., 2009; Scellato & Ughetto, 2013). In addition, there is reduced uncertainty as the PE firm gains more industry-specific expertise. This enables industry specialized PE firms to select targets with the most potential for value creation and to negotiate better takeover prices for them (Meuleman et al., 2009; Nadant, Perdreau, & Bruining, 2018).

Thirdly, industry specialized PE firms have a superior understanding of how best to add value to the target (Gompers, Kaplan, and Mukharlyamov, 2016). This relates primarily to the holding phase. More in-depth knowledge enables industry specialized PE firms to better balance and implement the financial, governance and operational controls (Nadant, Perdreau, & Bruining, 2018). Industry specialized PE firms may also use their networks to provide access to potential clients and suppliers (Hochberg, Ljungqvist, & Lu, 2007), and to recruit highly

qualified management for their portfolio companies (Meuleman et al., 2009). Furthermore, the enhanced sector-specific insight into competition, technology, and market developments could enable industry specialized PE firms to identify promising avenues of growth (Nadant, Perdreau, & Bruining, 2018).

In short, industry specialization can be a sustained competitive advantage to the PE firm, as there are ample ways in which industry specialized PE firms can outperform their non-industry specialized peers in every pre-exit phase of the investment process. If this is indeed the case, then industry specialization of PE firms should lead to higher operating performance improvements at the target level, relative to targets of non-industry specialized PE firms.

2.5 Stage specialization of Private Equity firms

Next to industry specialization, another dimension on which PE firms have been known to specialize is the investment stage, for example seed financing, early-stage investments, or later stage buyouts (Carter & Van Auken, 1994; Norton & Tenenbaum, 1993; Robinson, 1987). Similar to industry specialization, stage specialization aims to accrue and exploit specific accumulated knowledge into a competitive advantage (Barney, 1991; Bishop, 2004; EVCA, 2005). Specializing in a specific stage allows PE firms to gain a profound understanding of the dynamics of a particular stage, which enables the PE firm to assess the inherent risks, select the appropriate targets, and to monitor the target more effectively (Manigart et al., 2002).

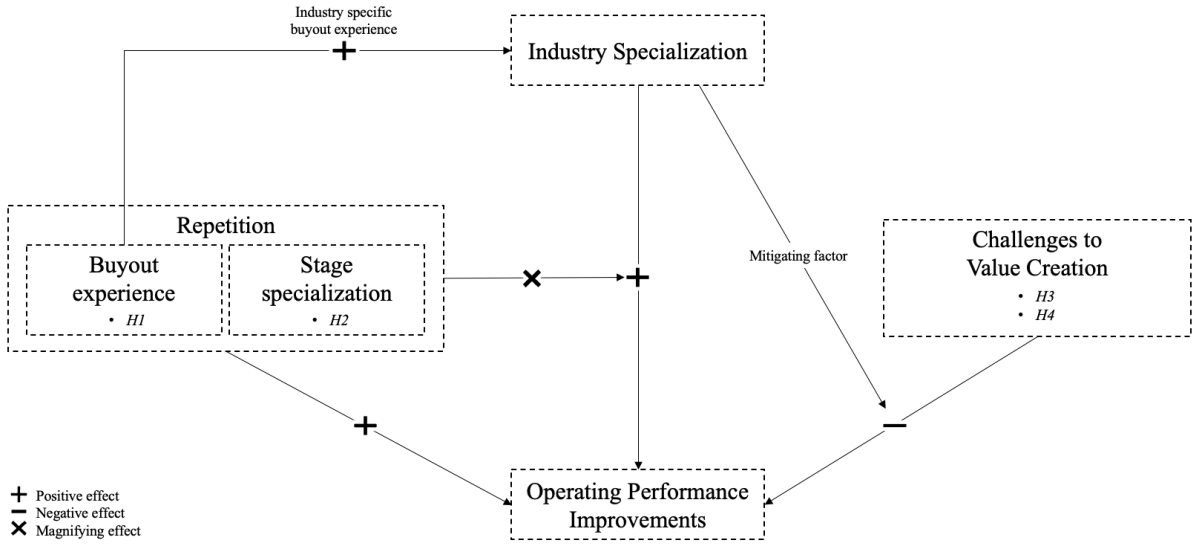
Only a limited amount of research has been conducted into the effects of stage specialization on (operating) performance. Bottazzi, Da Rin, and Hellmann (2004) and Norton and Tenenbaum (1993) find empirically that PE firms that only focus on early-stage investments are more actively involved and perform significantly better in terms of fund returns. However, these authors' focus is on the effect of stage specialization on fund performance, not on operating performance. In addition, they examine VC investments, rather than buyout investments. As far as I can tell, Cressy, Munari, and Malipiero (2007) are the only authors that specifically investigate the relationship between buyout (stage) specialization and operating performance and find no such relationship. However, these authors do not examine operational improvements but rather solely post-buyout operating performance. In addition, one could question the degree to which their sample of buyouts, completed between 1995 and 2002, represent the current competitive PE landscape, where there may be more added value to being (stage) specialized. Existing empirical research thus provides no conclusive results on the effect of stage specialization on operating performance improvements.

3. Conceptual model and hypotheses

The previous chapter highlighted various sides of PE, among which the proposed benefits of industry specialization to PE firms, as well as stage specialization. In the following chapter, a conceptual model is proposed. Subsequently, the hypotheses of the current study are introduced to substantiate the theoretical arguments put forth in the literature and to advance novel perspectives on the effect of industry specialization on operating performance improvements.

3.1 Conceptual model

Based on the literature review, this study proposes the following conceptual model, from which the hypotheses will be derived. The model also serves to illustrate the intercorrelation of the different hypotheses.



The relationship between industry specialization and operating performance improvements is by itself expected to be positive. On a conceptual level, it is contested that there are two broad classes of factors. The first class of factors is where PE firms accumulate knowledge through repetition and the second class of factors is where PE firms face challenges to value creation.

The first class of factors are expected to have a positive direct effect on operating performance improvements. Furthermore, the positive relationship between industry specialization and operating performance improvements is expected to be magnified when PE firms have more buyout experience, as PE firms accumulate knowledge on target selection, investment monitoring and value creation plan implementation through prior investments. Moreover, buyout experience within the industry in which a PE firm specializes ('industry specific buyout experience') will lead to a higher degree of industry specialization.

Aktas, De Bodt and Roll (2013) provide evidence of learning gains through repetitive acquisitions of similar companies. At its core, the source of the positive relationship between any kind of specialization (including industry specialization) and operating performance improvements also lies in knowledge accumulation through repetition, as the PE firm learns how to create value in the 'same kind' of companies by repetitively engaging in value creation activities, such that the PE firm becomes an expert at it. Over time, repetition allows PE firms to integrate routines to make them compressible and focused, which sets the stage for selection and value creation capacity development (Yang, Narayanan, & Zahra, 2009).

If a PE firm makes no distinctions in the type of investment stage it invests in, then the spectrum of value creation activities that the PE firm engages in within a given industry may still be very broad. When a PE firm defines its niche of preferred companies to invest in more sharply by combining stage and industry specialization, the value creation strategies are likely to be more similar in its different investments. This increases the opportunities for repetition of the same industry and stage specific value creation activities and may strengthen the positive effect of industry specialization on operating performance improvements.

The second class of factors concern challenges to value creation, which are expected to have a negative direct effect on operating performance improvements. However, industry specialization is expected to mitigate this negative relationship. The added benefit of being specialized in a specific industry is greater when there are challenges to value creation, as industry specialization enables the industry specialized PE firm to recognize and capitalize on complex avenues of value creation where other non-industry specialized PE firms cannot (Castellaneta & Gottschalg, 2016; Nadant, Perdreau, & Bruining, 2018).

3.2 Knowledge accumulation through repetition

3.2.1 Hypothesis 1: Buyout experience

The argument that industry specialization leads to an enhanced understanding of the specific industry that the PE firm is active in, as elaborated in section 2.4.2, can be extended further to building investment experience in general (Meuleman et al., 2009). The more buyout experience PE firms have, both industry specific and in general, the more knowledge they have accumulated from prior buyouts, which manifests itself in all phases of the buyout investment process discussed in section 2.1.2 (Baum & Silverman, 2004; De Clercq & Dimov, 2008).

More experienced buyout investors may be able to reduce adverse selection problems that are the result of information asymmetries between potential target companies and the PE

firm (Meuleman et al., 2009). Consequently, they may be superior in their ability to select targets with the best growth prospects or where the PE firm knows it can add the most value (Baum & Silverman, 2004). More buyout experience is also likely to be associated with a more extensive network that can generate higher deal flow (Bradford & Smith, 1997).

Kaplan and Strömberg (2004) assert that experienced buyout investors are better at writing contracts to minimize agency problems. This allows the PE firm to effectively manage the investment during the holding phase. In addition, experienced PE firms have increased bargaining power towards different stakeholders of the target company, resulting from the low information asymmetries and effective contracts (Coff, 1999). This enhances experienced PE firms' ability to manage the target companies during the holding phase and can have a positive influence on their operating performance (Meuleman et al., 2009). The expertise of experienced PE firms concerning strategic and financial management, manager selection, marketing efforts, and organic and inorganic growth can also improve the operating performance of the target company significantly (Lee, Lee, & Pennings, 2001; Wright et al., 2001; Wright, Hoskisson, & Busenitz, 2001).

Previous authors have observed that buyout investors accumulate experience in target selection, monitoring of the investment, and providing assistance to the implementation of the value creation plan (Cumming, Siegel, & Wright, 2007; Dimov & Shepherd, 2005). Alperovych, Amess, and Wright (2013) show empirically that buyout experience has a positive effect on the post-buyout efficiency of target companies. In a similar vein, Meuleman et al. (2009) find that buyout experience is associated with higher levels of post-buyout turnover growth. As such, these authors argue that the ability to learn from prior deals and subsequently upgrade organizational capabilities can be a source of competitive advantage in a broader sense than just for particular industries.

Among industry specialized PE firms, there exists considerable heterogeneity in terms of their amount of buyout experience. An industry specialized PE firm with very little buyout experience is not expected to exhibit the same industry specific know-how and capabilities as an industry specialized PE firm that has completed a multitude of prior buyouts, both within the industry in which a certain target operates and otherwise. It is therefore hypothesized that a combination of industry specialization and experience amplifies the improvements in operating performance:

H1: The improvement in target companies' operating performance due to industry specialization is higher if the PE firm is experienced.

3.2.2 Hypothesis 2: Stage specialization

Section 2.5 elaborated on another strategic dimension on which PE firms can specialize, namely stage specialization. The theoretical arguments for stage specialization are similar to industry specialization, namely reduced information asymmetries as the PE firm learns more about the probability of success in that stage (Eisenhardt, 1989) and reduced uncertainty as the PE firm gains more in-depth knowledge of companies in that specific stage (Cressy, Munari, & Malipiero, 2007). While the effect of stage specialization on fund performance (Bottazzi, Da Rin, & Hellmann, 2004; Manigart et al., 2002, Norton & Tenenbaum 1993) or operating performance of target companies (Cressy, Munari, & Malipiero, 2007) has been studied to some extent in existing literature, the research community has not yet addressed the interaction effect between industry and stage specialization on operating performance. Arguably, the benefits of industry specialization, as elaborated on in section 2.4.2, can be leveraged to their full extent when a PE firm also focuses primarily on a specific investment stage or several 'connected' stages, rather than all investment stages.

Industry specialized PE firms benefit from industry-specific networks through which they are likely to identify the most attractive opportunities. Norton and Tenenbaum (1993) contend that in order to enhance a PE firm's position in networks and information flow, PE firms concentrate in one financing stage or several financing stages as proprietary deal flow will be more focused and tailored to the PE firm. Combining stage and industry specialization could allow the PE firm to cultivate a close-knit deal flow based on networks of contacts and relationships, while earning a reputation for its expertise (Sahlman, 1990). It should be noted that while deal flow garnered through such a network would be more specialized, the network would also most likely be smaller, which could hurt the magnitude of the deal flow.

Further, industry specialized PE firms may be superior at evaluating opportunities when they appear through a more comprehensive and efficient due diligence phase (Gompers, Kaplan, and Mukharlyamov, 2016). The nature of the due diligence phase varies widely across different investment stages. In seed financing, due to the absence of any financial track record, investment decisions are made based on founder background checks, consulting with fellow seed financiers, analyses of similar starts-ups, and deep market analyses that includes gauging the market's need for the product, while due diligence in buyouts is much more focused on the available financial data, forecasts modelling, assessing the competitive landscape and scalability of the business, and choosing the appropriate amount of leverage (Bygrave, 1988). A combination of stage and industry specialization would allow the PE firm to not only familiarize itself with the target company more comprehensively and efficiently due to its

industry expertise, but to also have the expertise, capabilities, and network required for the due diligence process that is specific to the investment stage.

Moreover, while industry specialized PE firms may have a superior understanding of how best to add value to the target company through value creation activities, investing in one specific industry but across all different stages would still entail engaging in a wide range of value creation activities (Timmons & Bygrave, 1986). Investing in an early-stage technology venture, for example, typically entails putting a lot of effort into shaping the product categories, business models, and standards that will define future markets (Sarasvathy, 2001; Berglund, 2007), as well as garnering valuable patent rights (Baum & Silverman, 2004), whereas a mature technology company may benefit more from assistance related to international expansion and finding the right strategic partners. Additionally, syndication, which significantly changes the dynamics under which value creation strategies are executed, is a lot more prevalent in early stage investing than it is in buyouts, while also being more prevalent in higher-risk industries such as (bio)technology (Bygrave, 1987). Thus, the value creation strategies that an industry specialized PE firm engages in are likely to be more focused and similar if the PE firm is also a specialist in terms of investment stages. Because the focal point of the current study is buyouts by PE firms, the following hypothesis is advanced:

H2: The improvement in target companies' operating performance due to industry specialization is higher if the PE firm is a buyout specialist.

