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PRIVATE EQUITY ACTIVITY IN THE BALTICS: IMPACTS ON PORTFOLIO FIRM FINANCIAL PERFORMANCE

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Abstract

This study investigates the effects of private equity (PE) investment on firm financial performance and the influence of PE fund characteristics in the Baltic region from 2010 to 2020. The regression analysis suggests that PE involvement typically leads to heightened total asset growth over the three years post-investment compared to non-PE-owned counterparts, indicating a preference towards aggressive growth strategies by PE funds. Conversely, a negative association between PE involvement and short-term profitability is found, indicating a tradeoff between growth and profitability, which we find to be a common trait firms face in general. Notably, PE-owned companies appear more inclined to prioritize growth over short-term profits compared to non-PE-owned similar companies. Moreover, the examination indicates minimal divergence in the PE fund characteristics or the effects of these characteristics on the profitability of portfolio companies. While the Baltic PE industry is rapidly expanding, it has received very limited attention in existing research. The findings of this study quantify the dynamics of PE involvement in the Baltic region and offer insights into the broader implications for firm performance and economic outcomes.

Keywords: *Private Equity, Growth Capital, Baltic Region, Firm Financial Performance, Private Equity Fund Characteristics, Propensity Score Matching.*

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1. Introduction

Private equity (PE) has become a powerful driver of innovation and growth in the corporate world, reshaping industries through strategic investments and active involvement in portfolio companies. Total private market assets under management reached $13.1 trillion in June 2023, following 20% p.a. growth since 2018, although fundraising volume and returns were lower than in 2022 (Dahlqvist et al., 2024). The private equity buyout market had the best fundraising year ever in 2023, although returns were 2nd lowest in the last 15 years and deal volumes decreased by 19% (Dahlqvist et al., 2024). On a longer horizon, the private equity market has seen strong growth in the last 10 years, achieving an 8.8% CAGR while more than doubling the total assets under management (Burke, 2023).

Due to the relatively consistent growth and returns of the PE market, a substantial amount of research has been dedicated to the impact of such takeovers on employment, the economy in general, and, to some extent, the financial performance of portfolio companies. Since the Baltics are still an emerging market in PE (Sannajust & Groh, 2020), not much research has focused on this region or even included funds or companies in the analyzed data sample. In this research, we examine the effect of PE takeovers on the financial performance of the portfolio companies in the Baltic region, to determine if such buyouts are a net positive to the company and if they can outperform similar companies that do not undergo a PE takeover. Additionally, we plan to determine what fund-level characteristics are determinants of superior operating performance of the underlying companies. Thus, we set forth 2 research questions:

1. *Do companies bought out by private equity funds outperform their peers in their industry in the Baltics? If yes, then how and in what metrics?*

2. *How do specific fund/investment factors (e.g. investment size, stage) impact the performance of the portfolio companies?*

Overall, our findings suggest that firms experience higher asset growth rates following PE investment compared to similar companies in the Baltics. Additionally, we demonstrate that PE activity negatively affects profitability in the short to mid-term. Both findings are largely consistent with previous literature (Davis et al. 2019; Jelic & Wright, 2011; Scellato & Ughetto, 2013), and point toward a more long-term focus by PE firms,

as they seem to sacrifice profitability in the early years of the investment to build a foundation for further growth.

Due to limited transparency in the PE industry, we were only able to perform a constrained analysis of specific fund factor impacts. Nevertheless, we discovered limited evidence that investment size is negatively related to short/mid-term profitability. This is consistent with our other findings: larger investment sizes are associated with deals with higher stakes and risks, meaning that PE firms are likely to take a more long-term hands-on approach. Since we do not find much theoretical backing for this finding, we hope it will be researched more thoroughly in the future.

In the research, we have gathered and utilized an original dataset that has not been previously explored in the literature. We aspire for our thesis to illuminate the relatively opaque Baltic PE industry, offering insights for future research and industry practitioners alike. The findings may be important to companies interested in a buyout and larger PE firms looking to enter the market, and for regulators to gain insight into the impact of such takeovers on macroeconomic indicators, such as productivity and employment.

2. Literature review

First, we define and give a brief overview of what is private equity and venture capital, offering an outline of the current size, growth, and trends in the PE industry. Afterward, we provide some theoretical framework on why a private equity buyout can impact the performance of a company. Finally, we look at previous findings on private equity buyout impact on the underlying companies, and which fund level factors impact the underlying companies' performance the most.

2.1 Overview of private equity

In the most general form, private equity is defined as "company shares that are not available for sale on a stock market" (Cambridge Dictionary, n.d.). Colloquially, a private equity fund usually refers to capital managed by an investment firm that is dedicated to acquiring, investing in, and actively managing established private companies with the aim of achieving substantial returns for its investors. Usually, there are 2 parties involved in a PE firm: the general partner, which is the firm itself, and the limited partners, which are the investors who provide capital for the fund (often institutional investors, such as pension funds and insurance companies) (Kaplan & Strömberg, 2009). The general partner is the one responsible for managing the fund and, in return, receives

management fees. Due to the compensation agreements between the partners, the general partner has a very strong incentive to generate high returns from the fund (Gompers et al., 2016). The fund is generally active for 10–13 years, with the initial five years dedicated to investing the capital received (Kaplan & Strömberg, 2009). In a typical PE takeover, the PE firms buy a majority stake in the target company, while paying a 15–50% premium over the current stock price, by using 60–90% debt financing (Kaplan & Strömberg, 2009). As an illustration, in April 2023, BaltCap acquired 93.1% of the shares of Hansamatrix AS, becoming the majority shareholder, paying a 22% premium over the stock price at the end of 2022 and a 12% premium compared to the stock price on the last trading day before the announcement of the acquisition in February 2023 (BaltCap, 2023a).

2.1.1 Venture capital

A tangential term is venture capital (VC), which can be considered a sub-group of private equity: while PE funds focus on mature companies with predictable cash flows, VC investors are interested in start-ups and fast-growing companies with huge future earning potential (Johnson, 2020). Further differences arise as PE funds typically acquire a majority stake, especially in buyout funds, whereas VC investors commonly seek only a minority stake. Additionally, PE may explore earlier exit strategies compared to venture capitalists, on average. (Johnson, 2020). As can be noticed, the difference between a late-stage startup and a mature company can be unclear; the same can be said about VC and PE buyout investments in some cases. Generally, differentiation is done by self-selection, based on what each fund advertises itself as. Since venture capitalists generally invest in start-ups, we are omitting them from our analysis, as the financial data can often be incomplete or unrepresentative of the companies' performance.

2.1.2 Growth capital

In between PE buyouts and VC investments stand growth investments, which are a hybrid of both: typically, investments are made in established, but still relatively new companies that demand more capital for growth (Cote, 2021). These companies usually have a track record of past financial performance, meaning investors can more carefully evaluate their potential. Late investments generally have the same interpretation. Due to the similarities to buyout investments, we will be adding growth and late investments to our dataset, and differentiating them in our quantitative analysis, when appropriate. An

example from our dataset would be BaltCap Latvia Venture Capital Fund's acquisition of SIA Vendon in 2012 when the company only had 6 employees and a nearly €-0.5 million EBIT. By exit in 2022, the company has grown to 35 employees, €4.1 million in revenue, and ~€0.5 million EBIT for 3 consecutive years.

2.1.3 Other investments

Based on the classification provided by KPMG et al. (2023), there are 2 other major investment strategies for private equity firms: mezzanine financing and infrastructure investments. Mezzanine financing represents a hybrid between a loan and an equity investment. Initially structured as subordinated debt, it incorporates future warrants or guarantees for the purchase of equity (Torpey & Viscione, 1987). The target borrowers are usually established companies that do not wish to give up equity excessively but are not able to get a bank loan for favorable terms. In the Baltics, BPM Capital, FlyCap, Orion Asset Management, and INVL Asset Management engage in mezzanine financing (KPMG et al., 2023). An example from our dataset is the BPM Mezzanine Fund's investment into Eskaro AS in 2016. Generally, we will be including such investments in our dataset, and separating them, when necessary.

The latter strategy – infrastructure – involves the construction of different assets, such as a wind farm in Lithuania, funded by the BaltCap Infrastructure fund, for example (BaltCap, n.d.a). While historically linked to stable and predictable returns, the investment periods can vary, as noted by Brinkman and Sarma (2022). Despite this variability, given their comparability to buyout investments in a return context, we aim to incorporate them into our dataset. It's worth noting that some of these investments, especially those associated with government entities, lack a distinct legal entity, which may result in the exclusion of certain investments from our data.

2.1.4 Private equity industry overview

In 2022, the global private market witnessed a deal volume of $2.4 trillion, involving approximately 60,000 deals (Averstad et al., 2023). In 2023, the total assets under management reached $13.1 trillion by the middle of 2023, a 12% increase from 2022, although overall deal volumes, returns, and fundraising are on a downward trend, as reported by Dahlqvist et al. (2024). The PE market specifically has seen significant growth in the last 10 years, achieving an 8.8% CAGR while more than doubling the total assets under management (Burke, 2023). As per Witte (2024), the 2023 global PE deal

volume was $444 billion, which made up 25% of total M&A activity. In a more local context, the Baltic countries have the highest PE activity in Europe, with 3.54% of private companies being owned by PE firms in Latvia, 2.24% in Lithuania, and 1.34% in Estonia (Wilson & Sabater, 2023). The largest local private equity firm, BaltCap, has recently surpassed €500 million in assets under management (BaltCap, 2023b). The total PE investment in the Baltics has grown with a 46.5% CAGR in the last 5 years, reaching an all-time high of €212 million in 2022, backed by the €298 million raised for investments (KPMG et al., 2023). Based on KPMG et al. (2023), in the Baltics, in 2022 there were 11 active companies in the private equity market and 28 active in the venture capital market; in total, there are 84 active funds in the Baltic PE/VC space.

In the second half of 2022, a general slowdown of the PE market was seen due to both the European Central Bank's and Federal Reserve's interest rate hikes, making leveraged buyouts more expensive and diminishing future discounted cash flows (MacArthur et al., 2023). As of Q3 2023, the total deal volume has remained largely stagnant since Q2 2022, but the quantity of deals valued above $100 million has increased in each quarter of 2023, indicating a soft rebound as macroeconomic uncertainty wears off (Witte, 2023). As for 2023 overall, both PE and VC have had the lowest deal value and volume in the last 5 years, with transaction value declining nearly 35% year over year due to inflationary headwinds and high interest rates (Vidal & Sabater, 2024). PE fund returns have also been lackluster, reaching a 5% net return in 2023 (Dahlqvist et al., 2024). The first half of the year in terms of value was dominated by North American PE & VC activity, but the second half was led by Europe and Asia (Vidal & Sabater, 2024).

2.2 Main approaches to research on private equity performance

Based on the available literature, we notice that there are 3 general lines of inquiry in past research on private equity impact: an investors', a company's, or an economist's perspective. The investor's view, as seen in Harris et al. (2014), and Kaplan and Schoar (2005), is generally concerned with the quality of a PE fund as an investment. The goal is to determine if these funds provide above-market returns to investors, how large are the diversification benefits, etc.; due to this being the most popular lens of research, and due to it being directly relevant only to a narrow audience – investors –, this method was not chosen. Another potential methodology is considering the impact of PE on the broader economy and its indicators, such as unemployment, GDP growth, and inflation, as researched by Davis et al. (2019), and Teimouri and Zietz (2018). While this is certainly

an interesting aspect of PE investments, it can lose some granularity and detail of these takeovers. Thus, the research will be done through the lens of separate companies and their performance, as done before by Scellato and Ughetto (2013), and Paglia and Harjoto (2014).

2.3 Theoretical framework of private equity outperformance

To determine why the performance of PE-backed companies may be different from non-PE-backed companies, the specific involvement of the PE firm in the underlying companies' operations must be analyzed. Kaplan and Strömberg (2009) categorize and describe PE firm activities in their portfolio companies into 3 groups: financial, governance, and operational engineering. Overall, many of the activities are aimed at battling the implications of agency theory – entrenched management, poor governance, and an overall misalignment between the shareholders and company leadership (Scellato & Ughetto, 2013).

- **Financial activities** – An important factor in a leveraged buyout is increased company leverage by taking on more interest-bearing debt, which forces management to avoid wasteful spending by reducing the available free cash flow (Gompers et al., 2016). Additionally, this can create a tax shield in some countries, increasing the companies' enterprise value.
- **Governance activities** – Strong incentives, such as stock options, are created to motivate management to improve the company's performance. Acharya et al. (2011) determined that PE-backed company boards are generally smaller, meet more frequently, and are more active than publicly traded boards; additionally, they are less hesitant to fire poor-performing management teams than publicly traded boards. For venture capital investments, the VC fund usually introduces a more rigorous structure and boosts professionalism in the company (Acharya et al., 2011). Schofield (2014) also finds that governance improvements are one of the major channels in how PE firms increase the value of underlying firms. This author coined this phenomenon as 'governance arbitrage'.
- **Operational engineering** – Finally, PE firms or funds often invest in particular industries and markets, creating a pool of experience and expertise, sometimes even hiring their employees directly from the specific industry (Kaplan &

Strömberg, 2009). This generally provides value to the underlying company (Gompers et al., 2016).

2.4 Potential differences in the Baltic region & novelty

Previous studies have examined the impact of private equity takeovers in regions such as Europe (Scellato & Ughetto, 2013), the UK (Jelic & Wright, 2011), and the US (Davis et al., 2019). However, a detailed analysis of the Baltics has not yet been undertaken. Aspects such as the unique economic and historical landscape of the Baltics sets it apart from the rest of the world, warranting closer examination.

The Baltic states are distinguished by their small size and emerging market status, which may influence the financial performance patterns following PE takeovers compared to larger countries. Since reclaiming independence from the Soviet Union's occupation in the early 1990s, the three Baltic states have undergone rapid economic transformation and growth. By 1997, the Baltics had achieved the fastest growth among other transition economies (Organisation for Economic Co-operation and Development, 2000), and today they stand as the most advanced economies among the former Soviet states. The regaining of independence has fostered the development of liberal market ecosystems and early democratization, although political instability and short-lived governments are also common traits in the Baltics (European Bank for Reconstruction and Development [EBRD], 2022). The Baltics' transition has brought them to the forefront of digital innovation, establishing themselves as attractive markets for tech startups and investments. For instance, Estonia presented the highest count of startups per capita in the world in 2022 (Startup Estonia, 2023). Such an innovative and entrepreneurial business environment creates a unique ecosystem, influencing the performance of businesses in that market (EBRD, 2022).

A notable trait of the Baltic markets is the relatively low liquidity of the secondary market, as observed by Mirbabaeva (2023). This factor has impeded the growth of small and medium-sized enterprises (SMEs) in the region by restricting access to financing, as underscored by the European Commission (2022). Factors such as banks' reluctance to finance SMEs and regulatory burdens have served as barriers to entry into the capital markets, consequently hindering SME performance. Recognizing these challenges, the European Commission launched the Capital Markets Development Accelerator Fund in 2022 to promote equity financing for SMEs, addressing liquidity issues in the secondary market. Moreover, the EBRD invested a total of 358 million EUR into the Baltics in 2022,

as reported by Mirbabaeva (2023), contributing to an improvement in the market's liquidity situation and the growth of SMEs in the region.

The Baltic states are located at the crossroads of East and West, subject to influences from both Western Europe and the former Soviet bloc (EBRD, 2022). Their significant neighbor, Russia, exerts a considerable influence on the economic environment of the Baltic states. Notably, due to the recent conflict in Russia and Ukraine, the Baltics experienced the highest inflation rates in Europe and a decrease in investor appetite, as reported by Mirbabaeva (2023). By analyzing the Baltic market and comparing the results to other studies, it can be determined if investors should be more engaged with the market than currently. Sannajust and Groh (2020) analyzed private equity deals in emerging markets, including 31 observations from the Baltics, and concluded that the enthusiasm for emerging market superior pioneer returns is not supported by data, at least for foreign funds. They highlighted that local regulatory, financial, and cultural knowledge is critical to strong returns. As the main PE and VC firms in the Baltics are of local origin (KPMG et al., 2023), it is salient to explore if there are superior returns for local funds in an emerging market, like the Baltics. While our research does not directly analyze fund returns, fund portfolio company performance is correlated with fund returns (Guo et al., 2011).

Additionally, Hogeforster (2014) found that companies in the Baltic Sea region listed unqualified employees and poorly educated managers as barriers to high innovation. Through various mechanisms, as highlighted in the previous section, PE funds may be able to mitigate such issues in their portfolio companies, leading to superior performance. Furthermore, in very recent international news, a BaltCap partner was revealed appropriating €40.4 million from the BaltCap Infrastructure fund (BaltCap, 2024). Since this is likely the first time many investors and experts have investigated the Baltic PE market, a quantitative inquiry is necessary to determine if similar fraud & misappropriation of funds are commonplace; it is unlikely that portfolio companies would perform well if that were the case. Our findings may be circumstantially relevant to draw such conclusions.

Overall, most research in the Baltics has been focused on venture capital markets and suggestions for their improvement, such as Matisone (2021) and Prohorovs (2014). We believe that a look at PE and its underlying companies is warranted, as both previous research and quick data availability are lacking. Despite existing research on the impact of PE takeovers in Europe, the UK, and the US, the Baltics' distinctive geopolitical

positioning, recent independence, small scale, rapid market growth, and abundance of technology and innovation necessitate separate analysis rather than simply extrapolating findings from broader studies. Our gathered Lithuanian company financial dataset is not available publicly and even in some paid databases, such as BvD Orbis, and the data for Estonian & Latvian was partially manually collected, likely making it a novel dataset that has not been used in literature before.

2.5 Previous findings on private equity impact on portfolio companies

The impact of PE activity on the economy and companies has been studied extensively before, especially in the United States, which has been the leader in late VC deal volume for the last 15 years (Organisation for Economic Co-operation and Development, 2023). Davis et al. (2019) emphasize that the effects of PE activity on the economy are highly dependent on the general macroeconomic and credit condition, which gives merit to a granular study of particular regions, such as the Baltics. It is also important to note that there is also a great deal of economic-cycle-based heterogeneity (Kaplan & Strömberg, 2009); Axelson et al. (2009) show that PE funds generally overinvest during economic upswings and underinvest during poor economic conditions. Brown et al. (2021) find that modest profits are attainable if exposure is counter-cyclically allotted to PE funds. These previous findings suggest that any quantitative analysis on the topic must include controls for both time and economic conditions, or a research methodology that is time-invariant, such as comparisons to other companies in the same time periods.

There has been much discussion and contradictory findings about the performance of PE funds and their portfolio companies, as well as the economic implications. Wright et al. (2009) find that the short-term benefits (3–5 years) to the bought-out owners, new shareholders, and management are substantial, while the long-term benefits are unclear. While some critics have raised concerns over PE shareholders prioritizing short-term gains, Lerner et al. (2011) find no evidence of portfolio companies sacrificing innovation for short-term growth. Kaplan and Strömberg (2009) find evidence that PE activity generally creates economic value. Active ownership, consistent monitoring, and strategic input have been shown to positively impact PE-owned company performance in previous studies (Wright et al., 2009).

In terms of performance, Guo et al. (2011), Kaplan and Schoar (2005), and Leslie and Oyer (2008), do not find supporting evidence that PE-owned firms outperform their

benchmark peers, although some note considerable heterogeneity among funds. In contrast, Harris et al. (2014) find that PE funds in the US outperform the S&P 500 annually by about 3%, which implies that the portfolio companies see larger valuation growth than the publicly owned firms, potentially due to superior operating performance. Scellato and Ughetto (2013) analyzed the impact of PE ownership on portfolio companies in Europe and found a positive effect on total assets and employment in the short/mid-term, but a negative effect on operating profitability. Similarly, Paglia and Harjoto (2014) found evidence that SMEs not only experience employment growth after PE investments but also an increase in net sales. Additionally, they find that there may be a potential time lag between the investment and improvement in performance. On the contrary, in an analysis of 511 PE buyouts in Germany from 2002 to 2008, Antoni et al. (2019) found evidence that the companies reduced employee count, and employee turnover increased post-buyout. As there is some ambiguity in research results on the impact of PE activity, we believe it is necessary to add to this body of literature. Additionally, a large part of the research used data from the 1990's and 2000's and, to our knowledge, no similar research exists on the Baltic market. Finally, Sannajust and Groh (2020) did not find any evidence for superior PE fund performance in emerging markets, such as the Baltics. Based on these previous findings and our first research question, we set forth 5 hypotheses:

H1: *Private equity-backed companies achieve higher asset growth rates than non-buyout companies.*

H2: *Private equity-backed companies achieve higher revenue growth rates than non-buyout companies.*

H3: *Private equity-backed companies achieve lower profitability levels than non-buyout companies.*

H4: *Private equity-backed companies achieve higher productivity growth rates than non-buyout companies.*

H5: *Private equity-backed companies achieve higher employment growth levels than non-buyout companies.*

2.6 PE-firm level determinants of company performance

Although most of the older research has used agency theory as the main theoretical framework for buyouts, it is generally accepted that PE company and fund-specific

determinants are also important when analyzing company performance (Scellato & Ughetto, 2013). While they did not find significant results among most of the variables they tested (explained in the following sections), research before them with different datasets did, so it is valuable to perform the analysis again on a different sample to potentially gain more clarity on the explanatory power of the variables. In each section, we also outline the hypotheses that follow from the literature findings, to be able to answer our second research question.

2.6.1 Firm industry specialization

Cressy et al. (2007) conducted a study on 122 buyouts from the United Kingdom from 1995 to 2002, comparing them with a matched sample of companies in the same industry. The results indicate that buyouts led by PE firms with greater industry specialization generally exhibit increased post-buyout profitability, likely explained by an accumulation of knowledge in the industry. However, the findings regarding revenue growth are inconclusive. In the Baltics, all PE funds are industry agnostic, so such an analysis is impossible.