3.3 Challenges to value creation

3.3.1 Hypothesis 3: Secondary buyouts

According to Castellaneta and Gottschalg (2016) and Nadant, Perdreau, and Bruining (2018), the effects of industry specialization on operating performance improvements change when there are challenges to realize value generation. More specifically, the authors argue that the specialized resources of PE firms become more valuable when complex strategies at the target level are required to realize value creation, such as restructuring or innovation strategies. Taking the pre-buyout profitability as a proxy for the difficulty with which PE firms can create value at the target company level, Nadant, Perdreau, and Bruining (2018) show that operating performance improvements are greatest for initial low and initial high performing targets. They argue that initial low performers require specific competencies, such as turnaround financing, leading non-industry specialized PE firms to generally consider them unsuitable. Indeed, the

authors do seem to confuse industry specialization and turnaround specialization in their argumentation. For initial high performers, the authors argue that improvements are more difficult to reach, requiring complex and time-consuming strategies that can only be implemented successfully by industry specialized PE firms.

The argument that industry specialization becomes more valuable when there are challenges to value creation is particularly relevant for SBOs. Arguably, SBOs leave fewer opportunities for value creation compared to PBOs, as the most obvious avenues of creating value will already have been exploited by the primary buyer (Achleitner et al., 2012; Achleitner & Figge, 2012; Cumming, Siegel, & Wright, 2007; Wright, Gilligan, & Amess, 2009). Therefore, the difference in percentual operating performance improvements between industry specialized and non-industry specialized buyouts may be larger for SBOs than for PBOs.

Although plenty of research investigated the performance of SBOs, compared to PBOs (Achleitner & Figge, 2012; Bonini, 2015; Eschenröder, 2020; Hammer, Kick, & Schwetzler, 2021), the degree of industry specialization of the PE firms was not reported or examined in these studies. So far, little research has been conducted that specifically investigated the effect of industry specialization on the performance of SBOs, relative to PBOs. Following the line of argument by Castellaneta and Gottschalg (2016) and Nadant, Perdreau, and Bruining (2018) that the benefits of industry specialization are greatest when there are challenges to realize value generation, the following hypothesis is tested:

H3: The improvement in target companies' operating performance due to industry specialization is higher in secondary buyouts.

3.3.2 Hypothesis 4: The COVID-19 pandemic

The recent economic downturn caused by the COVID-19 pandemic heavily impacted the PE industry. In the short run, financial performance in terms of cash flows and revenues were affected, while in the long run, the uncertainty surrounding the pandemic hindered the ability to make investment decisions (Gompers, Kaplan, & Mukharlyamov, 2022). In a survey of 214 US buyout funds, with a collective AuM of $1.9 trillion, 39.9 percent of all portfolio companies were said to have been negatively affected by the pandemic, while 9.4 percent were severely negatively affected (Gompers, Kaplan, & Mukharlyamov, 2022). Many GPs also cancelled or delayed deals during the pandemic when vaccines were still unavailable, out of fear of (further)

global lockdowns and the subsequent closing of businesses (Arundale & Mason, 2020; Real Deals, 2020).

However, the pandemic also presented opportunities for PE firms. Some PE firms viewed the pandemic as an opportunity to take advantage of low valuations to take public companies private, engage in bolt-ons and carve-outs, and acquire distressed assets (Arundale & Mason, 2020; Financial Times, 2020a). In addition, the energetical pursuit of takeovers by big technology companies such as Alphabet, Amazon, Apple, Facebook, and Microsoft, following the pandemic, presented opportunities to exit investments (Financial Times, 2020b). Furthermore, many PE firms sought to acquire target companies that were unaffected by or conversely, actually thrived due to the pandemic, such as e-commerce, artificial intelligence, (digital) healthcare, fintech, cybersecurity, and gaming companies (Arundale & Mason, 2020).

As mentioned in the argumentation that led to H3, Castellaneta and Gottschalg (2016) and Nadant, Perdreau, and Bruining (2018) assert that the benefits to industry specialization are greatest when there are challenges to value creation. One specific challenging contingency explicitly studied by Castellaneta and Gottschalg (2016) is buyouts that are completed during economic downturns. Economic downturns make it more difficult for PE firms to reach the required threshold of returns on equity, forcing them to undertake more complex avenues of value creation, such as restructurings and turnaround initiatives (Short et al., 2006; Wright et al., 2001; Wright, Hoskisson, & Busenitz, 2001). The complexity of these operations and the heterogeneity in PE firms' ability to execute them successfully are at the root cause of the higher variance of performance among different PE firms during economic downturns (Bradley et al., 2011; Meyer, Brooks, & Goes, 1990). Castellaneta and Gottschalg (2016) confirm their hypothesis that the variance of buyout performance increases with economic downturns among a sample of global buyouts completed between 1973 and 2008.

To the best of my knowledge, no previous study has examined the effect of industry specialization during the most recent economic shock caused by the pandemic. Extending the research conducted by Castellaneta and Gottschalg (2016), the current research therefore contributes to the existing body of literature by testing the following hypothesis:

H4: The improvement in target companies' operating performance due to industry specialization is higher for buyouts completed during the COVID-19 pandemic.

This fourth hypothesis should be viewed as a sub-study within this research, as a modified, more recent buyout sample set is used. This is thoroughly elaborated on in the next chapter.

4. Data and methodology

This chapter provides an overview of the research design of the current study. Furthermore, the sample selection procedure and data sources are discussed. Thereafter, the dependent variables that relate to operating performance, the independent variables, both in terms of industry and stage specialization, and various control variables are elaborated on. The chapter concludes with descriptive statistics.

4.1 Research design

Section 2.4.1 elaborated on the discrepant findings of Cressy, Munari, and Malipiero (2007) and Meuleman et al. (2009). Cressy, Munari, and Malipiero (2007) look solely at the post-buyout operating performance of target companies backed by industry specialized PE firms to establish whether industry specialization confers a competitive advantage, which does not allow for conclusions to be drawn on the relation between industry specialization and operating performance *improvements*. The research design of the current study is an improvement on the methodology employed by Cressy, Munari, and Malipiero (2007), as the current study will examine the effect of industry specialization on the change in operating performance before and after the buyout.

Improvements in operating performance are often measured over a timeframe of five years (Acharya et al., 2013; Alemany & Marti, 2005; Desbrières & Schatt, 2002), as the operating performance in the pre-buyout year (t_{-1}) is subtracted from the average of the operating performance in the three post-buyout years (t_1-t_3), to arrive at the difference. This creates a consistent benchmark and avoids potential idiosyncratic biases stemming from using single-year figures (Nadant, Perdreau, & Bruining, 2018). In addition, the operational improvements that PE firms aim to realize may take some time to materialize, which the average of the operating performance in the three post-buyout years takes into account.

As further elaborated on in section 4.2, a second, modified sample is used in the current research to assess the effect of industry specialization on operating performance changes for buyouts completed during the pandemic. Due to limited data availability, one-year post-buyout operating performance figures are used. These are compared to the operating performance figures during the pre-buyout year, to compute the difference. As single post-buyout operating performance figures are used, these results should be interpreted with care, and function as an invitation for future research when post-buyout operating performance figures over a longer time span become available. However, as the most drastic changes to target companies are

typically made during the first 100 days (McKinsey & Company, 2021), the one-year post-buyout figures should still capture a substantial change in operating performance.

There are two reasons for selecting the UK as the geographical area of buyouts considered. First and foremost, UK company law is much stricter in terms of filing detailed financial statements for private firms than that of most other western countries, resulting in much better data availability (Cressy, Munari, & Malipiero, 2007). Secondly, second only to the US, the UK represent one of the most mature and largest PE markets in the world.

4.2 Sample selection and data sources

4.2.1 Dataset 1

In the construction of the first dataset, used to test H1-H3, several financial databases are used. Firstly, Zephyr, a Bureau van Dijk (BvD) database, is used to collect data on all LBOs completed in the UK between January 1st, 2014, and December 31st, 2018. This specific timeframe is chosen to ensure that a sufficient number of deals are included in the dataset. Furthermore, as historical financial data of targets does not go back further than 2013 in the BvD database, 2014 is the first year for which one-year pre-buyout data can be collected. Taking 2018 as the final year of LBOs completed allows for three years' worth of post-buyout data to be collected for all deals. In order to test H3, both PBOs and SBOs are collected, which is an extension of the research conducted by Cressy, Munari, and Malipiero (2007), Meuleman et al. (2009), and Nadant, Perdreau, and Bruining (2018), who all examine only PBOs. This sample results in a total of 989 buyouts, for which target and acquirer names, dates of incorporation, BvD ID numbers, country codes, deal completion dates, PBO or SBO classifications, and deal headlines are retrieved.

Secondly, Orbis, another BvD database, is used to collect financial data on the target companies. This financial data, over a window of one year prior to three years' post-buyout, is collected, which allows for the difference-in-difference analyses to be performed. Despite relatively good data availability in the UK, the dataset was significantly reduced, from 989 down to 211 observations when including information on EBITDA, turnover, net working capital, number of employees, total long-term debt, and total assets over the five-year period around the deal completion date.

Thirdly, the buyout history of the acquiring PE firms is acquired through Zephyr and ThomsonOne, to establish the extent to which the PE firms are industry and stage specialized and experienced in buyout investing. If a PE firm could not be found on Zephyr or

ThomsonOne, its deal history was manually looked up via its company website. If a PE firm could still not be found, it was discarded, leaving 192 observations.

4.2.2 Dataset 2

To establish the effect of the pandemic on the change in operating performance of target companies backed by industry specialized PE firms and test H4, a second dataset of buyouts is created. Data on LBOs completed in the UK between February 1st, 2020, and December 31st, 2020, is collected, resulting in a sample of 159 observations. Mirroring earlier research that investigated the effect of the pandemic on financial markets, the current research assumes that the pandemic started on February 1, 2020, when the number of global confirmed cases on the John Hopkins University website exceeded 10,000 (Omura, Roca, & Nakai, 2021). Here again, the sample is significantly reduced when accounting for the financial data availability of target companies in Orbis, down to 85 observations, for which only EBITDA and turnover figures could be found in terms of operating performance.

In the second part of this study, and only to test H4, these 85 buyouts in dataset 2 are added to the 192 buyouts in dataset 1. As such, the merged dataset comprises of 277 observations. This combined dataset is then used to assess the effect of industry specialization on the (t_{-1}-t_1) change in operating profitability and turnover growth of buyouts completed during the pandemic, relative to the effect of industry specialization on the (t_{-1}-t_1) change in profitability and turnover growth of buyouts completed between January 1st, 2014, and December 31st, 2018 (the control group).

4.3 Dependent variables – Operating performance improvements

Sections 2.3.1 and 2.3.2 elaborated on the performance operating measures of target companies that are most often discussed in existing literature, both in terms of financial returns and real returns. To get a comprehensive understanding of how industry specialization affects the operating performance changes of target companies, performance measures for both financial returns and real returns are used as dependent variables in the analyses. For all dependent variables, operating performance figures in the pre-buyout year is subtracted from the average in the three post-buyout years, to arrive at the difference.

4.3.1 Financial returns performance measures

Δ*EBITDA/Turnover (Operating profitability)* – Operating profitability is a widely adopted measure of company performance in previous research on buyouts (Jain & Kini, 1994; Kaplan, 1989; Long & Ravenscraft, 1993). Operating profitability is proxied in the current research by dividing the EBITDA figure by total turnover, following Acharya, Kehoe, and Reyner (2009) and Nadant, Perdreau, and Bruining (2018).

The benefit of EBITDA is that it reflects a company's fundamental operational earnings potential (Kaplan, 1989; Long & Ravenscraft, 1993; Scellato & Ughetto, 2013). Nadant, Perdreau, and Bruining (2018) assert that cash flows would be an equally suitable proxy for value creation. However, the impact of working capital changes and capital expenditures, which PE investors have been known to impact within target companies (Kaplan, 1989), makes it harder for cash flow measures to separate profitability from efficiency enhancements (Acharya, Kehoe, & Reyner, 2009).

EBITDA is preferred over EBIT, as the former is unaffected by the target's capital intensity. Depreciation and Amortization (D&A) figures are also prone to accounting manipulation, especially around change of ownership (Remenarić, Kenfelja, & Mijoč, 2018). Furthermore, EBITDA is preferred over net earnings due to the contingency of the latter upon a firm's capital structure and the substantial interest payments that targets typically face as a result of high leverage. By taking EBITDA/turnover as performance measure, rather than, for example, ROA, the effect of operational engineering can be examined in isolation, rather than a combination of operational and financial engineering (Cressy, Munari, & Malipiero, 2007).

Δ*Turnover (Growth)* – Turnover growth captures the growth of the target (Cressy, Munari, & Malipiero, 2007). Improvements in turnover and operating profitability have been reported as the most important sources of value creation by PE investors (Gompers, Kaplan, & Mukharlyamov, 2016). Turnover growth is also a widely adopted measure of operating performance in previous research on buyouts (Cressy, Munari, & Malipiero, 2007; Guo, Hotchkiss, & Song, 2011; Kaplan, 1989; Nadant, Perdreau, & Bruining, 2018), as it reflects the effect of strategic initiatives devised and implemented by PE investors concerning pricing, product (quality), distribution, and customer service, among other things (Acharya et al., 2013).

Δ*NWC/Turnover (Efficiency)* – Net Working Capital (NWC) over turnover is a measure of operational efficiency. Essentially, NWC reflects the amount of capital that is tied up in the operations of a company, as it measures how a company balances its current assets and current liabilities. The lower the NWC, the higher the operational efficiency. NWC is then scaled to the turnover of the target to reflect how efficiently working capital is used to generate turnover.