2.6.2 Firm stage specialization

Scellato and Ughetto (2013) in a dataset of 241 private-to-private European company buyouts in the late 1990s determined that generalist funds negatively impacted the operating profitability of the underlying companies, while turnaround funds had a positive impact on the underlying company. The authors explained this due to specialist funds facing less informational asymmetry and deeper expertise in the particular investment case, similar to the industry specialization. Cuny and Talmor (2007) argue that PE in a turnaround case can perform a more thorough and less personal investigation than the current management into why a company is underperforming, and enact a change of leadership, if necessary, potentially creating superior performance. Since in the Baltics all PE funds are specialized in a specific stage, it is impossible to compare generalists vs specialized funds; instead, we will be comparing the different stage investments in their performance. Using similar logic, we would expect buyout investments to have the largest operating improvements, as they are associated with the highest monetary and time investment, and likely have the strictest selection process.

H6: *The buyout stage is positively associated with underlying firm profitability*.

2.6.3 Firm experience

Meuleman et al. (2009) examined 238 PE-backed deals in the United Kingdom between 1993 and 2003 and found evidence that extensive PE firm experience, which is proxied as the total number of past buyout investments, is associated with higher levels of employee and sales growth. The implication is that PE firms with more previous experience have better skills & industry knowledge, leading to superior performance.

H7: *Private equity firm experience is positively associated with underlying firm profitability.*

2.6.4 Investment syndication

In an investment syndication deal, multiple private equity companies invest together into a single company, becoming co-owners and co-investors (Scellato & Ughetto, 2013). The authors argue that the pooling of resources and knowledge may provide additional benefits to the underlying company, but it may also cause collaboration issues and freeloading. Cumming and Walz (2009) analyzed 221 PE funds from 39 countries, discovering that investment syndication boosts fund returns, suggesting that the positive effect may be stronger. In our dataset we do not encounter any syndicated deals, thus, we cannot include such a variable in our dataset.

2.6.5 Investment count in a fund

Lossen (2006) finds evidence that the number of portfolio companies of a PE firm has a positive effect on the private equity fund's performance. It is hypothesized that this happens due to the average investment size decreasing if fund size is kept constant. Thus, for this research, investment count would be expected to negatively impact company performance, as keeping total fund size constant results in less average investment per company. Kanniainen and Keuschnigg (2003) develop a model that suggests that there may be a convex relationship between operating improvements and investment count – as the company portfolio size increases, there is less time and unique advice available per company, resulting in potentially smaller performance improvements.

In the Baltics, there is not a high difference in the count of funds vs PE firms, meaning this variable is highly correlated with firm experience and thus is not used in our analysis.

2.6.6 Fund size

Kaplan and Schoar (2005) find that the relationship between fund performance and fund size is initially positive, but overall concave, explained by there being only a finite quantity of highly profitable investments in the market; if fund size is continuously increased, less and less lucrative investments are added to the portfolio. We were not able to find consistent data on fund sizes, thus it is left for further research.

2.6.7 Individual investment size

While none of the literature we have read specifically looked at the relationship between private equity direct investment size and underlying company performance, we believe that this is valuable due to it being a direct reflection of the profitability of private equity, since the funds received for the sale of the company is a function of operating performance. Under the assumption that a fund invests a similar amount of money in each of the underlying companies, this measure can be interpreted as a division of fund size over investment count in a fund. Thus, it can be inferred that the relationship between investment size and company performance improvements is positive. We were not able to find specific information about investment sizes, but we were able to identify investment size ranges for each fund. We will use the min and max investment size for each fund in quantitative analysis. Since there doesn't appear to be a robust theoretical framework for this variable in the literature, we will not set forth a separate hypothesis, but we will discuss the variable where appropriate.

3. Methodology

As previously outlined, the impact of a PE buyout has been examined from various perspectives, including the overall performance of the PE fund or the performance of individual portfolio companies. Harris et al. (2014) adopted a comparative approach, assessing the performance of PE funds in absolute terms and relative to public markets, utilizing a dataset of PE fund-level cash flows. Scellato and Ughetto (2013), conversely, concentrated on portfolio companies, investigating whether they outperformed similar companies that did not undergo a buyout. While a similar approach to Harris et al. (2014) would be possible, the necessary data, such as the IRR and valuations of specific deals, would be complicated to obtain (due to it being proprietary) and the research would be largely investment-related. Moreover, the scarce quantity of PE funds within the Baltics

raises concerns regarding the significance and robustness of the obtained results. Therefore, our primary focus lies in exploring the impact of PE buyouts on the financial performance of portfolio companies and, by extension, on the broader economic landscape. We are taking the work of Scellato and Ughetto (2013) as a blueprint and adopting methodologies similar to theirs'.

3.1 Data

We examine a subset of companies in the Baltic region that experienced PE investments between 2010 and 2020. The period was chosen due to increased investment activity following the financial crisis, and the methodology requiring at least 3 years of data post-investment. Therefore, deals post-2020 do not have the necessary data coverage; additionally, it's important to note that our coverage of deal data from 2020 is only partial, as many companies have not yet released their 2023 annual reports. Our initial investigation revealed a lack of accessible public datasets consolidating the historical records of PE buyouts specifically within the Baltic countries. Consequently, information on individual transactions was manually sourced from the online platforms of all PE firms operating in the Baltic region and assimilated into a comprehensive dataset. For example, we looked through Livonia Partners (n.d.) previous investment page and recorded data such as company name, investment year, stage, and exit year. The scope of the investor universe in the Baltics was defined based on the findings of KPMG et al. (2023) and Deloitte et al. (2022). While we also consulted previous PE & VC Baltic reports, the investor universe remained consistent or smaller in comparison.

It must be noted that the disclosure of previous deals on these websites is voluntary, resulting in potential gaps within our dataset. One could therefore argue that a survivability bias may be present, where the below-average investment performance is understated, or not mentioned at all. While Scellato and Ughetto (2013) do not directly address this bias, some others in the research space have. Kaplan and Schoar (2005) find in their robustness test that funds do not stop reporting their performance after a large swing in performance when compared to the previous quarter. Additionally, Harris et al. (2014) argue that such a bias is only possible if all 3 of their commercial data sources are similarly upwardly biased, which they find to be unlikely. Cressy et al. (2007) do not find a statistically significant effect of selection bias. To address these gaps similarly to Harris et al. (2014), we supplemented our data with information retrieved from Pitchbook**,** although the coverage was poor. Several studies have utilized and validated the data

accuracy of the Pitchbook database (Paglia & Harjoto, 2014; Retterath & Braun, 2020). After this searching process, we had a dataset of 105 PE deals. Finally, we reached out to the Latvian Private Equity and Venture Capital Association (LVCA) & KPMG, who are the authors of the annual Baltic Private Equity and Venture Capital Market Overview, for a proprietary database. They were kind to share a partial database of past PE activity in the Baltics, from which we were able to both verify and enrich our dataset. When comparing this data to our manually sourced dataset, we were only missing 10 observations, supporting the aforementioned finding of Cressy et al. (2007). An additional potential reason against selection bias is that the deal count in the Baltics is small when compared to Western Europe/USA, meaning that each deal is important for the fund to attract new investments and investors. Some additional data, such as exit year and investment size, was sourced from Matisone (2021) Appendix 6, which is a doctoral thesis examining the necessary conditions for a self-sufficient VC market in Latvia. In total, the dataset contains 115 PE-involved deals in the Baltics, which is likely to be the most comprehensive dataset used in literature yet. We note that we also received very limited information on 10 additional deals, for which neither the fund websites nor the received database contained information; thus, we were not able to add these deals to our database.

Financial data regarding these portfolio firms was initially sourced from the BvD Orbis (further Orbis) database and subsequently integrated into our dataset. Since data from t-2 to t+3 is necessary for the quantitative analysis, where t is the deal year, then data was extracted for all companies from 2008 until 2023. Orbis was chosen due to accessibility, previous experience, and decent coverage in the Baltics. While Bajgar et al. (2020) do find some evidence of the Orbis database not being representative of country and industry-level populations, this is not an issue for PE data as we are looking for financials for specific companies, not specific groups. After data extraction from Orbis was completed, it was clear that coverage in the period 2010–2014 was lacking, and variables such as debt and equity were overall poorly covered with many missing values. Thus, we decided to complement it with data from the Latvian, Estonian & Lithuanian business registers. Data from the Latvian Enterprise Register was superior in coverage and detail over the Orbis dataset, so we decided to completely replace the financials for Latvian companies. It is important to highlight that this dataset does not distinguish between interest-bearing and non-interest-bearing liabilities; rather, it categorizes them just into current and long-term liabilities. We proceed with the assumption that the long-term liabilities predominantly include interest-bearing ones and thus treat them

accordingly. For short-term interest-bearing debt, we keep the Orbis data and set all missing values equal to 0. Data in Latvian lat was converted to euro at the set fixed conversion rate of €1 = 0.702804 LVL (European Commission, n.d.).

Additional data on Lithuanian companies was retrieved from Registrų centras (State Enterprise Centre of Registers) at a cost, as Orbis coverage was deemed inadequate. Data in Lithuanian litas was converted to euro at the fixed exchange rate of €1 = 3.4528 LTL (Lietuvos Bankas, n.d.). As this dataset did not provide specific distinctions regarding interest-bearing debt, we opted to utilize long-term liabilities as a proxy. Data on employee count was sourced from rekvizitai.lt, with the help of the Wayback Machine (*https://web.archive.org/*) to be able to see past versions of the website for larger data coverage.

We sourced data for Estonian enterprises from the e-Business Register, the official portal of the Estonian state. Our data acquisition involved a review of the annual reports for each target firm from 2008 to 2022. Through manual entry, we were able to enhance the quality of the data for Estonian firms, as we could now differentiate between interest and non-interest-bearing liabilities with greater precision and improve the overall coverage of the database. Values in Estonian kroon were converted at the fixed exchange rate €1 = 15.6466 EEK (Eesti Pank, n.d.).

Some data was estimated to replace missing values. 2 examples:

1) If there is data in 2014 & 2016 for sales, but the 2015 value was missing, then the average of the adjacent years is imputed (used for all financial data).
2) If the employee count is missing for 2011, but the count in 2012–2014 is near constant, then the average for 2012–2014 is imputed (only for employee count).

In the end, we filtered the dataset to only keep observations that have a known value on year t in the 4 financial metrics used in 3.2, otherwise, propensity score matching is impossible. Additionally, Orbis has poor data coverage for 2010–2012 for comparables, so multiple companies in this range do not find a corresponding company. This results in a final PE company dataset size of 87 used in quantitative analysis.

3.2 Propensity score matching

Building upon the work of Cressy et al. (2007), our study dives into the financial performance of portfolio firms, examining their status one year preceding and three years

after the deal. To establish a comparative control group, we adopt the widely utilized propensity score matching (PSM) methodology, frequently employed in prior research investigating the impact of PE transactions (Scellato & Ughetto, 2013; Tykvovà & Borell, 2012) and in general accounting research (Shipman et al., 2017). The goal of this approach is to create a pseudo-hypothetical case of how each company after a PE engagement would have performed without PE involvement (Engel & Keilbach, 2007), by finding a company with similar characteristics before the deal. Additionally, just comparing PE vs random non-PE firm performance would lead to biased results as selection into these 2 groups is not random but influenced by PE firm screening methods; it is necessary to quantitatively model this screening and incorporate it into our analysis.

Initially, we filter for Baltic-based enterprises operating within the same industries as the portfolio companies from the Orbis database with full financial data coverage in 2014–2022, thereby creating a sample set of 22,376 comparable companies. We also remove duplicate observations from our PE deal dataset so that companies are not matched with themselves. For the sake of methodological clarity and comprehensive coverage, we extract the financial variables necessary for propensity score matching spanning from 2010 to 2020. The identification of potential matching companies for a given portfolio firm is executed by aligning both entities' 2-digit NACE industry classifications, creating a subgroup for each PE company observation. We experimented with 3-digit codes, as done by Scellato and Ughetto (2013), and 4-digit codes, however, that led to generally worse matching outcomes. For the PE dataset, all financial variables are winsorized at 95% and 5% level to avoid outliers biasing further analysis. Finally, for matching only data on year t is necessary, so in each subgroup the relevant deal year is dynamically determined, and data is filtered accordingly. As a result, only companies in the same industry and with data from the same year as the deal year can be matched with the corresponding PE observations.

Subsequently, we proceed by employing a logit regression-based propensity score model for each subgroup separately, incorporating the same controls as Scellato and Ughetto (2013), for company size (total assets), profitability, productivity, and leverage, as proxies for screening variables used by private equity firms to determine which firms to invest in. Variable definitions can be seen in Appendix A. The variable PE is a dummy variable, equaling 1 if the specific company received a PE firm investment, and 0 otherwise. It must be noted that this is a purely predictive model, so accurate coefficient estimation concerns are not relevant.

$$PE_{i,t} = \alpha + \beta_1 TOTAL\ ASSETS_{i,t} + \beta_2 PRODUCTIVITY_{i,t} + \beta_3 PROFITABILITY_{i,t} + \beta_4 LEVERAGE_{i,t} + \varepsilon_i$$

The resulting propensity scores represent the forecasted probabilities of the binary outcome within the logistic regression model, forecasting the probability of a firm receiving a PE investment. Through a comparative analysis of these scores, each buyout firm is systematically paired with the most closely corresponding non-buyout control firm. We have paired each company that received a PE investment with a company that was equally likely to receive one (according to our model) but did not. To mitigate potential biases, it is admissible for a non-buyout control firm to be matched with multiple buyout firms. This methodological approach results in a dataset comprising PE and non-PE entities operating within the Baltic region. To verify the similarity of both groups, we calculated Cohen's d for all 4 independent variables in the logit regression, as suggested by Zhao et al. (2021). For all 4 variables, the values were between -0.13 to 0.32, indicating negligible to small differences in groups, as per Cohen's suggested benchmarks (Lakens, 2013). Scellato and Ughetto (2013) also tested other pairing methodologies but did not see any improvement in results. Finally, the matched pairs are all consolidated into one database, resulting in 174 total observations (87 PE, 87 non-PE firms). Among the 87 non-PE firms, three firms were matched twice, meaning the set consists of 84 unique firms. Also, note that the observation count in section 4.1 in each regression model is slightly different due to differing data coverage in each variable. The combined database is used from section 3.4.1 to 3.4.3, while only PE-owned companies are used in section 3.4.4; for this analysis, the data described in 2.7 is appended to the database.

Implementation of propensity score matching in R Studio was based on the methodology of Scellato and Ughetto (2013) and Engel and Keilbach (2007), with the code adapted from Zhao et al. (2021).

3.3 Variables and summary statistics

Appendix A provides the definitions of the variables employed in the quantitative analysis along with the corresponding summary statistics. Additionally, Table 1 provides the number and proportion of PE-invested companies by the deal year and by the country they operate in. Table 2 illustrates the amount and percentage of buyout firms in each sector.

When comparing the summary statistics in Appendix A to Scellato and Ughetto (2013), it is evident that the Baltic companies are smaller in terms of both total assets and employee count, and have a lower profitability, but are less leveraged than their sample. In terms of cap growth, our average is negative, but both datasets have very high variability. The average age of the company at deal year is almost 11 years. Some of these differences are the result of us using a slightly wider definition of PE investments, as they have focused on buyouts specifically, while we have also added growth investments. Additionally, for multiple variables the mean is a lot larger than the median, suggesting a positive skew in the dataset; that is the reason why we apply a log transformation for all the variables when using them in regressions.

Table 1 illustrates the amount of both investments and exits per year covered in our sample. In total, we have aggregated 115 PE deals, out of which 52 have been exited, 49 are active and 14 are either unknown or with an unknown exit year. Overall, 2014–2017 seems to have been with heightened investment activity. In terms of exits, nearly half happened in 2021 and 2022. The average investment holding period is 5.54 years, with the median being 5 years, which is close to the findings of Kaplan and Strömberg

Deal Year	Nr. of Deals	% of Deals	Nr. of Exits
2010	3	2.6%	0
2011	9	7.8%	0
2012	9	7.8%	0
2013	5	4.3%	0
2014	14	12.2%	2
2015	20	17.4%	1
2016	20	17.4%	4
2017	10	8.7%	3
2018	7	6.1%	5
2019	8	7.0%	4
2020	10	8.7%	6
2021	-	-	15
2022	-	-	13
2023	-	-	1
Total	**115**	**100%**	**52**
Active	-	-	49
Unknown	-	-	14

Table 1. Amount and % of PE investments and exits by deal year. Made by the authors.

Industry	Count
Manufacturing	35
Wholesale and retail trade	20
Information and communication	16
Professional, scientific, and technical activities	11
Human health and social work activities	7
Electricity, gas, steam, and air conditioning supply	6
Administrative and support service activities	4
Agriculture, forestry and fishing	3
Construction	3
Water supply	2
Real estate activities	2
Transportation and storage	2
Arts, entertainment, and recreation	2
Financial and insurance activities	1
Education	1
Total	**115**

Table 2. Amount of PE firm investments by industry based on letter NACE industry classification from Orbis. Made by the authors.

(2009), who show that the median holding period for PE investments is around 6 years, although it fluctuates over time.

As showcased in Table 2, manufacturing, wholesale and retail trade, IT and professional services are the most common in the dataset, which is similar to Scellato and Ughetto (2013) dataset, although we have both proportionally and in absolute values more manufacturing companies, while a lot less in the energy sector.

Investment Type	**Count**
Growth	56
Buyout	27
Late	14
Mezzanine	14
Infrastructure	4
Total	**115**

Table 3. Amount of PE firm investments by investment type. Made by the authors.

In terms of investment type, only ~ ¼ of our dataset are buyout deals, while nearly half are growth investments (Table 3). Most of the buyout investments were done by either BaltCap or Livonia Partners, while the growth and late investments are more varied by the investor. For country distribution, Latvian investments are the most common (61), followed by Lithuania (32) and Estonia (22). Such a distribution is likely since both Latvia and Lithuania have dedicated PE funds that invest nearly strictly into local companies, while Estonia does not have an equivalent. Additionally, Estonia leads Europe in VC investment per capita, potentially indicating that companies receive most of their external funding in earlier stages (Startup Estonia, 2023).

3.4 Quantitative analysis

In this section, we describe our Ordinary Least Squares (OLS) model specifications that are used to quantify the effect of PE buyouts on the later performance of the portfolio firm. We start by comparing the post-deal performance of the buyout firms with the matched companies based on size, profitability, employment, and productivity to find answers to the first research question. We perform both a univariate and multivariate analysis. Following, we will investigate solely the buyout firms and explore the impact of the characteristics of the private equity funds on the portfolio

companies' profitability after the funding to be able to answer the second research question.

3.4.1 The effect of PE activity on assets, employment, and sales

Following Scellato and Ughetto (2013), our initial dependent variables encompass the logarithmic growth rates of the company's total assets from one year before funding until three years post-funding, and the logarithmic growth rates of employee numbers over the same period. Additionally, mirroring the approach of Paglia and Harjoto (2014), we extend our investigation to include annual sales growth as a third dependent variable, aiming to assess portfolio companies' performance more comprehensively.

Initially, we conduct a basic univariate analysis in line with the approach outlined by Lindemanis et al. (2022) in their tables 4 and 5. This involves calculating the changes in the dependent variables for both PE and non-PE firms, followed by the computation of their respective t-statistics to assess the statistical significance of these changes.

Afterward, we proceed with running multiple regressions with different variable combinations to confirm the robustness of our results. More precisely, we are running 4 regressions to explain our first dependent variable, the growth of assets, 2 regressions to explain the growth of employee numbers, and 2 regressions to explain the sales growth. Growth for all variables is calculated as logarithmic growth, namely:

$$G\_X_{i,t-n:t} = \ln\left(\frac{X_{i,t}}{X_{i,t-n}}\right)$$

Our OLS regression variables are derived from the methodology outlined in Scellato and Ughetto (2013), however, we have incorporated an additional control variable, FIRM AGE, into all the models; it controls for the age of the company on the deal year, as previously employed by Paglia and Harjoto (2014). We believe this additional variable can further aid in avoiding potential biases, which may arise due to firms' differing ages within the sample. In all the regressions, we are including a dummy PE, our main variable of interest, which equals 1 if the company received a PE firm investment in year t and 0 otherwise. We include variables that control for the growth of total assets a year before the deal in models I and II and for total assets a year before the deal in models III, IV, and VIII. We include the variable EMPLOYEES in models V and VI. In all eight models, we control for leverage and profitability a year before the buyout. Variable CAPGROWTH was included in models II, IV, VI, VII, and VIII. All models

include industry fixed effects, where we separated the 3 most common industries in the sample, as per Table 2, while the remaining industries are categorized as "Other".

Model I, H1

$$G\_ASSETS_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 G\_ASSETS_{i,t-1} + \beta_3 LEVERAGE_{i,t-1} + \beta_4 PROFITABILITY_{i,t-1} + \beta_5 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model II, H1

$$G\_ASSETS_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 G\_ASSETS_{i,t-1} + \beta_3 LEVERAGE_{i,t-1} + \beta_4 PROFITABILITY_{i,t-1} + \beta_5 CAPGROWTH_{i,t} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model III, H1

$$G\_ASSETS_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model IV, H1

$$G\_ASSETS_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 CAPGROWTH_{i,t} + \beta_7 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model V, H5

$$G\_EMPLOYEES_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 EMPLOYEES_{i,t-1} + \beta_3 EMPLOYEES^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model VI, H5

$$G\_EMPLOYEES_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 EMPLOYEES_{i,t-1} + \beta_3 EMPLOYEES^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 CAPGROWTH_{i,t} + \beta_7 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model VII, H2

$$G\_SALES_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 G\_SALES_{i,t-1} + \beta_3 LEVERAGE_{i,t-1} + \beta_4 PROFITABILITY_{i,t-1} + \beta_5 CAPGROWTH_{i,t} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model VIII, H2

$$G\_SALES_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 SALES_{i,t-1} + \beta_3 SALES^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 CAPGROWTH_{i,t} + \beta_7 FIRM\ AGE_{i,t} + \varepsilon_i$$

3.4.2 The effect of PE activity on profitability

Moving forward, our focus extends to examining the impact of buyouts on the profitability of the target companies. The metric used to estimate is the ratio of EBIT to total assets. We are establishing two dependent variables: the average profitability over the 3-year post-buyout period and the profitability specifically in the third year following the buyout. We are conducting a regression analysis encompassing two models for each of these dependent variables.