NWC can be reduced by decreasing current assets and/or increasing current liabilities. This can be realized by decreasing the accounts receivable days, decreasing the inventory days, thereby reducing the operating cycle (Bain & Company, 2021b; Smith, 1990), and/or increasing the accounts payable days. Various authors indeed find that PE firms realize significant improvements to NWC efficiency within target companies (Smith, 1990; Weir, Jones, & Wright, 2015; Wright, Thompson, & Robbie; 1992). This suggests that PE investors are often able to renegotiate contracts with suppliers and customers (Ippolito & James, 1992).

Aktas, Croci, and Petmezas (2015) find that firms that are able to converge to their optimal NWC level show superior firm performance. More specifically, efficient NWC management allows firms to redeploy underutilized resources to high-valued use. As such, NWC management can improve the performance of portfolio companies and thereby increase their enterprise value (Bain & Company, 2021b).

4.3.2 Real returns performance measures

Δ*Turnover per employee (Productivity)* – Following earlier empirical research, the effect of PE ownership on productivity is captured through turnover over number of employees (Aldatmaz & Brown, 2020; Biesinger, Bircan, & Ljungqvist, 2020; Davis et al., 2019; Leslie & Oyer, 2008; Meuleman et al., 2009). Various authors find that PE ownership enhances productivity in terms of this performance measure (Brav et al., 2018; Brav, Jiang, & Kim, 2015; Davis et al., 2019; Guo, Hotchkiss, & Song, 2011), indicating that PE firms catalyze the creative destruction process in the labor market (Davis et al., 2014).

By using a combination of a nominator and a denominator into a single measure, this measure leaves room for various possible drivers behind the results. An obvious one is that part of the staff is laid off, resulting in higher turnover per employee (Gulliver & Jiang, 2020). This possibility is addressed in the dependent variable ΔNumber of employees discussed below. Another (less obvious) explanation may be a higher number of full-time workers replacing part-time workers (Wright, Gilligan & Amess, 2009). However, Lutz and Achleitner (2009) find the contrary, namely a shift from full-time to part-time employment under PE ownership.

Δ*Number of employees (Employment)* – Various authors argue that buyouts should not only be a means to capture financial gains from inefficiencies at the target company, but also to stimulate strategic change that stimulates growth in terms of employee numbers (Meuleman et al., 2009; Wright et al., 2000). Therefore, the current research also aims to investigate whether buyouts capture value from employees, an indication of which would be the case

where all aforementioned performance measures show improvements between pre-buyout and post-buyout, but employee growth does not.

Davis et al. (2014) show that buyouts are associated with high levels of job destruction, but simultaneous high levels of job creation, as PE firms catalyze the creative destruction process in the labor market. Simultaneous job destruction and job creation is studied in the current research by examining growth of absolute employee numbers, so that the net effect of PE ownership on employment is captured. Furthermore, laying off workers may improve operating profitability, as well as productivity. By looking at absolute employee numbers separately, a better indication of the potential sources of profitability and productivity improvements is achieved (Meuleman et al., 2009).

4.4 Independent variables – Industry and stage specialization

To construct measures for the degree of industry and stage specialization, this research builds upon the methodology employed by Cressy, Munari, and Malipiero (2007) and Nadant, Perdreau, and Bruining (2018), called the Index of Competitive Advantage (ICA). The measure is adapted from earlier literature on international trade and technology specialization (Archibugi & Pianta, 1994). The ICA is defined as follows:

$$ICA_{ij} = (C_{ij}/C_{.j})/(C_{i.}/C_{..})$$

Where a dot indicates summation over the relevant subscript and:

C_{ij} is the number of target companies of PE firm i in industry/stage j

$C_{.j}$ is the total number of target companies in industry/stage j across all PE firms in the sample

$C_{i.}$ is the total number of target companies of PE firm i

$C_{..}$ is the total number of target companies across all PE firms in the sample (across all industries/stages)

In this measure, the numerator ($C_{ij}/C_{.j}$) represents PE firm i's share of target companies in industry/stage j, relative to the entire sample's target companies in industry/stage j, whereas the denominator ($C_{i.}/C_{..}$) represents PE firm i's share of target companies in all industries/stages relative to all target companies in the entire sample (Cressy, Munari, & Malipiero, 2007). Therefore, ICA_{ij} measures a PE firm i's industry/stage focus, relative to that of the sample. It holds that:

$$ICA_{ij}\begin{cases}\geq 1 \longleftrightarrow C_{ij}/C_{.j} \geq C_{i.}/C_{..} \\ < 1 \longleftrightarrow C_{ij}/C_{.j} < C_{i.}/C_{..} \\ = 0 \longleftrightarrow C_{ij} = 0\end{cases}$$

In other words, a value greater than 1 means that the PE firm is industry/stage specialized, relative to the sample. A value smaller than 1 means that the PE firm is relatively industry/stage unspecialized. Therefore, dummy variables are created for industry and stage specialization that take a value of 1 if the ICA of the PE firm ≥ 1 and a value of 0 otherwise.

Cressy, Munari, and Malipiero (2007) use all deals completed in their sample period as the window to determine the ICA. However, as they also consider deals that were completed *after* a specific buyout, the degree of industry/stage specialization of the PE firm *at the time of that buyout* is not truly reflected. To correct for this, therefore, the window that is used to determine the ICA in the current research includes the entire investment history of the PE firm (and the entire sample), up to the deal completion date of each buyout.

One could question whether treating each target company the same, irrespective of size, deal value or number of investment years, is an adequate representation of how much industry expertise is gathered from a single investment. Although a larger target company that is held for a longer period requires more attention and therefore has more opportunities to extract industry expertise from the process, it could well be argued that the amount of industry expertise gathered marginally decreases with size and investment period. More industry expertise is likely to be gathered from holding multiple small target companies for a short amount of time, compared to one large target company with the same total deal value and the same total holding period. In the absence of a function that translates company size, deal value and investment years into the amount of industry expertise gathered, each investment is treated the same when using the ICA to construct the industry specialization measure.

Many PE firms self-declare to be specialized in certain industries (Bain & Company, 2022b, Gompers, Kaplan, & Mukharlyamov, 2016). There exists, however, substantial heterogeneity in the different industry classifications that PE firms make. The classification used in this research should reflect the different industries that PE firms themselves seem to distinguish between, to match how PE firms specialize in certain industries in practice.

In a first step, target companies are assigned to different industries based on their NACE Rev.2 Classification, which is a code assigned by the European Union and its member states to particular classes of economic activity and can be retrieved from Zephyr. Based on this first classification, companies are then manually assigned to one of the 11 major industries within

the Industry Classification Benchmark (ICB), which is an industry classification launched by the FTSE 2005 and is currently used by FTSE International and STOXX, two major indices. The 11 industries within the ICB classification are basic materials, consumer discretionary, consumer staples, energy, financials, healthcare, industrials, real estate, technology, telecommunications, and utilities.

With respect to the stage specialization construct, both Zephyr and ThomsonOne indicate whether a deal concerns a (leveraged) buyout, referred to as a 100% institutional buyout, or whether a deal concerns seed financing, or first to eight round financing, where a minority stake is taken. The number of 100% institutional buyouts completed by the PE firm, *vis-à-vis* all its other prior deals where a minority stake is taken, up to the deal completion date of the buyout of interest are used to construct the stage specialization ICA.

For syndicated deals, the ICA is constructed for the lead investor, as previous literature has shown that they tend to exert the highest level of influence on the target company, adopt a more hands-on approach than the other co-investors, and are most involved in the monitoring and management of the target company (Barry, 1994; Cressy, Munari, & Malipiero, 2007; Das & Teng, 1998; Gorman & Sahlman, 1989; Wright & Lockett, 2003). They also typically hold the highest equity stake in the target company.

4.5 Independent variables – Control variables

Several control variables are included in the regression analyses that are related to the target company, the PE firm, and/or the deal dynamics. These variables are included as they have been empirically shown to affect the change in pre- and post-buyout operating performance of target companies.

Target size – Wright et al. (1995) and Kaplan (1991) report that the size of the target company in buyouts is positively associated with a short holding period and high exit probability. Based on the results of these studies, Nikoskelainen and Wright (2007) argue that size may be a significant factor in determining returns. These authors suggest that financial sponsors may prefer sizable target companies that can be expected to provide high absolute returns for the fund. This would result in PE investors focusing most of their attention on their larger portfolio companies, assisting those companies more intensely to achieve higher operating performance changes. This may be further amplified by the limited exit possibilities of smaller firms due to a lack of interest from large strategic buyers and the infeasibility of exiting through an IPO (Nikoskelainen & Wright, 2007).

On the other hand, theoretically speaking, smaller companies may have more growth potential than established, larger firms (Banz, 1981; Reinganum, 1981). A smaller size does bring challenges to capitalize on these growth opportunities, such as financial constraints (Carpenter & Petersen, 2002), shortage of personnel (Fombrun & Wally, 1989) and incoherent systems and structures (Kotter & Sathe, 1978). However, PE firms, through their expertise and resources, should eminently be able to overcome these challenges and to capitalize on the growth opportunities of small firms, illustrating the potential added value of specializing in investing in early-stage ventures. To account for the scale effects on the change in pre- and post-buyout operating performance, turnover figures in the pre-buyout year are included in the regression analyses, following Cressy, Munari, and Malipiero (2007).

Target age – Various authors have demonstrated that the age of a company is positively related to its chance of survival (Cressy, 2006; Evans, 1987), due to the 'up-or-out' dynamic of the market (Haltiwanger, Jarmin, & Miranda, 2013). First must either learn, or exit (Coad et al., 2018). At the same time, however, research has shown that aging firms show a decline in growth opportunities (proxied by Tobin's q) due to organizational rigidity (Loderer, Stulz, & Waelchli, 2017). Anyadike-Danes and Hart (2017) also find that on average, a firm's growth slows after the first five years. This slowing growth may result in reduced operational performance by older firms. This is in line with the results of Loderer, Stulz, and Waelchli (2017), who find that profitability decreases with a firm's age. These results are (partly) supported by Akben-Selcuk (2016), who finds a negative and convex relationship between firm age and profitability, suggesting that firms become more profitable again at an older age.

Empirical studies have reported mixed results relating to company age and innovation. Bianchini et al. (2017) find that young firms tend to innovate less than older firms, as their primary focus is on short-term results and value preservation and not on long-term (risky) projects. On the other hand, Acemoglu and Cao (2015) find that young firms are more likely to invest in radical innovation, which may increase its chances of value creation. In the current study, the age of the target company is operationalized as the number of years between its date of incorporation and the deal completion date.

Target initial profitability – Previous industrial economics literature has emphasized the importance of initial profitability figures when predicting future growth and avenues for value creation (Cressy, 2006). As explained in section 2.4.1, the results that Cressy, Munari, and Malipiero (2007) report seem to be predetermined by the pre-buyout operating profitability of the target company, indicating that industry specialized PE firms 'pick winners'.

In the difference between pre-buyout and post-buyout operating profitability, the initial profitability is already partly operationalized. However, Nadant, Perdreau, and Bruining (2018) illustrate that there is added value to including a separate measure of pre-buyout operating profitability, as their results suggest that the benefits of industry specialization depend on a target company's initial operating profitability. Target initial profitability is operationalized by dividing the target's EBITDA by its turnover in the pre-buyout year.

Target initial turnover growth – Much like initial profitability, initial turnover growth is an important determinant when predicting future growth (Bergström, Grubb, & Jonsson, 2007; Cressy, 2006; Guo, Hotchkiss, & Song, 2011). A flat initial turnover growth is indicative of a struggling company, while high initial turnover growth indicates a fast-growing, successful company, with ample value creation avenues. Target initial turnover growth is operationalized as the target's percentual change in turnover between the pre-buyout year and the buyout year.

PE firm size – It has been argued in previous literature that larger PE firms benefit from economies of scale (Cressy, Munari, & Malipiero, 2007; Meuleman et al., 2009). Size also captures several other important performance-related characteristics, such as reputation and human capital (Phalippou & Zollo, 2005). Furthermore, fund size has been associated with higher fund returns (Kaplan & Schoar, 2005; Phalippou & Zollo, 2005). It should be noted that there is no absolute academic consensus on this, as Harris, Jenkinson, and Kaplan (2014) find buyout fund size to be unrelated to fund performance. An explanation is invoked by Phalippou and Zollo (2005), who point out the difficulty larger funds may have in finding enough deals.

As research has also shown that the size of a fund is negatively related to fund failure rate, this control variable is included to avoid potential survivorship bias (Brown et al., 1992). PE firm size would ideally be measured as the total AuM of the PE firm at the time of the buyout, following Cressy, Munari, and Malipiero (2007) and Meuleman et al. (2009). However, due to data availability, this measure is proxied as the current AuM of the PE firm. This should be a close enough approximation, as a relatively recent dataset is used.

PE firm experience – Section 3.2.1. elaborated in detail on the potential added value of experience, which in many respects, mirrors the added value of industry specialization (Meuleman et al., 2009). Two different kinds of buyout experience are added to the analysis, namely industry specific and general buyout experience. Both are operationalized as the total number of prior buyout investments of the PE firm at the time of the deal completion date, when only considering prior buyouts in the industry of the target of interest, and otherwise.

PE firm age – Various authors have argued that the broader network of well-established PE firms can have a positive effect on deal-flow (Fenn, Liang, & Prowse, 1997; Fuchs et al.,

2021; Gompers, Kaplan, & Mukharlyamov, 2016; Teten & Farmer, 2010). These networks are typically built through years of working in the PE industry (Ljungqvist & Richardson, 2003). Although firm experience already proxies for this to some extent, it is reasonable to assume that between two PE firms with the same amount of experience in terms of number of investments, the one who has been around longer has built up a broader industry network. In addition, being around for a longer period of time means a higher number of funds have been raised, which is an indication of success (Barber & Yasuda, 2017, Kaplan & Schoar, 2005). This variable is operationalized as the number of years between the PE firm's date of incorporation and the deal completion date.