For all the models, we introduce control variables including the profitability level one year preceding the deal and the FIRM AGE variable. In addition, we incorporate the PE dummy variable and control for the asset and leverage levels one year before the deal across all models. Similarly to the models in section 3.4.1, industry fixed effects, which separate the industries into four categories, are applied to all four models.

Model I, H3

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 PE + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model II, H3

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 CAPGROWTH_{i,t} + \beta_7 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model III, H3

$$PROFITABILITY_{i,t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\ AGE_{i,t} + \varepsilon_i$$

Model IV, H3

$$PROFITABILITY_{i,t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 ASSETS_{i,t-1} + \beta_3 ASSETS^2{}_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 CAPGROWTH_{i,t} + \beta_7 FIRM\ AGE_{i,t} + \varepsilon_i$$

3.4.3 The effect of PE activity on productivity

Finally, we investigate whether there exists a relationship between buyout deals and changes in labor productivity. We take the growth rate of labor productivity spanning from one year before the deal to three years after the deal as our dependent variable. We execute two regression models, each integrating controls for various factors.

Across both models, we introduce controls for the BUYOUT dummy variable, assets, leverage, and profitability from the year preceding the deal. Additionally, we introduce a variable, G_L_PRODUCTIVITY, which accounts for the growth in labor productivity during the two years before the deal. In the second model, we augment the analysis by including the CAPGROWTH variable, which is not present in the first model. Variable FIRM_AGE is added to both models.

Model I, H4

$$G\_L\_PRODUCTIVITY_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 G\_L\_PRODUCTIVITY_{i,t-1} + \beta_3 ASSETS_{i,t-1} + \beta_4 ASSETS^2{}_{i,t-1} + \beta_5 LEVERAGE_{i,t-1} + \beta_6 PROFITABILITY_{i,t-1} + \beta_7 FIRM\_AGE_{i,t} + \varepsilon_i$$

Model II, H4

$$G\_L\_PRODUCTIVITY_{i,t-1:t+3} = \alpha + \beta_1 PE_{i,t} + \beta_2 G\_L\_PRODUCTIVITY_{i,t-1} + \beta_3 ASSETS_{i,t-1} + \beta_4 ASSETS^2{}_{i,t-1} + \beta_5 LEVERAGE_{i,t-1} + \beta_6 PROFITABILITY_{i,t-1} + \beta_7 CAPGROWTH_{i,t} + \beta_8 FIRM\_AGE_{i,t} + \varepsilon_i$$

3.4.4 Characteristics of PE funds and profitability

This section is focused on exploring how specific characteristics of the PE investment fund affect the post-funding profitability of the target firms. PE deals can vary significantly based on the portfolio size, and geographic focus. Our analysis focuses on the traits of the primary investor, often leading the investment collaboration and holding larger equity shares than the co-investors.

We are conducting four regression analyses, employing the mean profitability of the targeted firms within a period spanning from one to three years following the deal as the dependent variable. Each model incorporates distinct variables and controls. Specifically, across all models, we integrate the CAPGROWTH variable, and control variables encompassing asset levels, leverage, and profitability, following the methodology of Scellato and Ughetto (2013).

Each investment fund in our sample is focused on a specific investment stage, eliminating the need to account for whether it is a generalist fund (in industry or stage) as Scellato and Ughetto (2013) did. Therefore, in model I we will employ dummy variables BUYOUT, INFRASTRUCTURE, GROWTH, LATE, and MEZZANINE, to discern the impact of the fund's chosen investment stage focus on the target firm's profitability (the intercepts are omitted in the specification). The second model includes a variable for firm experience, proxied by the number of previous investments by the investment firm. In

model III, we introduce a variable representing the investment fund's declared maximum investment amount, and in model IV, we incorporate the fund's specified minimum investment size, examining the fund's investment range within the regression analysis.

Model I, H6

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 BUYOUT_{i,t} + \beta_2 INFRASTRUCTURE_{i,t} + \beta_3 GROWTH_{i,t} + \beta_4 MEZZANINE_{i,t} + \beta_5 CAPGROWTH_{i,t} + \beta_6 ASSETS_{i,t-1} + +\beta_7 LEVERAGE_{i,t-1} + \beta_8 PROFITABILITY_{i,t-1} + \beta_9 FIRM\_AGE_{i,t} + \varepsilon_i$$

Model II, H7

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 EXPERIENCE_{i,t} + \beta_2 CAPGROWTH_{i,t} + \beta_3 ASSETS_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\_AGE_{i,t} + \varepsilon_i$$

Model III

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 MAX\_INVESTMENT_{i,t} + \beta_2 CAPGROWTH_{i,t} + \beta_3 ASSETS_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\_AGE_{i,t} + \varepsilon_i$$

Model IV

$$\overline{PROFITABILITY}_{i,t+1:t+3} = \alpha + \beta_1 MIN\_INVESTMENT + +\beta_2 CAPGROWTH_{i,t} + \beta_3 ASSETS_{i,t-1} + \beta_4 LEVERAGE_{i,t-1} + \beta_5 PROFITABILITY_{i,t-1} + \beta_6 FIRM\_AGE_{i,t} + \varepsilon_i$$

3.5 Robustness analysis

To make sure our regression results are not caused by structural issues in variable selection, we perform variance inflation factor (VIF) analysis on our independent variables in each regression to make sure they are not highly multicollinear. In untabulated results, we see that for regressions in 3.4.1. only the squared variables are potentially multicollinear (VIF around 5) with their non-squared counterparts, which is to be expected. For regressions in 3.4.2., leverage and capgrowth were in the 5-10 range, so we ran all regressions with capgrowth omitted, but the results were not significantly impacted.

Data is winsorized to the 95th percentile to get rid of outlier data points while keeping the observation in the dataset. We also perform the same analysis with winsorizing to the 90th and 99th percentiles and do not see a large divergence in results. The only notable difference in significance for the PE variable is in 3.4.1. model VIII, where the PE

variable becomes a significant determinant of sales growth at a 10% level with 90th and 99th percentile winsorizing.

4. Results

4.1 Results for PE engagement impact on financial performance

Variables	$\Delta PE_{t-1;t+3}$	N_{PE}	$\Delta non\text{-}PE_{t-1;t+3}$	$N_{non\text{-}PE}$	Difference test (t-stat)
TOTAL ASSETS	5149.11	69	584.89	87	2.97***
EMPLOYEES	11.97	67	40.26	86	-0.87
SALES	6028.91	70	9454.60	87	-0.68
PROFITABILITY	-0.03	68	0.24	78	-1.51
PRODUCTIVITY	214.50	66	74.05	76	0.93

Table 4. Univariate analysis of change in key financials for PE vs non-PE firms. Units are the same as in Appendix A. Made by the authors. [*Note: Due to companies being matched based on these same variables, we report absolute changes instead of relative growth.*]

In a univariate analysis (Table 4), the increase in total assets in 3 years for PE firms is nearly tenfold larger than for non-PE firms, and the difference is statistically significant at a 1% level, showcasing that PE-owned firms expand more aggressively and quicker than non-PE firms, which corresponds with the more recent PE focus of generating value through synergies between complementary businesses (Parameshwaran, 2023). For the number of employees, profitability, and sales, we see a larger increase for non-PE companies, although the difference is not statistically significant. For productivity growth, PE firms outperform non-PE firms, although the difference is not statistically significant. In untabulated results, we conducted the same analysis using logarithmic growth instead of absolute growth. However, in this case, none of the variables exhibited a statistically significant difference in means.

As highlighted before, the first set of regressions uses logarithmic total asset growth from t-1 to t+3. The results are presented in Table 5.

	G_ASSETS, t-1:t+3			
	Model I	Model II	Model III	Model IV
	(1)	(2)	(3)	(4)
PE	0.201	0.197	0.360***	0.335**
	(0.124)	(0.128)	(0.128)	(0.129)
G_ASSETS, t-1	−0.149	−0.141		
	(0.224)	(0.232)		
ASSETS, t-1			−0.292***	−0.286***
			(0.095)	(0.095)
ASSETS, $t-1^2$			0.021***	0.020***
			(0.008)	(0.008)
LEVERAGE, t-1	−0.424**	−0.425**	−0.450***	−0.439***
	(0.182)	(0.183)	(0.168)	(0.168)
PROFITABILITY, t-1	−0.069	−0.078	−0.621**	−0.674***
	(0.330)	(0.339)	(0.278)	(0.281)
FIRM AGE, t	−0.018**	−0.018**	−0.014*	−0.0123*
	(0.009)	(0.009)	(0.009)	(0.009)
CAPGROWTH, t		0.008		0.065
		(0.058)		(0.051)
Constant	0.980***	0.976***	1.836***	1.819***
	(0.225)	(0.228)	(0.283)	(0.283)
N	125	125	145	145
R^2	0.125	0.125	0.272	0.280
Adjusted R^2	0.064	0.056	0.223	0.227
Residual Std. Error	0.676 (df = 116)	0.679 (df = 115)	0.663 (df = 135)	0.662 (df = 134)
F Statistic	2.068** (df = 8; 116)	1.825* (df = 9; 115)	5.593*** (df = 9; 135)	5.219*** (df = 10; 134)

Notes: ***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

Table 5. OLS regression results for total asset growth. Made by the authors.