PE firm independence – The performance of target companies can also be influenced by whether a PE firm is captive or independent. A PE firm is captive if it is affiliated to a financial institution such as a bank or insurance company, or governmental organization. PE affiliates from financial institutions have less pressure to maximize returns because their ability to raise subsequent funds is less dependent on it (Abbott & Hay, 1995; Manigart et al., 2002; Meuleman et al., 2009). Furthermore, PE firms that are run by governmental or other public bodies may pursue goals other than return maximization (Cumming & MacIntosh, 2006; Lerner, 2000). Therefore, a dummy variable is included that takes a value of 1 if a PE firm is independent, and a value of 0 otherwise.

Deal Leverage – Section 2.2.1 elaborated on the advantages and disadvantages of using leverage in PE transactions. The large amount of debt incurred in a typical buyout imposes significant discipline on management, which can be an important force in achieving efficiency gains (Cressy, Munari, & Malipiero, 2007; Cumming, 2005; Holmstrom & Kaplan, 2001; Jensen, 1986). At the same time, incurring too much debt may have a negative effect on future growth, as high interest payments may leave less room for exploring new avenues of growth (Anton, 2019; Coricelli et al., 2012; Stulz, 1990). A variable that reflects the amount of leverage used in the transaction helps to isolate the effects of financial engineering on the change in operating performance.

When a PE company acquires a target company with leverage, this debt is incurred in the financial statements of the target company itself, commonly referred to as a 'debt pushdown', which enables the construction of the variable employed in the current research. Ideally, this variable would have been operationalized as the company's debt/equity ratio shortly after the buyout, following Cressy, Munari, and Malipiero (2007). However, due to data availability, deal leverage is operationalized as the long-term debt/assets ratio of the target company in the buyout year, following Nadant, Perdreau, and Bruining (2018).

Syndication – Access to deal flow, improved screening and selection capabilities, and monitoring skills are often-cited benefits of the syndication of deals, which can have a positive effect on target companies' operating performance improvements (Cumming, 2006; Lerner, 1994; Manigart et al., 2006). Meuleman et al. (2009) argue that PE firms may syndicate their deals to gain access to resources of other PE firms. Extending this line of argument, pooling the industry expertise and general buyout experience of multiple PE firms may amplify the benefits that industry specialization and buyout experience bring.

On the other hand, syndication may cause coordination frictions between PE firms, arising from different incentives, objectives, and opinions on strategies to follow (Nanda & Rhodes-Kropf, 2018). Especially when an industry specialized PE firm enters into syndication with one or more non-industry specialized PE firms, these coordination frictions may outweigh the perceived benefits from the perspective of the industry specialized PE firm. A dummy variable is included in the regression that takes a value of 1 if the deal is syndicated and a value of 0 otherwise.

Divisional buyout – A divisional buyout, also referred to as a carveout, is where a corporate division, subsidiary or separate operating unit is acquired (Hite & Vetsuypens, 1989). Agency problems may be significant in divisions of large, complex organizations when the multidivisional structure lacks the appropriate control and incentive mechanisms (Fama & Jensen, 1983; Hill, 1988; Meuleman et al., 2009; Thompson & Wright, 1987). Growth opportunities of the division may also be constrained by the organizational structure (Wright et al., 2001). Wright, Hoskisson, and Busenitz (2001) argue that divisional buyouts foster an environment where entrepreneurial activity is more encouraged post-buyout, relative to other buyouts. Therefore, buyouts of such divisions can lead to a more efficient and profitable allocation of resources, leading to operating performance improvements (Meuleman et al., 2009). A dummy variable is included in the analysis that takes a value of 1 in the case of a divisional buyout, and a value of 0 otherwise.

Secondary buyout – Theoretically speaking, SBOs leave fewer opportunities for operating performance improvements, as the 'low hanging fruit' will already have been picked during the PBO (Achleitner & Figge, 2012). However, previous research has reported mixed results when comparing the operating performance improvements of SBOs, compared to PBOs. While Hammer, Kick, and Schwetzler (2021) and Archleitner and Figge (2012) find no significant difference in operating performance improvements between SBOs and PBOs, Eschenröder (2020) and Bonini (2015) find that SBOs perform worse or at least not better than

PBOs, on average. In the current research, a dummy variable is added to the analysis that takes a value of 1 if the vendor is a PE firm, and a value of 0 otherwise.

Cross-border buyout – PE firms that engage in cross-border buyouts are confronted with several additional challenges to value creation, which can have an impact on operating performance improvements. Firstly, cross-border PE firms are likely to have less extensive networks and resources in a foreign country to identify targets with the most opportunities for value creation (Azzi & Suchard, 2019; Buchner et al., 2018; Jia & McCourt, 2022). Secondly, cross-border acquiring PE firms may suffer from greater information asymmetries compared to local PE firms, stemming from cultural and geographical differences (Hammer, Janssen, & Schwetzler, 2021). Thirdly, there may be challenges to monitoring the operations of a cross-border portfolio company, due to a lower amount of influence the PE firm can exert on existing management and the possibility of moral hazard (Dai, Jo, & Kassicieh, 2012; Holloway, Lee, & Shen, 2016). In recent years, local offices of PE firms have enjoyed increased popularity to overcome the challenges to cross-border value creation (Hammer et al., 2022). In the current study, a dummy variable is included that takes a value of 1 if the buyout is cross-border and the PE firm does not have a local office in the UK, and a value of 0 otherwise.

S&P500 – The condition of public equity markets correlates with the level of equity funds available for buyout purposes, which in turn may affect target companies' growth possibilities and profitability (Franzoni, Nowak, & Phalippou, 2012; Cressy, Munari, & Malipiero, 2007). Moreover, this variable is included to account for intra-year swings in economic sentiment not captured by year dummies. Furthermore, the stock market is said to be a predictor of the economic environment, which suggests a discrepancy between the condition of the stock market and the economic environment observed in a given year. The S&P500 is chosen because it provides a reliable picture of the developments in and state of global equity markets at the time of the buyout. Also, a substantial proportion of the acquiring PE firms in the dataset originate from the US. Hence, this variable is operationalized as the level of the S&P500 Index on the deal completion date.

Year of buyout – Macroeconomic factors such as real interest rates, inflation, gross domestic product, and unemployment rates have been shown to be correlated with the supply and demand for VC and PE investments, as well as to the performance of companies in the economy (Bernoth & Colavecchio, 2014; Cumming, MacIntosh, 2006). Therefore, differences in time-varying macroeconomic effects should be accounted for. Accounting for these effects is especially relevant for the second part of the current study, where the effect of industry specialization on the operating performance improvements of buyouts completed during the

pandemic are examined. Therefore, year-dummies are included in the regressions to control for time-varying differences across buyouts.

Industry – The operating performance improvements of target companies may also be contingent upon the industry in which they operate. Bain & Company (2022b) elaborate on the returns that buyouts in different industries have produced in the past decade, indicating that there may be significant heterogeneity in the operating performance improvements achieved in buyouts across different industries. Therefore, dummy variables are included for every major ICB industry listed in section 4.4.

Table 1 provides an overview of all the variables included in the analysis, along with a brief description. Due to the skewness of some variables, they are transformed into their square root or natural logarithm versions, as elaborated on in section 4.7.

Table 1

Definitions of the variables used in the analyses

Variables	Definition
Dependent variables	
ΔOperating profitability	The *percentual* difference between EBITDA/turnover in the pre-buyout year (t-1) and the average in the three post-buyout years (t1, t3).
ΔTurnover	The *percentual* difference between turnover in the pre-buyout year (t-1) and the average in the three post-buyout years (t1, t3).
ΔNWC/Turnover	The *percentual* difference between NWC/turnover in the pre-buyout year (t-1) and the average in the three post-buyout years (t1, t3).
ΔTurnover per employee	The *percentual* difference between turnover/employees in the pre-buyout year (t-1) and the average in the three post-buyout years (t1, t3).
ΔNumber of employees	The *percentual* difference between number of employees in the pre-buyout year (t-1) and the average in the three post-buyout years (t1, t3).
Independent variables	
ICA industry dummy	A dummy variable that takes the value 1 if the PE firm is industry specialized, and 0 otherwise.
ICA stage dummy	A dummy variable that takes the value 1 if the PE firm is a buyout specialist, and 0 otherwise.
Ln target size	The natural logarithm of turnover ($mln) of the target company in the pre-buyout year (t-1).
Sqrt target age	The square root of the difference in years between the date of incorporation of the target company and the deal completion date.
Target initial profitability	The EBITDA/turnover measure of the target company in the pre-buyout year (t-1).
Target initial turnover growth	The *percentual* difference between turnover in the pre-buyout year (t-1) and the buyout year (t0).
Ln PE firm size	The natural logarithm of the amount of AuM of the PE firm ($mln).
Ln general experience	The natural logarithm of the total number of buyouts completed by the PE firm up until the deal completion date across all industries.
Ln industry experience	The natural logarithm of the total number of buyouts completed by the PE firm up until the deal completion date within the industry of a certain target.
Sqrt PE firm age	The square root of the difference in years between the date of incorporation of the PE firm and the deal completion date.
Independence dummy	A dummy variable that takes the value 1 if the PE firm is independent, and 0 otherwise.
Leverage	The long-term debt/assets of the target company in the buyout year (t0).
Syndication dummy	A dummy variable that takes the value 1 if the buyout is syndicated, and 0 otherwise.
Divisional dummy	A dummy variable that takes the value 1 in the case of a divisional buyout, and 0 otherwise.
Secondary dummy	A dummy variable that takes the value 1 if the vendor is a PE firm, and 0 otherwise.
Cross-border dummy	A dummy variable that takes the value 1 if the buyout is cross-border and the PE firm does not have a local office in the UK, and 0 otherwise.
S&P500	The level of the S&P500 Index on the deal completion date.
Year dummies	Dummy variables that take the value 1 if the buyout is completed in 2014, 2015, 2016, 2017, 2018, or 2020.
Industry dummies	Dummy variables that take the value 1 for each of the major industries in the ICB classification.

4.6 Methodology

4.6.1 Sample selection bias

Because accounts data is missing for a significant proportion of the initial number of deals in both datasets, a two-stage Heckman procedure is adopted for each sample to deal with the sample selection issues this raises (Heckman, 1976, 1979). In the first stage, the probability that a deal is included in the final sample is estimated using a probit model, based on the target's

profitability (EBITDA/turnover) and size (turnover) figures in the pre-buyout year, which were available for 410 out of the initial 989 deals in dataset 1 and for 125 out of the initial 159 deals in dataset 2. The residuals of the selection equation are used to construct the selection bias control factor, called *Lambda*, which is equivalent to the inverse Mills ratio (Smits, 2003). In the second stage, *Lambda* is added to the regression analysis as an additional independent variable to capture the effect of unmeasured profitability and size related characteristics that are also related to the probability that a deal is included in the final sample. This way, the other independent variables are no longer affected by these effects and show unbiased coefficients.

4.6.2 Multilevel mixed-effects models

Castellaneta and Gottschalg (2016) show empirically that PE performance is determined to a substantial degree by a firm-specific effect. Nadant, Perdreau, and Bruining (2018) also emphasize the heterogeneity in PE firms' ability to leverage higher target operating performance from industry specialization, resulting in operating performance improvements that are specific to each PE firm. Therefore, these authors use MLME models to study the effect of PE firm industry specialization on operating performance improvements.

MLME models are well suited for these kinds of analyses, as they allow for the intercept and coefficients of the variables in the regressions to differ across PE firms. As such, MLME models allow for clustering among the 192 buyouts that were completed by 119 different PE firms in the current sample. Letting the intercept differ across PE firms allows for a PE firm-specific effect to be captured (Castellaneta & Gottschalg, 2016). Letting the coefficients of the variables differ across PE firms allows for the heterogeneity in resource endowments of PE firms to lever capabilities from their target companies to be captured. The base MLME model is as follows (Nadant, Perdreau, & Bruining, 2018):

$$y_{i,j} = (\alpha_1 + \varsigma_{1,j}) + \sum_n (\beta_n + \varsigma_{j,n}) x_{i,j,n} + \sum_m \beta_m x_{i,j,m} + \varepsilon_{i,j}$$

Where $y_{i,j}$ is the improvement in operating performance for target *i* of PE firm *j*. $(\alpha_1 + \varsigma_{1,j})$ is the random intercept of PE firm *j*, and $\varsigma_{1,j}$ represents the deviation of PE firm *j*'s intercept from the mean intercept α_1. $(\beta_n + \varsigma_{j,n})$ is the random coefficient of variable n for PE firm *j*, if the coefficient is allowed to differ between the PE firms in the sample. $\varsigma_{n,j}$ represents the deviation of PE firm *j*'s coefficient from the mean coefficient β_n for variable n. β_m represents the

coefficient of variable m for PE firm *j*, if the coefficient is not allowed to differ between the PE firms in the sample and is thus equal to the sample's mean. $\varepsilon_{i,j}$ are the residuals.

Through Likelihood Ratio (LR) tests, it is analyzed whether MLME models offer significant improvements over OLS regressions, and which variables' coefficients should be allowed to differ to improve the MLME models.

4.7 Descriptive statistics

Table 2 provides an overview of the number of buyouts in the sample that were completed per year. The number of sample buyouts completed in the UK increases steadily from 2014 to 2017, which is largely in accordance with empirical research and literature on buyout activity in the UK during this period (BVCA, 2018; Preqin, 2019). The number of buyouts completed in 2018 is significantly lower due to the limited financial data availability for the year 2021, resulting in an inability to construct the three-year post-buyout performance measures for most buyouts completed in 2018. These observations were therefore omitted from the analysis.

Table 2

Buyout frequencies per year

Year	Number of buyouts	Percentage
2014	40	20.8%
2015	45	23.4%
2016	47	24.5%
2017	48	25.0%
2018	12	6.3%
Total	192	100.0%

Table 3 provides an overview of the number of buyouts that were completed per industry, distinguishing between non-industry specialized and industry specialized PE firms. As described in section 4.4, the target companies are classified using the ICB, as constructed by FTSE International and STOXX. Non-industry specialized PE firms in the sample have focused primarily on the consumer discretionary, industrial, and technology industries, while industry specialized PE firms have focused mainly on the consumer discretionary and industrial industries. The consumer discretionary industry comprises sectors such as consumer services, leisure goods, media, and retail. The industrial industry includes business services, construction, engineering, and aerospace and defense. Sectors within the technology industry include software, computer services, and technology hardware and equipment. While the separate samples differ substantially in their distributions of buyouts across industries, the total sample is in line with the distribution across industries reported by the BVCA during this period (BVCA, 2014; 2015; 2016; 2017; 2018).

Table 3

Buyout frequencies of non-industry specialized PE firms and industry specialized PE firms per ICB industry

	Non-industry specialized PE firms		Industry specialized PE firms		Total	
ICB sector	Number of buyouts	Percentage	Number of buyouts	Percentage	Number of buyouts	Percentage
Basic materials	0	0.0%	1	0.8%	1	0.5%
Consumer discretionary	16	22.5%	51	42.1%	67	34.9%
Consumer staples	3	4.2%	3	2.5%	6	3.1%
Energy	3	4.2%	1	0.8%	4	2.1%
Financials	9	12.7%	11	9.1%	20	10.4%
Healthcare	2	2.8%	5	4.1%	7	3.6%
Industrials	17	23.9%	29	24.0%	46	24.0%
Real estate	2	2.8%	1	0.8%	3	1.6%
Technology	15	21.1%	12	9.9%	27	14.1%
Telecommunications	3	4.2%	2	1.7%	5	2.6%
Utilities	1	1.4%	5	4.1%	6	3.1%
Total	71	100.0%	121	100.0%	192	100.0%

For every buyout in the sample, the dependent and independent variables described in sections 4.3 to 4.5 were collected. Table 4 provides an overview of the descriptive statistics of these variables, again distinguishing between non-industry specialized and industry specialized PE firms.

Table 4

Descriptive statistics

	Non-industry specialized PE firms						Industry specialized PE firms						
Dependent variables	Mean	Median	Std. dev.	Min.	Max.	Obs.	Mean	Median	Std. dev.	Min.	Max.	Obs.	t-statistic
ΔOperating profitability	-0.070	-0.019	0.209	-1.292	0.227	72	-0.019	-0.023	0.287	-1.361	1.372	120	-1.303
ΔTurnover	0.240	0.102	0.670	-0.724	3.557	72	0.724	0.228	2.710	-0.898	27.936	120	1.488
ΔNWC/Turnover	0.010	-0.005	0.276	-0.782	2.028	72	0.038	-0.001	1.043	-2.290	10.933	120	-0.224
ΔTurnover per employee	-0.062	-0.152	0.417	-0.774	2.388	72	0.156	-0.054	1.419	-0.943	14.470	120	-1.272
ΔNumber of employees	0.359	0.242	0.571	-0.303	3.351	72	0.866	0.284	4.654	-0.362	51	120	-1.230
Independent variables													
ICA stage dummy	0.69	1	0.46	0	1	72	0.78	1	0.42	0	1	120	-1.238
Target size	101.7	44.3	152.6	3.6	915.8	72	101.4	35.4	378.4	1.0	3,969.4	120	0.009
Ln target size	10.8	10.7	1.2	8.2	13.7	72	10.5	10.5	1.3	6.9	15.2	120	1.864*
Target age	19.8	17.0	14.7	1.0	81.0	72	23.9	18.0	20.4	0.0	111.0	120	-1.491
Sqrt target age	4.16	4.12	1.57	1.00	9.00	72	4.53	4.24	1.84	0.00	10.54	120	-1.410
Target initial profitability	0.154	0.145	0.143	-0.344	0.536	72	0.146	0.137	0.268	-1.995	1.015	120	0.226
Target initial turnover growth	0.087	0.044	0.506	-0.402	4.015	72	0.230	0.108	0.730	-0.606	6.356	120	-1.455
PE firm size	20,006	2,500	60,546	66	471,000	72	19,270	1,379	55,833	66	471,000	120	0.085
Ln PE firm size	7.86	7.82	2.11	4.19	13.06	72	7.67	7.23	2.19	4.19	13.06	120	0.610
General experience	154.10	48.00	281.20	1	1,433	72	94.7	43.0	146.8	2	911	120	1.921*
Ln general experience	3.88	3.87	1.59	0	7.2675	72	3.74	3.76	1.30	0.7	6.81	120	0.650
Industry experience	6.6	1	22.9	0	29.0	72	8.0	5.0	11.1	1	91.0	120	-1.197
Ln industry experience	0.80	0.00	1.02	0	3.30	72	1.75	1.70	1.04	0	4.51	120	-5.188***
PE firm age	20.6	19.0	15.5	0	70.0	72	19.2	16.5	12.9	1	67.0	120	0.652
Sqrt PE firm age	4.13	4.36	1.89	0	8.37	72	4.10	4.06	1.57	1	8.19	120	0.140
Independence dummy	0.931	1	0.256	0	1	72	0.942	1	0.235	0	1	120	-0.306
Leverage	0.160	0.001	0.321	0	1.451	72	0.108	0.004	0.205	0	0.978	120	1.368
Syndication dummy	0.056	0	0.231	0	1	72	0.042	0	0.201	0	1	120	0.439
Divisional dummy	0.167	0	0.375	0	1	72	0.075	0	0.264	0	1	120	1.98**
Secondary dummy	0.375	0	0.488	0	1	72	0.400	0	0.492	0	1	120	-0.342
Cross-border buyout	0.139	0	0.348	0	1	72	0.083	0	0.278	0	1	120	1.218
S&P500	2,150.1	2,081.6	237.9	1,748.9	2,905.4	72	2,217.1	2,112.2	240.7	1,827.9	2,904.8	120	-1.875*

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

When examining the mean operating performance changes for both samples, it appears that industry specialized PE firms drive greater improvements in all operating performance measures in the target companies they acquire. However, the large maximum values, high

standard deviations, and median values for the dependent variables in the industry specialized subsample indicate that the differences in mean values are most likely driven by outliers.

Tests for normality are performed using skewness and kurtosis analyses. Absolute skewness and kurtosis values of less than two standard deviations are taken as an indication that the variables follow a normal distribution. Variables that do not meet these assumptions are subsequently transformed to satisfy the normality assumptions of linear regressions and t-tests. For target age and PE firm age, the square root is taken, while for target size, PE firm size and PE firm experience, both industry specific and in general, the natural logarithm is taken. A benefit of these transformations is that they account for the probable non-linear relationship between these independent variables and operating performance changes, as the added value of being more experienced and/or larger as a PE firm, for example, is likely to be marginally decreasing in number of deals completed or additional dollars in AuM, respectively.

In order to perform the appropriate t-test, an F-test was performed first to determine whether the variances across both samples were equal or not. If the variances were equal, a Student's t-test was performed, while if they were not, a Welch's t-test was performed. The t-tests indicate that none of the operating performance changes are significantly different between the buyouts completed by non-industry specialized PE firms and industry specialized PE firms. With respect to the independent variables, the t-tests indicate that industry specialized PE firms acquire smaller targets, have less general buyout experience but considerably higher industry specific buyout experience, engage less in divisional buyouts and generally acquire firms when the S&P500 Index is at relatively higher levels.

From economic reasoning, it seems plausible that industry specialized PE firms have less general buyout experience, as their investable universe to build this experience from is smaller. It is also in line with expectations that industry specialized firms have more industry specific buyout experience than their non-industry specialized counterparts. The fact that industry specialized PE firms engage in more acquisitions in times of higher company valuations is an indication that these PE firms are superior at selecting target companies with room for value creation, despite high company valuations.

Table 5 presents the correlation matrix of the dependent variables. For every correlation, a Pearson's test was performed to establish significance. It can be inferred from table 5 that PE firm age, PE firm size, and general buyout experience show high correlations, possibly resulting in multicollinearity. As the benefits of being of an older age for a PE firm are largely captured by general buyout experience, PE firm age is excluded from subsequent analyses. PE firm size is kept in the analyses because it proxies for benefits to the PE firm that

are not captured by general buyout experience, as discussed in section 4.5. Furthermore, industry specific buyout experience shows high correlations with several variables, especially with general buyout experience. Therefore, industry specific buyout experience is also excluded. However, when testing H1, the variables for general buyout experience and industry specific buyout experience will be used in separate analyses.

It also follows from table 5 that deal leverage is positively correlated with a target's initial profitability, which supports the notion that more profitable companies are able to service higher interest payments, allowing them to attract a higher level of debt. The absence of any significant correlation between industry specialization and initial target profitability raises questions about whether the explanation offered by Cressy, Munari, and Malipiero (2007), that industry specialized PE firms tend to 'pick winners', holds true.

Table 5

Correlation matrix

	ICA industry dummy	*ICA stage dummy*	*Ln target size*	*Sqrt target age*	*Target initial profitability*	*Target initial turnover growth*	*Ln PE firm size*	*Ln general experience*	*Ln industry experience*	*PE firm age*	*Independence dummy*	*Syndication dummy*	*Leverage*	*Divisional dummy*	*Secondary dummy*	*Cross-border dummy*	*S&P500*
ICA industry dummy	1																
ICA stage dummy	0.089	1															
Ln target size	-0.001	-0.064	1														
Sqrt target age	0.108	0.067	0.181**	1													
Target initial profitability	-0.016	0.002	-0.017	0.017	1												
Target initial turnover growth	0.105	-0.074	-0.052	-0.069	-0.048	1											
Ln PE firm size	-0.006	0.089	0.059	-0.028	0.024	0.002	1										
Ln general experience	-0.085	-0.239***	-0.002	-0.088	-0.039	0.005	0.290***	1									
Ln industry experience	0.264***	-0.120	-0.077	-0.145**	0.009	0.155**	0.254***	0.311***	1								
PE firm age	-0.047	-0.078	0.101	-0.022	0.083	-0.001	0.270***	0.514***	0.217***	1							
Independence dummy	0.022	0.046	0.039	-0.004	-0.146**	0.000	0.016	0.009	-0.087	-0.124	1						
Syndication dummy	-0.032	0.017	0.008	0.114	0.035	-0.040	-0.040	-0.061	-0.020	-0.076	-0.248***	1					
Leverage	-0.099	-0.077	-0.028	-0.108	0.182**	0.001	0.210***	0.105	0.014	0.157**	0.112	-0.028	1				
Divisional dummy	-0.142*	-0.025	0.168**	0.065	-0.032	-0.117	-0.070	-0.053	-0.076	0.045	-0.047	0.001	-0.046	1			
Secondary dummy	0.025	0.126*	-0.055	-0.093	0.025	0.153**	0.020	0.079	0.154**	0.111	-0.102	0.024	0.033	-0.246***	1		
Cross-border dummy	-0.088	0.004	0.201***	0.051	-0.006	-0.055	-0.084	-0.033	-0.031	-0.023	0.088	-0.076	0.046	0.044	-0.063	1	
S&P500	0.135*	0.109	-0.023	-0.046	-0.019	0.043	-0.058	-0.027	0.007	-0.009	0.101	0.036	-0.014	-0.140*	0.038	0.029	1

***p<0.001, **p<0.01, *p<0.05

5. Results and discussion

In this chapter, the results of the study are discussed. For each dataset separately, tests are performed to account for potential sample selection bias. Thereafter, the appropriate models to perform the analyses with are identified. Subsequently, the regression results are presented, after which the hypotheses advanced in chapter 3 are tested. The chapter concludes with a discussion of the results.

5.1 Dataset 1

5.1.1 Sample selection bias

In a first step, regressions including inverse Mills ratios (*Lambdas*) are estimated to account for sample selection bias, as elaborated on in section 4.6.1. The tendency of industry specialized PE firms to acquire smaller targets, as discussed in section 4.7, underlines the importance of the two-stage Heckman procedure to check for potential sample selection bias, as the resulting bias towards larger companies may not be affecting buyouts completed by industry specialized PE firms to the same degree as buyouts completed by non-industry specialized PE firms.

In the probit selection models, shown in table 6, the coefficients of the variables Ln target size and initial profitability are significant at the 1% and 10% level, respectively, confirming their explanatory power in predicting the inclusion of an observation in the sample. Adding more independent variables to the probit model tended to reduce the equation's significance. An important condition for the use of the Heckman procedure is that the selection equation contains at least one variable that is not also included in the main regression, to avoid multicollinearity with the Mills ratios (Smits, 2003). Therefore, Ln target size was excluded from the main regressions.

It follows from the results presented in table 6 that the Mills ratios are not statistically different from zero in any of the models. In addition, the independent variable coefficients are hardly affected by the inclusion of the Mills ratios. Therefore, following Cressy, Munari, and Malipiero (2007) and Meuleman et al. (2009), the Mills ratios are not included in any of the succeeding analyses, as no sample selection bias seems to be present in dataset 1.