Overall, 2 models (III and IV) in Table 5 show that the PE variable has a statistically significant positive effect on the growth of total assets, meaning that companies that received a PE investment in year t exhibit higher asset growth rates vis-à-vis non-PE backed companies, ceteris paribus. The other 2 models have a positive coefficient but are statistically insignificant. This mirrors the findings of Scellato and Ughetto (2013), who find a statistically significant coefficient in all 4 models, although the coefficients numerically are ~3x larger, and with a higher standard error, meaning that in the Baltics the PE effect on asset growth is larger than in Europe, on average. These findings confirm our H1. Additionally, in alignment with Scellato and Ughetto (2013), the growth of assets seems to be negatively related to lagged values of total assets and firm age, showcasing the fact that there are generally more expansion opportunities as a smaller/younger company. Following their methodology, we also incorporated a squared total assets control variable; consistent with their findings, our analysis revealed a statistically significant positive coefficient for this variable at the 1% significance level. This suggests a relationship characterized by a U-shaped curve, where both very low and

very high asset values correspond to high asset growth. While Scellato and Ughetto (2013) do not directly address this specific finding, we conjecture that for smaller companies, even a minor increase in total assets could result in a significant percentage growth. Conversely, larger companies may possess greater financial resources and opportunities for international expansion than mid-sized companies, thereby experiencing higher asset growth rates. Given that the same U-shaped relationship is evident in multiple subsequent regressions, similar reasoning could be applied to those coefficients as well. Interestingly, lagged profitability seems to negatively predict future asset growth, potentially indicating a tradeoff between growth & profitability, similar to the one described by Mankins (2017). Finally, lower levels of lagged leverage are associated with higher growth, which is likely a result of our PE dataset, where many companies have undergone a leveraged buyout: the leverage ratio for PE-invested companies increased from 35% in t-1 to 47% in t+1. Companies take on more debt to expand their business.

	G_EMPLOYEES, t-1:t+3		G_SALES, t-1:t+3	
	Model V	Model VI	Model VII	Model VIII
	(1)	(2)	(3)	(4)
PE	0.147	0.113	0.210	0.206
	(0.113)	(0.115)	(0.161)	(0.168)
EMPLOYEES, t-1	−0.119	−0.101		
	(0.101)	(0.099)		
EMPLOYEES, $t-1^2$	0.019	0.016		
	(0.018)	(0.018)		
G_SALES, t-1			−0.295***	
			(0.070)	
SALES, t-1				−0.524***
				(0.085)
SALES, $t-1^2$				0.042***
				(0.007)
LEVERAGE, t-1	−0.211	−0.239*	−0.234	0.063
	(0.137)	(0.134)	(0.243)	(0.222)
PROFITABILITY, t-1	−0.137	−0.256	−0.547	−1.435***
	(0.230)	(0.230)	(0.436)	(0.378)
FIRM AGE, t	−0.0005	−0.001	−0.024**	−0.019*
	(0.007)	(0.007)	(0.011)	(0.011)
CAPGROWTH, t		0.008		0.065
		(0.058)		(0.051)
Constant	0.358**	0.233*	0.884***	2.067***
	(0.161)	(0.125)	(0.289)	(0.307)
N	140	140	123	145
R^2	0.075	0.056	0.205	0.353
Adjusted R^2	0.011	0.006	0.150	0.310
Residual Std. Error	0.549 (df = 130)	0.551 (df = 132)	0.877 (df = 114)	0.874 (df = 135)
F Statistic	1.168 (df = 9; 130)	1.115 (df = 7; 132)	3.682*** (df = 8; 114)	8.173*** (df = 9; 135)

Notes: ***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

Table 6. OLS regression results for employee and sales growth. Made by the authors.

The next set of models has logarithmic growth rate of employment and sales as dependent variables (Table 6). In the first two models, we find that PE involvement has a positive effect on employment growth post-investment, although not statistically significant, whereas Scellato and Ughetto (2013) found a statistically significant positive coefficient. Jelic and Wright (2011) find a significant increase in employment post-management buyouts in the UK, although in the period after exit, not investment. Davis et al. (2019) similarly report a positive effect for the US market, indicating a notable 13% rise in employment following the acquisition of private firms, which is similar to our coefficient. Due to lacking statistical significance we reject H5, although we acknowledge that data on employee count is the least reliable due to not being a standardized entry on financial statements.

As for sales growth, we find a positive effect from PE ownership, although it is not statistically significant in either model. Both Paglia and Harjoto (2014) and Jelic and Wright (2011) find a positive and significant effect, although with very different regression specifications and datasets. As noted in 4.3., under some different model specifications it is possible to gain very limited statistical significance. These findings point towards the rejection of H2. Corroborating previous findings, lagged sales, profitability, and company age are negatively related to sales growth, indicating a tradeoff between top-line growth & profitability, and that it's easier to increase sales as a newer company.

Table 7 describes the quantitative results for explaining profitability. All 4 models have a negative PE coefficient, which are all statistically significant at either the 5% or 10% level. This is comparable to findings by Scellato and Ughetto (2013), who also find negative coefficients in all model specifications, but with only partial statistical significance. Similarly, Jelic and Wright (2011) do not find a significant change in profitability after a PE fund exits its investment. Combining this finding with previous sections, it can be implied that PE firms are willing to sacrifice short-term profitability to grow the business in terms of assets for a long-term payoff. These findings confirm H3. We also find limited evidence that profitability is autocorrelated with its lagged values. Additionally, lower leverage is associated with higher future profitability. Yazdanfar and Öhman (2015) find similar evidence for Swedish SMEs, where debt levels and profitability are negatively related.

	PROFITABILITY, AVG(t+1:t+3)		PROFITABILITY, t+3	
	Model I	Model II	Model III	Model IV
	(1)	(2)	(3)	(4)
PE	−0.050**	−0.047*	−0.055*	−0.050*
	(0.025)	(0.025)	(0.029)	(0.029)
ASSETS, t-1	−0.027	−0.028	−0.042**	−0.044**
	(0.018)	(0.018)	(0.021)	(0.021)
ASSETS, $t-1^2$	0.002	0.002	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
LEVERAGE, t-1	−0.056*	−0.057*	−0.070*	−0.072*
	(0.033)	(0.033)	(0.038)	(0.038)
PROFITABILITY, t-1	0.087*	0.093*	0.093	0.103
	(0.052)	(0.052)	(0.062)	(0.063)
CAPGROWTH, t		−0.009		−0.013
		(0.010)		(0.011)
FIRM AGE, t	−0.001	−0.001	−0.002	−0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Constant	0.160***	0.163***	0.194***	0.197***
	(0.054)	(0.054)	(0.064)	(0.064)
N	160	160	145	145
R^2	0.117	0.121	0.145	0.153
Adjusted R^2	0.064	0.062	0.088	0.089
Residual Std. Error	0.135 (df = 150)	0.135 (df = 149)	0.149 (df = 135)	0.149 (df = 134)
F Statistic	2.204** (df = 9; 150)	2.059** (df = 10; 149)	2.535** (df = 9; 135)	2.413** (df = 10; 134)

Notes: ***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

Table 7. OLS regression results for profitability. Made by the authors. [*Note: Model III and Model IV are explaining profitability only on year t+3*]

Table 8 describes the quantitative results for productivity, which we have estimated as a natural logarithm of sales per employee. In both specifications, PE coefficients are slightly positive but not statistically significant, which supports the findings of Scellato and Ughetto (2013), although they use a partially different definition of productivity than ours. In contrast to our findings, Davis et al. (2019) find large productivity gains post-buyout, although they only consider US buyouts between 1980 and 2013; additionally, they stress that results are heterogenous in different samples due to credit and economic conditions, thus our results may not be contradictory. This finding confirms our earlier research, showing that while PE investment tends to have a positive effect on employment and sales, these effects are not statistically significant. Therefore, the relationship between sales/employees, which is our definition of productivity, is positive but lacks statistical significance. These findings reject H4.

	G_PRODUCTIVITY, t-1:t+3	
	Model I	Model II
	(1)	(2)
PE	0.056	0.065
	(0.200)	(0.202)
G_PRODUCTIVITY, t-1	−0.463***	−0.464***
	(0.162)	(0.163)
ASSETS, t-1	−0.612***	−0.616***
	(0.152)	(0.153)
ASSETS, $t-1^2$	0.053***	0.054***
	(0.013)	(0.013)
LEVERAGE, t-1	0.156	0.149
	(0.253)	(0.255)
PROFITABILITY, t-1	−0.881**	−0.861*
	(0.437)	(0.441)
CAPGROWTH, t		−0.032
		(0.077)
FIRM AGE, t	−0.026**	−0.027**
	(0.013)	(0.013)
Constant	1.937***	1.957***
	(0.470)	(0.475)
N	115	115
R^2	0.303	0.304
Adjusted R^2	0.235	0.229
Residual Std. Error	0.866 (df = 104)	0.870 (df = 103)
F Statistic	4.511*** (df = 10; 104)	4.084*** (df = 11; 103)
Notes:		***Significant at the 1% level.
		**Significant at the 5% level.
		*Significant at the 10% level.

Table 8. OLS regression results for productivity. Made by the authors. [*Note: productivity is estimated as Ln(Sales/Employees)*]

4.2 Results for PE characteristics on profitability

Table 7: Profitability Regression Model

	Profitability, AVG(t+1;t+3) Model I
BUYOUT	-0.081
	(0.139)
GROWTH	-0.038
	(0.140)
INFRASTRUCTURE	0.134
	(0.153)
LATE	0.054
	(0.157)
MEZZANINE	-0.063
	(0.133)
CAPGROWTH, t	−0.019**
	(0.008)
ASSETS, t-1	−0.047
	(0.038)
ASSETS, $t-1^2$	0.005
	(0.003)
LEVERAGE, t-1	-0.030
	(0.007)
PROFITABILITY, t-1	0.419***
	(0.137)
FIRM AGE, t	-0.001
	(0.003)
N	90
R^2	0.434
Adjusted R^2	0.330
Residual Std. Error	0.155 (df = 76)
F Statistic	4.161*** (df = 14; 76)
Notes:	***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 9. OLS regression results for stage comparison in terms of profitability. Made by the authors.

Based on Table 9, deal stages do not have a significant effect on profitability, as all coefficients are not statistically significant at any level. Infrastructure projects seem to have the highest profitability, as they are likely the safest and with the least expansion opportunities, although it must be noted that the sample for them is extremely small. Buyout has the largest negative coefficient, although it is statistically insignificant. Based on this result, we reject H6.

Table 8: Profitability Regression Models

	Profitability, AVG(t+1;t+3)		
	Model I	Model II	Model III
	(1)	(2)	(3)
EXPERIENCE, t	−0.026		
	(0.016)		
MAX_INVESTMENT		−0.047*	
		(0.027)	
MIN_INVESTMENT			−0.024
			(0.026)
CAPGROWTH, t	−0.030***	−0.023**	−0.021**
	(0.008)	(0.010)	(0.010)
ASSETS, t-1	−0.082*	−0.094*	−0.082
	(0.063)	(0.065)	(0.068)
ASSETS, $t-1^2$	0.007*	0.008*	0.007
	(0.004)	(0.007)	(0.007)
LEVERAGE, t-1	−0.073	−0.083	−0.088
	(0.063)	(0.061)	(0.062)
PROFITABILITY, t-1	0.334**	0.338**	0.298**
	(0.124)	(0.160)	(0.163)
FIRM AGE, t	−0.002	−0.001	−0.001
	(0.003)	(0.003)	(0.003)
Constant	0.124	0.477	0.162
	(0.249)	(0.410)	(0.380)
N	74	75	75
R^2	0.502	0.507	0.490
Adjusted R^2	0.424	0.431	0.411
Residual Std. Error	0.156 (df = 64)	0.154 (df = 64)	0.157 (df = 64)
F Statistic	6.440*** (df = 10; 64)	6.594*** (df = 10; 64)	6.161*** (df = 10; 64)
Notes:			***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

Table 10. OLS regression results for experience and investment size in terms of profitability. Made by the authors.