Table 6

OLS models, including lambdas, resulting from a two-stage Heckman procedure, for all operating performance models. Ln target size is omitted to avoid multicollinearity with the inverse Mills ratio. The 2014 dummy and basic materials dummy are also omitted to avoid multicollinearity. To be concise, year and industry dummies are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover		ΔNWC/Turnover		ΔTurnover per employee		ΔNumber of employees	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.065*	0.038	0.167	0.128	0.004	0.057	0.067	0.083	0.149	0.107
ICA stage dummy	0.088**	0.042	0.064	0.143	-0.012	0.064	0.014	0.093	0.067	0.119
Sqrt target age	-0.010	0.011	-0.080**	0.036	0.007	0.016	-0.009	0.023	-0.105***	0.030
Target initial profitability	-0.465***	0.092	0.115	0.098	-0.321**	0.137	0.080	0.063	-0.109	0.257
Target initial turnover growth	-0.044	0.027	0.698***	0.090	-0.177***	0.041	0.372***	0.058	0.041	0.076
Ln PE firm size	0.004	0.011	-0.095**	0.038	0.004	0.017	-0.048*	0.025	-0.026	0.032
Ln general experience	0.015	0.016	0.222***	0.055	-0.004	0.024	0.088**	0.035	0.096**	0.046
Independence dummy	-0.094	0.077	0.126	0.254	-0.108	0.116	-0.100	0.164	0.184	0.217
Syndication dummy	-0.018	0.085	0.265	0.285	-0.190	0.128	-0.060	0.184	0.492**	0.239
Leverage	-0.089	0.073	0.449*	0.243	0.197*	0.110	-0.103	0.157	0.412**	0.206
Divisional dummy	-0.023	0.059	-0.291	0.198	0.085	0.089	-0.147	0.128	-0.141	0.166
Secondary dummy	0.040	0.039	0.125	0.130	-0.047	0.058	0.101	0.084	-0.113	0.108
Cross-border dummy	0.075	0.056	-0.153	0.187	-0.071	0.084	0.069	0.121	-0.032	0.157
S&P500	0.000	0.000	0.000	0.001	0.000	0.000	-0.001	0.000	0.000	0.001
Year dummies	Yes		Yes		Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes		Yes		Yes	
Lambda	-0.184	0.176	0.853	0.536	-0.420	0.264	0.263	0.346	-0.067	0.494
Constant	0.425	0.497	-0.382	1.631	0.264	0.745	0.983	1.054	-0.793	1.395
Observations	192		192		92		192		192	
Adj. R-squared	0.211		0.431		0.083		0.304		0.122	
F-stat.	2.76***		5.99***		1.59*		3.88***		1.91***	

	Included dummy	
Probit	Coef.	Std. Err.
Ln target size	0.131***	0.044
Target initial profitability	0.405*	0.218
Constant	-1.483***	0.462
Observations	410	
LR chi2(2)	16.59***	

***p<0.01, **p<0.05, *p<0.10

5.1.2 Choosing the appropriate models

Through LR-tests, it is determined whether MLME models offer improvements over OLS models and which variables' coefficients should be allowed to differ to improve the MLME models. Chi-squared values indicate that the MLME models where the intercept and industry specialization coefficient are allowed to differ offer improvements over OLS models for the ΔTurnover and ΔTurnover per employee models. The results of these MLME models are presented in table 7. The random effects parameters are presented at the bottom of the table, which indicate that the variation of the industry specialization dummy variables is substantial, more than two standard errors in the ΔTurnover model and more than three standard errors in the ΔTurnover per employee model. As an explanatory variable with non-zero variance for its coefficient reveals heterogeneity in its marginal effect (Alcácer et al., 2013), this substantial amount of variance indicates that PE firms vary considerably in their capacity to leverage

industry specific capabilities and resources to enhance target companies' operating performance in terms of turnover growth and turnover per employee growth.

Table 7

Results of OLS or MLME models for all operating performance measures. The 2014 dummy and basic materials dummy are omitted to avoid multicollinearity. To be concise, year and industry dummies are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover		ΔNWC/Turnover		ΔTurnover per employee		ΔNumber of employees	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.064*	0.038	0.150	0.115	0.003	0.057	0.049	0.075	0.145	0.107
ICA stage dummy	0.088**	0.042	0.069	0.125	-0.012	0.063	0.012	0.078	0.061	0.119
Ln target size	0.015	0.016	-0.134***	0.045	0.039	0.024	-0.039	0.028	0.006	0.046
Sqrt target age	-0.011	0.011	-0.059*	0.033	0.009	0.016	-0.027	0.021	-0.098***	0.030
Target initial profitability	-0.414***	0.076	0.400	0.245	-0.206*	0.114	0.432***	0.159	-0.090	0.215
Target initial turnover growth	-0.045*	0.027	0.750***	0.076	-0.178***	0.040	0.443***	0.047	0.045	0.076
Ln PE firm size	0.004	0.011	-0.081**	0.034	0.003	0.017	-0.041*	0.022	-0.025	0.032
Ln general experience	0.015	0.016	0.212***	0.044	-0.004	0.024	0.088***	0.027	0.097**	0.046
Independence dummy	-0.093	0.077	0.119	0.226	-0.108	0.116	-0.091	0.141	0.187	0.218
Syndication dummy	-0.015	0.085	0.319	0.240	-0.192	0.128	0.003	0.150	0.489**	0.240
Leverage	-0.093	0.074	0.401**	0.203	0.199*	0.110	-0.117	0.125	0.410*	0.208
Divisional dummy	-0.023	0.059	-0.257	0.160	0.085	0.089	-0.096	0.098	-0.143	0.167
Secondary dummy	0.039	0.039	0.000	0.109	-0.046	0.058	0.012	0.068	-0.116	0.109
Cross-border dummy	0.077	0.056	-0.106	0.161	-0.073	0.084	0.046	0.101	-0.027	0.158
S&P500	0.000	0.000	-0.001	0.001	0.000	0.000	-0.001	0.000	0.000	0.001
Year dummies	Yes		Yes		Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes		Yes		Yes	
Constant	0.121	0.479	2.563*	1.405	-0.527	0.718	1.236	0.880	-0.823	1.350
Model	OLS		MLME		OLS		MLME		OLS	
Observations	192		192		192		192		192	
Adj. R-squared	0.211				0.084				0.113	
F-stat.	2.76***				1.60**				1.84***	
Random effects parameters			Estimate	S.E.			Estimate	S.E.		
Var ICA industry dummy			0.359	0.158			0.196	0.062		
Var constant			0.000	0.000			0.000	.		
Var residuals			0.287	0.058			0.103	0.018		
MLME LR tests										
Chi2(2)	0.21		6.18*		0.90		11.64***		0.00	
Prob>chi2	0.900		0.045		0.638		0.003		1.000	

***p<0.01, **p<0.05, *p<0.10

For the ΔOperating profitability, ΔNWC/Turnover, and ΔNumber of employees models, MLME models do not offer significant improvements over regular OLS models. A possible explanation of the limited clustering in the sample may lie in the relatively short sample period in which buyouts are studied in the current research, which doesn't allow for many buyouts completed by the same PE firm to be observed. Based on the chi-squared values shown in table 7, it is decided to perform subsequent analyses with MLME models for the ΔTurnover and ΔTurnover per employee models and to use regular OLS models for the remaining three operating performance models.

5.1.3 Regression results

The results of the main regressions are presented in table 7, from which it follows that industry specialization is associated with a 6.4% higher operating profitability increase, which is significant at the 10% level. This operating profitability increase is of a similar magnitude as reported by Nadant, Perdreau, and Bruining (2018), who find a 7.5% higher increase in operating profitability among targets backed by industry specialized PE firms. Industry specialization is not significantly associated with improvements in the other four operating performance measures. This is in line with the results reported by Meuleman et al. (2009), who find no significant relationship between industry specialization and operating performance improvements but stands in contrast to the results found by Nadant, Perdreau, and Bruining (2018), who also report an additional 33.6% in turnover growth among targets backed by industry specialized PE firms.

Stage specialization is shown to be associated with an even higher increase in operating profitability than industry specialization, namely 8.8%, which is significant at the 5% level. This further illustrates the added value of PE specialization and provides support for the supposed relationship between repetition and operating performance improvements, discussed in the conceptual model that was presented in section 3.1. Although the results seem to indicate that stage specialization may be even more important than industry specialization to explain targets' operating profitability improvements, an F-test revealed that the two coefficients are not statistically different (F-stat. of 0.17). It can therefore not be concluded that PE firms should prefer either form of specialization over the other to improve operational performance.

General buyout experience also shows a significant positive relation with turnover growth, turnover per employee growth and number of employees growth, with the two former relationships even being significant at the 1% level. These results are in line with expectations as elaborately discussed in section 3.2.1. As the general buyout experience variable is operationalized as a natural logarithm, a 1.0% increase in general buyout experience entails an additional 0.21%, 0.09%, and 0.10% increase in turnover growth, turnover per employee growth, and number of employees growth, respectively. These results are somewhat comparable to those found by Meuleman et al. (2009), who report a 0.08% and 0.24% increase in turnover growth and number of employees growth, respectively, during the three post-buyout years, for every 1.0% increase in the logarithmic general buyout experience variable.

Both target size and target age are significantly negatively related to turnover growth. This is in line with the notion that older and larger companies show a decline in growth opportunities due to organizational rigidity, while younger and smaller companies are able to

capitalize on growth opportunities. Target age is also significantly negatively related to number of employees growth, suggesting that older targets contain higher proportions of redundant workforce, resulting in layoffs. PE firm size is significantly negatively related to both turnover growth and turnover per employee growth, which could be explained by the difficulty that large PE firms may face regarding capital deployment and thus enter into sub-optimal investments.

Initial profitability and initial turnover growth are significantly negatively related to improvements in operating profitability and significantly positively related to improvements in turnover, NWC/turnover, and turnover per employee. The negative sign of the initial operating profitability coefficient in the ΔOperating profitability model is indicative of limited room for additional margin improvements in already highly profitable targets, which may translate into value creation strategies that are more focused on turnover growth, which is in line with the positive sign of the initial profitability coefficient in the ΔTurnover model. High initial turnover growth is indicative of ample growth opportunities to capitalize on, resulting in significant positive coefficients for this variable in the ΔTurnover and ΔTurnover per employee models. The significant negative coefficients for both initial profitability and initial turnover growth in the ΔNWC/Turnover model indicate that highly profitable and fast-growing companies present the most opportunities for efficiency improvements.

The relationships between leverage and both turnover growth and number of employees growth are significantly positive, albeit at the 10% level. Still, it provides a strong counterargument against critics who claim that the high leverage component of LBOs leads to a shunning of valuable growth opportunities and employee cuts. It also serves as corroboration that leverage may serve as a mitigating factor in the free cash flow problem (Jensen, 1986), as high interest payments force managers to only focus on value-generating, rather than value-destroying projects. Leverage also shows to be positively related to ΔNWC/turnover. Here, a negative sign was expected, as leverage puts pressure on management to increase efficiency. Plausibly, leverage forces management to focus on the most obvious and conventional ways of value creation, such as operating profitability improvements and turnover growth, while efficiency improvements are given less importance. However, this is just conjecture and would need further investigation that is beyond the scope of the current research.

While syndication of deals is not found to be related with improvements in financial returns, it is significantly positively related to number of employees growth. This is in line with the reasoning that syndication does not occur based solely on reducing risk but also the pooling of resources and capabilities to improve operating performance. The results also highlight the importance of not solely examining financial returns, but real returns as well.

Several independent variables do not hold any explanatory power in any of the operating performance models but do exhibit correlation to other independent variables, as shown in table 5. Therefore, additional analyses are performed where the correlated variables are excluded from the models, but this does not improve the explanatory power of the insignificant variables.

The lack of significant SBO dummies indicates that SBOs show no lower operating performances improvements than PBOs. This contradicts previous research that reports that SBOs, on average, perform worse than PBOs (Bonini, 2015; Eschenröder, 2020), but it is in line with the results of Achleitner and Figge (2012) and Hammer, Kick, and Schwetzler (2021), who find that SBOs offer no fundamentally lower operational value creation potential.

Industry specialization is not significantly related to improvements in NWC/turnover, turnover per employee or number of employees, which proved robust to various extensions of the models as elaborated on in the following sections. Therefore, the results of these operating performance models will not be reported.

5.1.3.1 Investing in the right industries?

To test whether the relationship between industry specialization and operating performance improvements are truly the result of the leveraging of industry specific resources and not merely investing in the 'right' industries, table 8 compares the performance of the sectors in which both industry specialized and non-industry specialized PE firms invest. For every buyout in the sample, the change in EBITDA/turnover and turnover within the sector in Europe during the five-year window around the buyout as described in section 4.2.1 are retrieved from Damodaran's website. Each buyout is manually assigned to one of the 103 different sectors that Damodaran specifies, rather than the major industry classification of the ICB.

From table 8, it follows that PE firms in both subsets of buyouts did not invest in sectors that showed different profitability or turnover improvements during the five-year window around the buyouts, which is confirmed by t-tests. It also follows from table 8 that sector profitability margins hardly change. This is in line with expectations, as any structurally higher profitability margins attract competition that drive margins back to their historical average.

Table 8

Sector-wide improvements in profitability and turnover during the five-year window around the buyouts

	Non-industry specialized PE firms					Industry specialized PE firms					
	Mean	Median	St. dev.	Min.	Max.	Mean	Median	St. dev.	Min.	Max.	t-statistic
ΔOperating profitability	0.001	0.002	0.016	-0.056	0.0351	0.004	0.000	0.044	-0.061	0.451	-0.532
ΔTurnover	0.075	0.076	0.037	-0.009	0.164	0.079	0.079	0.041	-0.001	0.164	-0.545

***p<0.01, **p<0.05, *p<0.10

5.1.4 Testing hypothesis 1

The results in table 7 indicate that industry specialization is associated with higher operating profitability improvements. Industry specialized PE firms differ widely in the amount of buyout experience they possess. As more experienced PE firms may be able to reduce adverse selection problems, have superior target selection abilities, and are more proficient at realizing operational improvements, it is expected that buyout experience increases the positive relationship between industry specialization and operating performance improvements.

To verify H1, an interaction term between industry specialization and general buyout experience is added to the models, the results of which are shown in table 9. In the ΔOperating profitability model, the industry specialization coefficient drops from 6.4% down to 0.9% and loses its significance. This coefficient represents the effect of industry specialization for the PE firm with the lowest general buyout experience in the sample, which is a single prior buyout. Note that a PE firm could not have been qualified as industry specialized with zero prior completed buyouts. As the interaction term is not significant, this indicates that general buyout experience is not associated with improvements in operating profitability among industry specialized PE firms. The ΔOperating profitability model provides no support for H1.

Table 9

ΔOperating profitability and ΔTurnover models, extended with interaction terms between industry specialization and both general and industry specific buyout experience. To be concise, control variables, constants, and random effect parameters of the MLME models are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover		ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.009	0.094	-0.549*	0.280	0.024	0.059	-0.384**	0.181
Ln general experience	0.009	0.019	0.160***	0.046				
ICA industry dummy*Ln general experience	0.016	0.026	0.210***	0.077				
Ln industry experience					0.017	0.030	0.164**	0.073
ICA industry dummy*Ln industry experience					0.016	0.036	0.252**	0.101
Control variables	Yes		Yes		Yes		Yes	
Model	OLS		MLME		OLS		MLME	
Observations	192		192		192		192	

***p<0.01, **p<0.05, *p<0.10

In the ΔTurnover model, the industry specialization coefficient reduces from 15.0% down to -54.9% and becomes significant at the 10% level, which represents the effect of industry specialization for a PE firm with one prior completed general buyout. For every 1.0% in additional general buyout experience that industry specialized PE firms accumulate, an additional 0.21% in turnover growth is realized, compared to non-industry specialized PE firms, which is significant at the 1% level. The foregoing indicates that the positive relationship

between industry specialization and turnover growth that is displayed in table 7, although not statistically significant, is driven to an important degree by the amount of general buyout experience that industry specialized PE firms possess.

In a separate analysis, a different interaction term is added to the model, namely between industry specialization and industry specific buyout experience. General buyout experience and industry specific buyout experience could not be included in the same models simultaneously due to multicollinearity issues. The results are presented in table 9 and are very similar to those where an interaction term between industry specialization and general buyout experience is added to the models. For every 1.0% in additional industry specific buyout experience that industry specialized PE firms accumulate, an additional 0.25% in turnover growth is realized, compared to non-industry specialized PE firms. The ΔTurnover models with both kinds of experience interaction terms provide strong support for H1.

These results highlight the importance of correcting for buyout experience when using the ICA to compute an industry specialization measure, which Nadant, Perdreau, and Bruining (2018), remarkably, do not. Merely one prior buyout in the same industry as the buyout that is being studied (C_{ij}) is enough for a PE firm to be qualified as industry specialized if the PE firm's general buyout experience ($C_{i.}$) is low enough, even though the supposed benefits of industry specialization may be more pronounced in a PE firm that is only half as industry specialized in terms of the ICA industry measure but has completed a multitude of both industry specific and general prior buyouts. See table A1 in the Appendix for a practical illustration.

5.1.5 Testing hypothesis 2

When industry specialized PE firms are also specialized in terms of investments stages, knowledge accumulation through the repetition of similar value creation activities may strengthen the positive relationship between industry specialization and operating performance improvements. H2 is tested by including an interaction term between the industry and stage specialization dummies in the models, the results of which are presented in table 10. Inclusion of the interaction term in the ΔOperating profitability model causes the coefficients of the industry and stage specialization dummies to drop from 6.4% down to 0.6% and from 8.8% down to 4.3%, respectively, and both are no longer significant. In none of the operating performance models, the interaction term is statistically significant, which proved robust to the exclusion of variables that showed correlation to the stage specialization dummy in table 5. As such, H2 is not supported by these results.

Table 10

ΔOperating profitability and ΔTurnover models, extended with an interaction term between industry specialization and stage specialization. To be concise, control variables, constants, and random effect parameters of the MLME model are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.006	0.071	0.231	0.218
ICA stage dummy	0.043	0.063	0.109	0.154
ICA industry dummy*ICA stage dummy	0.080	0.084	-0.111	0.255
Control variables	Yes		Yes	
Model	OLS		MLME	
Observations	192		192	

***p<0.01, **p<0.05, *p<0.10

A conceivable explanation for these results is that being both industry and stage specialized leads to such a sharp reduction of the investable universe, that the opportunities for accumulating knowledge through repetition are reduced, rather than increased. Moreover, a severely limited investable universe may force specialized PE firms to enter into sub-optimal investments as they have no other investment opportunities. This argumentation suggests that there may be an optimal level of specialization for PE firms, beyond which specialization is disadvantageous to operating performance improvements. This would imply that the relationship between specialization and operating performance improvements is concave.

To test for a concave relationship between industry specialization and operating performance improvements, as well as between stage specialization and operating performance improvements, the models are extended further. Table 11 provides the results of regressions that include the continuous outcome of the ICA industry measure as a variable, instead of a binary variable, and its square as an additional variable. Table 11 also provides the results of similar models but now using a continuous ICA stage variable and its square as an additional variable. Regular OLS models are used for all operating performance models as MLME models offer no significant improvements. To establish concavity, the coefficients of the continuous ICA variables would have to be significantly positive, while the coefficients of the squares would have to be significantly negative. However, no such significant results were found in any of the models and hence, no indication of a concave relationship between industry or stage specialization and operating performance improvements could be established. Hence, no support was found for the argument that limiting the investable universe by high levels of specialization is inherently detrimental to operating performance improvements.

Table 11

OLS models for the ΔOperating profitability and ΔTurnover models, extended with continuous ICA industry and stage variables and their squares. To be concise, control variables and constants are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover		ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	-0.005	0.018	0.019	0.058	0.006	0.007	0.027	0.021
ICA industry dummy^2	0.001	0.001	0.001	0.004				
ICA stage dummy					0.110	0.094	-0.265	0.299
ICA stage dummy^2					-0.032	0.036	0.128	0.115
Control variables	Yes		Yes		Yes		Yes	
Observations	192		192		192		192	

***p<0.01, **p<0.05, *p<0.10

5.1.6 Testing hypothesis 3

It follows from existing literature that the benefits of industry specialization are greatest when there are challenges to value creation. Because SBOs are likely to leave fewer obvious avenues of value creation as these will have already been exploited, it is expected that the improvement in targets' operating performance due to industry specialization is higher in SBOs.

To test H3, the industry specialization and SBO dummies are interacted. The results are displayed in table 12. In the ΔTurnover model, the industry specialization coefficient reduces from 15.0% down to 10.4% and remains insignificant. The SBO coefficient drops from 0.0% down to -5.7%, indicating that value creation is indeed more challenging in SBOs, however the coefficient remains insignificant. While the benefits of industry specialization in SBOs is an additional 22.4% in turnover growth, the industry specialization dummy and interaction term are not jointly significant (unreported p-value of 0.19). In addition, the interaction term itself is insignificant. The ΔTurnover model therefore provides no support for H3.

Table 12

ΔOperating profitability and ΔTurnover models, extended with an interaction term between industry specialization and secondary buyout. To be concise, control variables, constants, and random effect parameters of the MLME model are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.017	0.047	0.104	0.139
Secondary dummy	-0.041	0.061	-0.057	0.152
ICA industry dummy*Secondary dummy	0.124*	0.073	0.120	0.203
Control variables	Yes		Yes	
Model	OLS		MLME	
Observations	192		192	

***p<0.01, **p<0.05, *p<0.10

In the ΔOperating profitability model, the coefficients of the industry specialization and SBO dummies reduce from 6.4% down to 1.7% and from 3.9% down to -4.1%, respectively, and both are insignificant. The interaction term has a coefficient of 12.4% and is significant at the 10% level, which means that for SBOs, the added value of industry specialization is an additional 14.1% improvement in operating profitability, which is significant at the 10% level. The ΔOperating profitability model thus provides weak support for H3.

It should be noted that SBOs by industry specialized PE firms not only outperform SBOs by non-industry specialized PE firms, but also significantly outperform PBOs by non-industry specialized PE firms by 10.0%, and PBOs by industry specialized PE firms by 8.3% in terms of operating profitability improvements. Both outperformances are significant at the 10% level. This is a somewhat surprising result that is therefore investigated in further detail.

Previous research has discovered contingencies in which SBOs can potentially outperform PBOs in terms of operational improvements. PBOs typically focus on professionalizing business practices, while more complex value creation strategies are only executed or initiated if sufficient time is left (Hammer, Kick, & Schwetzler, 2021). By contrast, in SBOs, the targets have already been professionalized and thus, are ready for more complex value creation strategies, which is where the added value of being industry specialized comes in. Hammer, Kick, and Schwetzler (2021) find empirically that this 'groundwork hypothesis' holds particularly for SBOs of smaller targets, as these are more likely to lack professional structures, which increases the added value of the groundwork laid in the PBO.

Table 13 summarizes the results when estimating the same regression models as before on the subset of 75 SBOs in the sample, including an interaction term between the industry specialization dummy and target size. Regular OLS regressions are used as MLME models offer no improvements over OLS regressions, which is likely due to the little clustering within this smaller dataset. The interaction term indicates that improvements in both operating profitability and turnover among targets backed by industry specialized PE firms decrease with the size of the target, however the interaction term is not significant in either of the models. Thus, the results provide no evidence that the superior performance of SBOs by industry specialized PE firms is driven by SBOs of smaller companies.

Table 13

ΔOperating profitability and ΔTurnover OLS models on the subset of 75 SBOs in the sample. The 2014 dummy and basic materials dummy are omitted to avoid multicollinearity. The divisional buyout dummy and energy industry dummy are also omitted because they did not appear in the SBO sample. To be concise, control variables and constants are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover		ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.768	0.524	0.445	1.400	0.083	0.058	0.040	0.163
Ln target size	0.061	0.037	-0.001	0.099				
ICA industry dummy*Ln target size	-0.061	0.048	-0.033	0.128				
Industry specialized acquirer*Non-industry specialized vendor					0.114*	0.064	0.242	0.173
Buyout specialized acquirer*Non-buyout specialized vendor					-0.012	0.062	-0.073	0.165
General experience acquirer>General experience vendor					0.037	0.057	-0.185	0.153
Control variables	Yes		Yes		Yes		Yes	
Observations	75		74		75		74	
Adj. R-squared	0.334		0.355		0.342		0.372	
F-stat.	2.37***		2.49***		2.32**		2.49***	

***p<0.01, **p<0.05, *p<0.10

For SBOs, it makes sense to not only consider the level of experience, industry specialization, and stage specialization of a PE firm relative to the sample, but also relative to the vendor PE firm. Therefore, several dummy variables are added to the SBO regressions to indicate whether the acquiring PE firm i) is industry specialized while the vendor PE firm is not, ii) is a buyout specialist while the vendor PE firm is not, and iii) has more general buyout experience than the vendor PE firm. The results are displayed in table 13.

The outperformance of SBOs where the acquiring PE firm is industry specialized seem to be driven by those buyouts where the vendor PE firm is not industry specialized. This is in line with the empirical findings of Degeorge, Martin, and Phalippou (2016), who report an outperformance of SBOs over PBOs in those instances where the acquiring and vendor PE firms possess different skill sets. Being a buyout specialist while the vendor PE firm is not, is not found to have significant explanatory power in any of the operating performance models, nor is having more general buyout experience than the vendor PE firm.

5.2 Combining dataset 1 and 2

5.2.1 Sample selection bias and choosing the appropriate models

Similar to dataset 1, inclusion of Mills ratios (*Lambdas*), resulting from a two-stage Heckman procedure, do not indicate that any sample selection bias is present in dataset 2. The results of the two-stage Heckman procedure for dataset 2 can be found in table A2 in the Appendix.

After merging the two datasets as described in section 4.2.2, LR-tests indicate that MLME models with differing intercepts and coefficients for the industry specialization dummy offer significant improvements over regular OLS regressions for both the ΔOperating profitability and ΔTurnover models. The results of these MLME models are presented in table 14.

5.2.2 Testing hypothesis 4

A period of economic downturn, such as the recent pandemic, is another situation in which there are challenges to value creation. Therefore, extending the line of reasoning that the benefits of industry specialization are greatest when there are challenges to value creation, it was asserted that improvements in target companies' operating performance due to industry specialization would be higher for buyouts completed during the pandemic. To test H4, an interaction term between the industry specialization dummy and a dummy variable for buyouts completed during the pandemic is added to the models. The results are presented in table 14.