Deriving from Table 10, maximum investment size is negatively associated with profitability, although the significance is very limited. While this may seem like a counter-intuitive result, we believe it is consistent with the findings of 4.1, that PE firms are willing to sacrifice short-term profits for long-term success: larger investments carry more commitment and a larger stake in the company, potentially requiring more short-term sacrifices. Meuleman et al. (2009) found experience to be a positive determinant of underlying firm operating performance, although this was in terms of employee and sales growth, not profitability; we find no evidence of experience having a significant impact on post-investment profitability. Thus, we reject H7. Additionally, profitability is again autocorrelated with its lagged variable, meaning that firm profitability is a relatively stable metric over time.

4.3 Limitations

There are a few limitations that must be considered when interpreting and analyzing our results. In total, we outline 4 limitations.

Firstly, we have expanded the usual scope of such research by including growth & infrastructure investments, as the Baltics have had only 28 buyout investments in our time period; while the strategies are similar in many aspects, comparison with other research that analyzes purely buyout investments requires some caution.

Secondly, roughly 30 investments were eliminated from our dataset due to lacking data in publ0069c & private databases, especially for Lithuanian companies, which may impact the representativeness of our sample. Although we have attempted to mitigate such risks, it is still possible that there are investments that have not been disclosed on PE fund websites & the database we received from KPMG. Additionally, data coverage in the period 2010–2013 in the Orbis database is poor, resulting in missing observations and subpar matches for propensity score matching.

Thirdly, we used financial data for comparable companies from Orbis, which comes with the issues mentioned above and generally skews toward larger companies. For further research, we recommend attempting to utilize the publicly available Latvian & Estonian datasets, although they lack industry designations, which is why we chose to use the Orbis data.

Finally, data for PE fund characteristics and investment categories is self-reported, which in some cases may not fully align with the actual nature of the fund or investment, resulting in inaccurate data.

5. Discussion

Overall, the results described in section 4.1. and 4.2 point towards a buy-and-build strategy employed by PE firms, which is, for example, how BaltCap characterizes their investment strategy (BaltCap, n.d.b). Right after the investment, PE firms seem to focus on acquiring the assets and talent necessary for long-term success, often through mergers and acquisitions. Likewise, Livonia Partners set their aim to help companies expand into new markets and challenge current market leaders (Livonia Partners, n.d.). To achieve this, a short-term cost-cutting approach is not adequate, and PE firms must focus on commercial acceleration and revenue and EBIT growth (Kovac et al., 2018). Amess et al. (2015) provide further evidence demonstrating that PE activity has a positive effect on

company portfolio innovation, countering claims of PE short-term cost-cutting and lack of investment, which can explain the drop in profitability post-investment. It is also important to note that our research focuses on the short and mid-term implications of PE takeovers, as the quantitative analysis is done for data up to t+3. In our dataset, the average holding period for already sold companies is 5.57 years, meaning that our analysis likely precedes the period of improved profitability and higher earnings. While it would be insightful to expand our analysis for further years, it is likely impossible as extending the timeframe would reduce the sample size even more. In addition, Jelic and Wright (2011) found overall limited evidence for PE-backed firm superior performance in profitability both post-buyout and post-exit. Guo et al. (2011) find that gains in operating performance account for approximately 20% of investment returns PE firms get after sale. Despite potential short-term fluctuations, Harris et al. (2014) findings illustrate that PE fund returns generally outperform the S&P 500, underscoring the long-term value added by PE engagement: there is both evidence for PE firms fundamentally improving the operations of the underlying business and that the market and investors value these improvements accordingly.

Both for companies that were acquired by PE firms and their comparables, we find evidence of an important tradeoff between profitability and expansion, as described by Mankins (2017) and Levinthal and Wu (2010), who emphasize that opportunity cost of investments can cause divergence between total profits and margins. Companies generally need to choose between focusing on margins or expansion, and PE funds in the Baltics seem willing to sacrifice short-term margins more to stimulate growth.

As for PE impacts on the broader economy, we do not find evidence for the sentiment that PE takeovers cause layoffs and increase unemployment (Valladares, 2019). This is supported by Davis et al. (2019), who find that PE takeovers have a negative impact on employment for public companies, but a nearly symmetrical positive employment effect for private company takeovers. Since our sample only has a few public-to-private deals, and public companies are still a large minority in the Baltics, we do not believe PE activity poses a threat to employment; regulators should not be worried about increased PE activity from this aspect.

We do not find much evidence of fund-specific determinants impacting the outcomes of PE investments, although our available variables for analysis are admittedly limited. This is likely a result of the homogeneity of PE funds in the Baltic market: most funds are generalist, industry and stage-agnostic, and follow overall similar strategies.

Potentially larger maximum investment size listed by the PE fund is negatively associated with short-term profitability, although the statistical significance is limited.

6. Conclusions

The focus of this research was twofold: firstly, to determine the impacts of PE investment on underlying firm financial performance, and secondly, to determine if the financial outcomes depend on the characteristics of the particular PE fund. We have aggregated a novel dataset of 115 historical PE engagements from 2010 to 2020 and the respective company financial performance 3 years pre- and post-investment, which we believe to be a valuable addition to the research space. After filtering for missing data, we perform propensity score matching for 87 of these engagements to find 87 comparable non-PE-owned companies. We use this dataset in regression analysis to test our 7 hypotheses.

Our findings suggest that the involvement of PE leads to a greater increase in total asset growth over the three years following investment compared to similar firms, showcasing that PE funds pursue aggressive growth strategies to expand the underlying business. Additionally, we find evidence that PE involvement is negatively associated with short-term profitability. Synthesizing these two findings together, we find support for the general tradeoff between growth and profitability that all firms face, and we determine that PE fund-owned companies are more inclined to sacrifice short-term profits for growth than non-PE owned similar companies.

We do not find any statistically significant differences between PE-owned and non-PE-owned firms in terms of sales, employee count, and productivity growth rates post-investment. More generally, there seems to be a U-shaped relationship between total assets and sales, and their respective growth rates. Regarding PE fund characteristics, we observed little variation in their impact on portfolio company profitability; however, larger PE investments may lead to a larger decrease in short-term profitability.

This paper addresses a gap in existing research as the Baltic PE industry has been growing quickly in recent years but is often not included in datasets of similar research or appears only sparingly.

Overall, we observe that Baltic PE-owned companies exhibit distinct development and performance compared to their non-PE-owned counterparts. However, due to limited data coverage, we cannot draw definitive conclusions regarding relative performance. Nonetheless, when considering the theoretical arguments of active PE management

alongside our findings and those of previous studies, the PE industry likely generates value for shareholders and the underlying companies. Despite the recent BaltCap embezzlement case, which is an unfortunate exception, we believe that PE activity in the Baltics has generally had a positive impact on acquired companies rather than a negative one.

7. Reference List

Google folder with full-text materials:

https://drive.google.com/drive/folders/1fXNbppmfTNuobd_6qWUmYt_mHDIuWvZk?usp=sharing

Acharya, V. V., Gottschalg, O., Hahn, M., & Kehoe, C. (2011, June). *Corporate Governance and Value Creation: Evidence from Private Equity.* (European Corporate Governance Institute (ECGI) - Finance Working Paper No. 232/2009). http://dx.doi.org/10.2139/ssrn.1324016

Amess, K., Stiebale, J., Wright, M. (2015, April). *The impact of private equity on firms' innovation activity.* (Düsseldorf Institute for Competition Economics (DICE) - DICE Discussion Paper, No. 184). http://hdl.handle.net/10419/109639

Antoni, M., Maug, E., & Obernberger, S. (2019). Private equity and human capital risk. *Journal of Financial Economics*, *133*(3), 634–657. https://doi.org/10.1016/j.jfineco.2019.04.010

Averstad, P., Beltrán, A., Brinkman, M., Maia, P., Pinshaw, G., Quigley, D., Sanghvi, A., Spivey, J., & Vickery, B. (2023, March 21). *McKinsey Global Private Markets Review 2023: Private markets turn down the volume*. McKinsey & Company. Retrieved March 29, 2024, from https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/mckinseys-private-markets-annual-review-2023

Axelson, U., Strömberg, P., & Weisbach, M. S. (2009). Why are buyouts levered? The financial structure of private equity funds. *The Journal of Finance*, *64*(4), 1549–1582. https://doi.org/10.1111/j.1540-6261.2009.01473.x

Bajgar, M., Berlingieri, G., Calligaris, S., Criscuolo, C., & Timmis, J. (2020, May). *Coverage and representativeness of Orbis data* (OECD Science, Technology and Industry Working Papers No. 2020/06). https://doi.org/10.1787/c7bdaa03-en

BaltCap. (2023a, April). *BaltCap to become the majority shareholder of HansaMatrix*. Retrieved April 1, 2024, from https://www.baltcap.com/baltcap-to-become-the-majority-shareholder-of-hansamatrix/

BaltCap. (2023b, August). *BaltCap receives full alternative investment fund manager's licence.* Retrieved September 16, 2023, from https://www.baltcap.com/baltcap-receives-full-alternative-investment-fund-managers-licence/

BaltCap. (2024, February). *BaltCap completes the main stage of the internal investigation into misconduct*. Retrieved April 2, 2024, from https://www.baltcap.com/baltcap-completes-the-main-stage-of-the-internal-investigation-into-misconduct-changes-in-organisation-and-operational-management-to-follow/

BaltCap. (n.d.a). *Zvirgzdaiciu energija*. Retrieved February 8, 2024, from https://www.baltcap.com/portfolio-item/zvirgzdaiciu-energija/

BaltCap. (n.d.b). *Buyout strategy*. Retrieved February 10, 2024, from https://www.baltcap.com/our-strategy/buyout/

Brinkman, M., & Sarma, V. (2022, August 1). *Infrastructure investing will never be the same*. McKinsey & Company. Retrieved April 7, 2024, from https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/infrastructure-investing-will-never-be-the-same

Brown, G. W., Harris, R. S., Hu, W., Jenkinson, T., Kaplan, S. N., & Robinson, D. T. (2021). Can investors time their exposure to private equity? *Journal of Financial Economics*, *139*(2), 561–577. https://doi.org/10.1016/j.jfineco.2020.08.014

Burke, R. P. (2023, August 21). *Are you harnessing the growth and resilience of private capital?* EY. Retrieved September 16, 2023, from https://www.ey.com/en_gl/private-business/are-you-harnessing-the-growth-and-resilience-of-private-capital

Cambridge Dictionary. (n.d.). *Meaning of private equity in English*. Retrieved November 16, 2023, from https://dictionary.cambridge.org/dictionary/english/private-equity

Cote, C. (2021, July 13). *3 Key Types of Private Equity Strategies*. Harvard Business School Online. Retrieved February 7, 2024, from https://online.hbs.edu/blog/post/types-of-private-equity