Table 14

ΔOperating profitability and ΔTurnover MLME models, excluding and including an interaction term between industry specialization and COVID buyout. The 2014 dummy and basic materials dummy are omitted to avoid multicollinearity. To be concise, industry dummies are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔOperating profitability		ΔTurnover		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.077	0.052	0.034	0.056	0.097	0.071	0.065	0.087
COVID buyout dummy	0.394	0.329	0.339	0.336	-1.599**	0.757	-1.602**	0.756
ICA industry*COVID buyout			0.151*	0.088			0.095	0.150
ICA stage dummy	0.106	0.093	0.103	0.093	0.046	0.083	0.047	0.083
Ln target size	0.019	0.016	0.018	0.016	-0.083***	0.030	-0.084***	0.030
Sqrt target age	-0.010	0.011	-0.011	0.011	-0.013	0.021	-0.012	0.021
Target initial profitability	-0.360***	0.038	-0.358***	0.038	0.030	0.044	0.033	0.045
Target initial turnover growth	-0.056**	0.024	-0.052**	0.024	0.795***	0.059	0.798***	0.059
Ln PE firm size	-0.009	0.031	-0.010	0.030	-0.022	0.022	-0.022	0.022
Ln general experience	-0.028	0.019	-0.023	0.020	0.091***	0.031	0.091***	0.031
Independence dummy	0.003	0.213	-0.009	0.210	0.136	0.111	0.133	0.111
Syndication dummy	-0.057	0.074	-0.071	0.074	0.111	0.125	0.113	0.125
Divisional dumy	0.186***	0.050	0.170***	0.051	-0.125	0.114	-0.133	0.115
Secondary dummy	0.083**	0.035	0.085**	0.035	0.011	0.078	0.010	0.078
Cross-border dummy	-0.538***	0.134	-0.484***	0.135	-0.075	0.111	-0.079	0.111
S&P500	0.000	0.000	0.000	0.000	-0.001**	0.000	-0.001**	0.000
2015 dummy	0.005	0.056	0.002	0.057	0.177	0.124	0.180	0.124
2016 dummy	-0.028	0.056	-0.029	0.057	0.468***	0.118	0.468***	0.117
2017 dummy	-0.085	0.112	-0.083	0.114	0.636***	0.206	0.633***	0.206
2018 dummy	-0.140	0.166	-0.146	0.169	0.764**	0.336	0.748**	0.336
Industry dummies	Yes		Yes		Yes		Yes	
Constant	-0.532	0.559	-0.468	0.564	2.363**	1.010	2.362**	1.009
Random effects parameters	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Var ICA industry dummy	0.067	0.024	0.060	0.023	0.090	0.041	0.091	0.044
Var constant	0.635	0.085	0.619	0.083	0.000	0.000	0.000	0.000
Var residuals	0.014	0.004	0.015	0.004	0.232	0.026	0.231	0.037
LR tests								
Chi2(2)	100.44***		97.52***		7.88**		8.02**	
Prob>chi2	0.000		0.000		0.019		0.018	

***p<0.01, **p<0.05, *p<0.10

In the ΔOperating profitability model, inclusion of the interaction term reduces the industry specialization dummy coefficient from 7.7% down to 3.4%, which remains insignificant. The insignificance of the coefficient of the dummy variable that represents COVID buyouts indicates that these buyouts did not perform statistically different from those completed in 2014 (the base year) in terms of operating profitability improvements. The interaction term in the ΔOperating profitability model has a coefficient of 15.1% and is significant at the 10% level. This means that for buyouts completed during the pandemic, the added value of industry specialization is an additional 18.5% improvement in operating profitability, which is significant at the 10% level. The ΔOperating profitability model thus weakly corroborates H4.

Inclusion of the interaction term in the ΔTurnover model reduces the industry specialization dummy coefficient from 9.7% down to 6.5%, again remaining insignificant. The year dummies indicate that buyouts completed during the pandemic performed significantly worse than those completed in 2014 in terms of turnover growth, which is in line with expectations. Among the years 2014 to 2018, 2014 was the worst performing year in terms of turnover growth. Even then, buyouts completed during the pandemic achieved, on average, a turnover growth that is 160.2% lower than those completed in 2014. As the interaction term is not statistically different from zero, the ΔTurnover model provides no support for H4.

Despite the (weak) support found for H4 in the ΔOperating profitability model, it must be stressed that the results offer only a preliminary insight as single year post-buyout operating performance figures are used, which are susceptible to idiosyncratic biases. Additional limitations are that a proxy for the amount of leverage used in the buyout could not be included in the analysis, and that only improvements in operating profitability and turnover growth could be used as dependent variables due to data availability. The results described above therefore function as an invitation for future research when three-year post-buyout operating performance figures on all five operating performance measures, as well as debt ratios, become available for target companies.

5.3 Discussion

The results of this research reveal that industry specialization is associated with higher improvements in operating profitability, but not with higher improvements in turnover, NWC/turnover, turnover per employee, or number of employees. It appears that non-industry specialized PE firms are less capable of making improvements to (or maintaining high levels of) profitability among targets than industry specialized PE firms. It may also be the case that

non-industry specialized PE firms sacrifice operating profitability improvements to achieve improvements in turnover, NWC/turnover, turnover per employee, and number of employees, which are not significantly lower than those achieved by industry specialized PE firms.

Because improvements in operating profitability and turnover have been reported as the most important sources of value creation by PE investors, they are arguably the most self-evident avenues for industry specialized PE firms to outperform non-industry specialized PE firms (Gompers, Kaplan, & Mukharlyamov, 2016). The lack of significant results for NWC/turnover, turnover per employee, and number of employees in any of the (expanded) models may be the result of industry specialized PE firms placing less or at least not more focus on improving these operating performance measures (and consequently not being superior at improving them) compared to non-industry specialized PE firms.

The results with respect to the effect of industry specialization on operating profitability improvements are in line with those reported by Nadant, Perdreau, and Bruining (2018) but cannot be directly compared to the findings of Cressy, Munari, and Malipiero (2007), as the latter authors use post-buyout operating profitability as a dependent variable, rather than operating profitability improvements. The results partly contradict those of Meuleman et al. (2009), as these authors do not find any relationship between industry specialization and operating performance improvements. These discrepant results arguably stem from a higher added value of (industry) specialization in more recent years due to an increasingly competitive PE environment. This may also explain the finding of the current research that stage specialization is associated with an 8.8% higher increase in operating profitability.

The results suggest that the different classes of factors described in the conceptual model are related to improvements in different operating performance measures. PE firms derive knowledge from prior investments and manifest their absorptive capacity in their evaluation, selection, and management of investment opportunities (De Clercq & Dimov, 2007). The current research attests that experience gathered from prior buyouts provides industry specialized PE firms with the capabilities and know-how required to optimally identify and exploit opportunities of growth, rather than opportunities of profitability improvements. This may be due to the fact that experience and deep knowledge of trends, products, and customers entices industry specialized PE managers to make entrepreneurial investments in growth that do not feed through to contemporaneous profitability (Meuleman et al., 2009).

Contrarily, when there are challenges to value creation, such as in SBOs and during an economic downturn, industry specialized PE firms appear to be superior at generating profits. This indicates that industry specialized PE firms make successful improvements to existing

resources and capabilities of their portfolio companies that optimize profitability, despite challenging circumstances (Nadant, Perdreau, & Bruining, 2018). This reflects the proficiency of industry specialized PE firms regarding cost management and exploiting opportunities for profit optimization, which is particularly important during economic downturns, when margins are typically under pressure. In SBOs, industry specialized PE firms apparently take advantage of the lack of an optimized profit generating structure within target companies.

The current research contains certain limitations that can provide guidance to future inquiries. First, the effects of industry specialization on performance, as well as contingencies that may or may not influence this effect, are studied at the individual target firm level. The effects of a less diversified portfolio and smaller investable universe on the equity returns at the fund level remain unaddressed. Second, data availability presented some challenges when conducting this research. Data availability severely reduced the size of the initial samples. Additionally, three-year post-buyout operating performance figures could not be used to assess the effect of industry specialization on operating performance improvements of buyouts completed during the pandemic, as no three years have passed since these buyouts were completed. As mentioned before, this would be an interesting avenue for future research. Third, the presence of sample selection bias cannot be fully ruled out, even when the two stage Heckman procedure provided no such indication. More specifically, a potential problem might have arisen from the data availability on target size and initial profitability, used to predict the probability that a deal was included in the final samples. Data was available for only 410 out of a total of 989 companies in dataset 1 and for only 125 out of a total of 159 companies in dataset 2. Fourth, only buyouts completed in the UK were examined in the current research. One should therefore be cautious to extrapolate the results to other geographical areas, especially those areas with less mature PE markets than the UK. More specifically, the supply and demand side of PE, the degree of industry specialization within the PE market, as well as the broader legal, institutional, and financial environment can influence the outcome of PE specialization-related studies (Cressy, Munari, & Malipiero, 2007). Fifth, there is a risk of omitted variable bias. An interesting avenue of future research would therefore be to investigate whether there are other, unobserved factors that impact the probability that a target is acquired by an industry specialized PE firm that may also lead to higher operating performance improvements. For example, the higher operating performance improvements among industry specialized PE firms may be a reward for higher target idiosyncratic risk. Sixth, further research could focus on a broader range of ‘societal’ performance proxies (other than turnover per employee and number of employees), such as innovation, wages, and entrepreneurial activity.

6. Conclusion

The increasing amount of funds chasing after the same, limited amount of assets has brought about fierce competition within the PE industry in recent years. This study aimed to shed light on the extent to which, and under which circumstances, industry specialization of PE firms confers a competitive advantage in this environment, resulting in target companies' operational outperformance. Using a sample of 192 UK buyouts, completed from 2014 to 2018, the results of this study revealed that industry specialization is associated with an additional 6.4% improvement in operating profitability. MLME models indicated that substantial heterogeneity exists among PE firms in their ability to translate industry expertise into enhanced operating performance. Industry specialization was not found to have a direct significant relationship with improvements in turnover, NWC/turnover, turnover per employee, or number of employees.

These results have important implications. They suggest that industry specialization can indeed constitute a competitive advantage in today's highly competitive PE landscape. This can provide guidelines for strategic choices by PE firms, but also for the management of future target companies in choosing their financial partners.

The research was extended by examining contingencies under which the effects of industry specialization may be magnified as theoretically proposed in a conceptual model. The results suggest that prior buyout experience, both in general and within the industry in which the target company operates, drives improvements in turnover growth among industry specialized PE firms. For every 1.0% additional general or industry specific buyout experience, a 0.21% or 0.25% higher turnover growth is realized, respectively, among target companies backed by industry specialized PE firms, compared to target companies backed by non-industry specialized PE firms.

While stage specialization by itself was shown to be related to an additional 8.8% improvement in operating profitability, no support was found for the theoretical argument that combining industry and stage specialization leads to even higher improvements in operating performance. One might instead argue that although the amount of relevant knowledge that is accumulated per investment may be higher when a PE firm is specialized on both dimensions, this does not outweigh the effect of the limited amount of experience that can be gathered in a severely narrowed investable universe, suggesting that PE firms should therefore balance these two effects of specialization at the margin. However, further analyses provided no evidence that there is indeed an 'optimal' level of industry or stage specialization, beyond which

specialization starts to hurt operating performance improvements. Nevertheless, the results found in the current study imply that while there is added value to both industry and stage specialization, there is no added value to becoming specialized on both dimensions.

Building further upon the work of Castellaneta and Gottschalg (2016) and Nadant, Perdreau, and Bruining (2018), the results suggest that the benefits of industry specialization are significantly greater in SBOs than in PBOs, and they are greater during the recent pandemic than during the pre-pandemic period. The results support the notion that industry specialization is more valuable when there are challenges to value creation.

In SBOs, the added value of industry specialization is an additional 14.1% improvement in operating profitability. These results exceeded expectations, as SBOs completed by industry specialized PE firms not only outperform SBOs completed by non-industry specialized PE firms in terms of operating profitability improvements, but also the entire sample of buyouts. The superior performance of SBOs where the acquiring PE firm is industry specialized is at least partly driven by SBOs where the vendor PE firm is not industry specialized. This underlines the importance of complementary skill sets between two PE firms in a transaction (Degeorge, Martin, and Phalippou, 2016). It is therefore recommended for industry specialized PE firms, when engaging in SBOs, to not only conduct in-depth due diligence into a potential target company, but also into the vendor PE firm to establish its degree of industry specialization, relative to the acquiring PE firm.

For buying completed during the pandemic, industry specialization is associated with an additional 18.5% improvement in operating profitability. These results should be treated with some care but do serve as an indication that industry specialization is more valuable during periods of economic downturn. The relevance of this finding could not be greater. Central banks around the world are currently raising interest rates to counter high inflation levels, which could trigger a recession. A recession would entail another economic downturn, presenting yet another opportunity for industry specialized PE firms to potentially outperform their non-industry specialized peers.

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Appendix

Table A1
Example of the difference in ICA industry outcomes, depending on a PE firm's industry specific and general buyout experience

	PE firm industry specific buyout experience at time of buyout (C_{ij})	PE firm general buyout experience at time of buyout ($C_{i.}$)	Sample industry specific buyout experience at time of buyout ($C_{.j}$)	Sample general buyout experience at time of buyout ($C_{..}$)	ICA industry
PE firm A	1	5	300	6000	4
PE firm B	50	500	301	6001	1.99

Table A2
ΔOperating profitability and ΔTurnover OLS models, including lambdas, resulting from a two-stage Heckman procedure, on dataset 2. Ln target size is omitted to avoid multicollinearity with the inverse Mills ratio. The 2014 dummy and basic materials dummy are also omitted to avoid multicollinearity. The energy industry dummy is omitted because it did not appear in the dataset 2. To be concise, industry dummies are not reported. See table 1 for variable definitions

	ΔOperating profitability		ΔTurnover	
	Coef.	Std. Err.	Coef.	Std. Err.
ICA industry dummy	0.395	0.244	0.149	0.093
ICA stage dummy	0.367	0.291	-0.044	0.110
Sqrt target age	0.057	0.076	0.040	0.029
Target initial profitability	-0.109	0.089	-0.062	0.034*
Target initial turnover growth	1.143***	0.257	0.849	0.098***
Ln PE firm size	-0.018	0.077	-0.017	0.029
Ln general experience	-0.008	0.108	-0.003	0.041
Independence dummy	-0.468	0.333	-0.031	0.126
Syndication dummy	-0.008	0.347	-0.020	0.132
Divisional dumy	0.380	0.451	-0.032	0.171
Secondary dummy	0.366	0.337	0.215*	0.128
Cross-border dummy	0.252	0.475	0.125	0.180
S&P500	0.001	0.004	-0.001	0.002
Industry dummies	Yes		Yes	
Lambda	-5.580	24.884	-6.247	9.407
Constant	-1.574	2.266	-0.633	0.857
Observations	85		85	
Adj. R-squared	0.123		6.11***	
F-stat.	1.51		0.58	

	Included dummy	
Probit	Coef.	Std. Err.
Ln target size	-0.106	0.077
Target initial profitability	0.033	0.038
Constant	1.584**	0.801
Observations	125	
LR chi2(2)	2.01	

***p<0.01, **p<0.05, *p<0.10