Cressy, R., Munari, F., & Malipiero, A. (2007). Playing to their strengths? Evidence that specialization in the private equity industry confers competitive advantage. *Journal of Corporate Finance, 13*(4), 647–669. https://doi.org/10.1016/j.jcorpfin.2007.04.007

Cumming, D. J., & Walz, U. (2009). Private equity returns and disclosure around the world. *Journal of International Business Studies, 41*(4), 727–754. https://doi.org/10.1057/jibs.2009.62

Cuny, C. J., & Talmor, E. (2007). A theory of private equity turnarounds. *Journal of Corporate Finance, 13*(4), 629–646. https://doi.org/10.1016/j.jcorpfin.2007.04.006

Dahlqvist, F., Green, A., Maia, P., Mangan, C., Nee, A., Quigley, D., Sanghvi, A., Schneider, R., Spivey, J., & Vickery, B. (2024*). McKinsey Global Private Markets Review 2024: Private markets in a slower era.* McKinsey & Company. Retrieved March 29, 2024, from https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/mckinseys-private-markets-annual-review

Davis, S. J., Haltiwanger, J., Handley, K., Lipsius, B., Lerner, J., & Miranda, J. (2019). *The economic effects of private equity buyouts*. Social Science Research Network. https://doi.org/10.2139/ssrn.3465723

Deloitte, LTVCA, LVCA, & ESTVCA. (2022). *Baltic Private Equity and Venture Capital Market Overview 2021*. https://www.balticpevcmarket.com/

Eesti Pank. (n.d.). *History of Estonian money*. Retrieved February 27, 2024, from https://www.eestipank.ee/en/museum/history-estonian-money

Engel, D., & Keilbach, M. (2007). Firm-level implications of early stage venture capital investment — An empirical investigation. *Journal of Empirical Finance, 14*(2), 150–167. https://doi.org/10.1016/j.jempfin.2006.03.004

European Bank for Reconstruction and Development. (2022). *Diagnostic of Estonia, Latvia and Lithuania*. Retrieved April 2, 2024, from https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url

=https://www.ebrd.com/publications/country-diagnostics/estonia-latvia-lithuania&ved=2ahUKEwirm5i1pJ-FAxUDBxAIHXv2A20QFnoECC8QAQ&usg=AOvVaw2vIqjOFjKZNeL7Bi38nRmb

European Commission. (2022). *Supporting small and medium-sized enterprises' access to finance in the Baltic region*. https://reform-support.ec.europa.eu/what-we-do/financial-sector-and-access-finance/supporting-small-and-medium-sized-enterprises-access-finance-baltic-region_en

European Commission. (n.d.). *Latvia and the euro*. Economy and Finance. Retrieved February 27, 2024, from https://economy-finance.ec.europa.eu/euro/eu-countries-and-euro/latvia-and-euro_en

Gompers, P. A., Kaplan, S. N., & Mukharlyamov, V. (2016). What do private equity firms say they do? *Journal of Financial Economics*, *121*(3), 449–476. https://doi.org/10.1016/j.jfineco.2016.06.003

Guo, S., Hotchkiss, E. S., & Song, W. (2011). Do buyouts (Still) create value? *The Journal of Finance*, *66*(2), 479–517. https://doi.org/10.1111/j.1540-6261.2010.01640.x

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2014). Private Equity Performance: What Do We Know? *The Journal of Finance*, *69*(5), 1851–1882. https://doi.org/10.1111/jofi.12154

Hogeforster, M. (2014). Future challenges for innovations in SMEs in the Baltic Sea region. *Procedia - Social and Behavioral Sciences*, *110*, 241–250. https://doi.org/10.1016/j.sbspro.2013.12.867

Jelic, R., & Wright, M. (2011). Exits, Performance, and Late Stage Private Equity: the Case of UK Management Buy-outs. *European Financial Management*, *17*(3), 560–593. https://doi.org/10.1111/j.1468-036x.2010.00588.x

Johnson, J. (2020, December 15). *Private Equity vs. Venture Capital: What's the Difference?* CO – by U.S. Chamber of Commerce. Retrieved November 21,

2023, from https://www.uschamber.com/co/run/business-financing/private-equity-vs-venture-capital

Kanniainen, V., & Keuschnigg, C. (2003). The optimal portfolio of start-up firms in venture capital finance. *Journal of Corporate Finance, 9*, 521–534. https://doi.org/10.1016/S0929-1199(02)00021-4

Kaplan, S. N., & Schoar, A. (2005). Private equity performance: returns, persistence, and capital flows. *Journal of Finance, 60*(4), 1791–1823. https://doi.org/10.1111/j.1540-6261.2005.00780.x

Kaplan, S. N., & Strömberg, P. (2009). Leveraged buyouts and private equity. *Journal of Economic Perspectives, 23*(1), 121–146. https://doi.org/10.1257/jep.23.1.121

Kovac, M., Burns, D., & McLinn, J. (2018, April 9). How private equity is shifting from cost cutting to growth. *Forbes*. Retrieved February 10, 2024, from https://www.forbes.com/sites/baininsights/2018/04/09/how-private-equity-is-shifting-from-cost-cutting-to-growth/?sh=48bd651f2a20

KPMG, LTVCA, LVCA, & ESTVCA. (2023). *Baltic Private Equity and Venture Capital Market Overview 2022*. Retrieved October 18, 2023, from https://www.balticpevcmarket.com/

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*. https://doi.org/10.3389/fpsyg.2013.00863

Lerner, J., Sorensen, M., & Strömberg, P. (2011). Private equity and Long-Run Investment: the case of innovation. *Journal of Finance, 66*(2), 445–477. https://doi.org/10.1111/j.1540-6261.2010.01639.x

Leslie, P., & Oyer, P. (2008). *Managerial Incentives and Value Creation: Evidence from Private Equity*. (National Bureau of Economic Research –Working Paper 14331) https://doi.org/10.2139/ssrn.1341295

Levinthal, D. A., & Wu, B. (2010). Opportunity costs and non-scale free capabilities: profit maximization, corporate scope, and profit margins. *Strategic Management Journal (Print)*, *31*(7), 780–801. https://doi.org/10.1002/smj.845

Lietuvos Bankas. (n.d.). *Historical timeline*. Retrieved March 29, 2024, from https://www.lb.lt/en/historical-timeline

Lindemanis, M., Loze, A., & Pajuste, A. (2022). The effect of domestic to foreign ownership change on firm performance in Europe. *International Review of Financial Analysis*, *81*, 101341. https://doi.org/10.1016/j.irfa.2019.04.004

Livonia Partners. (n.d.). *Vision*. Retrieved February 10, 2024, from https://www.livoniapartners.com/vision

Lossen, U. (2006). *The Performance of Private Equity Funds: Does Diversification Matter?* (Munich Business Research Working Paper Series No. 2006-14). http://dx.doi.org/10.2139/ssrn.916702

MacArthur, H., Burack, R., Rose, G., De Vusser, C., Yang, K., & Lamy, S. (2023, February 27). *Private equity outlook in 2023: Anatomy of a slowdown*. Bain & Company. Retrieved November 23, 2023, from https://www.bain.com/insights/private-equity-outlook-global-private-equity-report-2023/

manager's licence. Retrieved September 16, 2023, from https://www.baltcap.com/baltcap-receives-full-alternative-investment-fund-managers-licence/

Mankins, M. (2017, May 1). *Stop focusing on profitability and go for growth*. Harvard Business Review. Retrieved April 7, 2024, from https://hbr.org/2017/05/stop-focusing-on-profitability-and-go-for-growth

Matisone, A. (2021). *Achieving Self-Sustainability of Venture Capital Market in Latvia.* [Doctoral Thesis, Riga Technical University]. RTU Press E-books. https://orcid.org/0000-0003-0237-5570

Meuleman, M., Amess, K., Wright, M., & Scholes, L. (2009). Agency, strategic entrepreneurship, and the performance of private equity-backed buyouts.

Entrepreneurship: Theory and Practice, 213–239. https://doi.org/10.1111/j.1540-6520.2008.00287.x

Mirbabaeva, N. (2023, February 3). *EBRD invested record €358 million in the Baltic states in 2022*. European Bank for Reconstruction and Development. https://www.ebrd.com/news/2023/ebrd-invests-record-358-million-in-the-baltic-states-in-2022.html

Organisation for Economic Co-operation and Development. (2000). *Policy insights from a decade of Baltic transition*. https://www.oecd.org/estonia/1864879.pdf

Organisation for Economic Co-operation and Development. (2023). *Venture capital investments (market statistics)* [Dataset]. https://data-explorer.oecd.org/vis?tm=private%20equity&pg=0&snb=1&vw=ov&df%5Bds%5D=dsDisseminateFinalDMZ&df%5Bid%5D=DSD_VC%40DF_VC_INV&df%5Bag%5D=OECD.SDD.TPS&df%5Bvs%5D=1.0&pd=2007%2C&dq=.%20.%20.USD_EXC.A&ly%5Brw%5D=BUSINESS_DEVELOPMENT_STAGE&ly%5Bcl%5D=TIME_PERIOD&ly%5Brs%5D=REF_AREA&to%5BTIME_PERIOD%5D=false

Paglia, J. K., & Harjoto, M. A. (2014). The effects of private equity and venture capital on sales and employment growth in small and medium-sized businesses. *Journal of Banking and Finance*, *47*, 177–197. https://doi.org/10.1016/j.jbankfin.2014.06.023

Parameshwaran, S. (2023, November 14). *How private equity has evolved to compete in global M&A*. Knowledge at Wharton. Retrieved April 7, 2024, from https://knowledge.wharton.upenn.edu/article/how-private-equity-has-evolved-to-compete-in-global-ma/

Prohorovs, A. (2014). *Problems and solutions to the attraction of venture capital funds and informal venture capital.* [Doctoral Thesis, RISEBA University of Applied Sciences]. https://riseba.lv/wp-content/uploads/2023/09/2014-anatolijs_prohorovs_eng-lv.pdf

Retterath, A., & Braun, R. (2020, September). *Benchmarking venture capital databases*. Social Science Research Network. https://doi.org/10.2139/ssrn.3706108

Sannajust, A., & Groh, A. P. (2020). There's no need to be a pioneer in emerging private equity markets. *Journal of Corporate Finance*, *65*, 101781. https://doi.org/10.1016/j.jcorpfin.2020.101781

Scellato, G., & Ughetto, E. (2013). Real effects of private equity investments: Evidence from European buyouts. *Journal of Business Research*, *66(*12), 2642–2649. https://doi.org/10.1016/j.jbusres.2012.06.001

Schofield, S. G. (2014). *Corporate governance and the relevance of private equity* [PhD Thesis, University of New South Wales]. https://doi.org/10.26190/unsworks/16739

Shipman, J. E., Swanquist, Q. T., & Whited, R. L. (2017). Propensity Score Matching in Accounting Research. *The Accounting Review*, *92*(1), 213–244. https://doi.org/10.2308/accr-51449

Startup Estonia. (2023, November 3). *Chapter 2022 of the Estonian Startup sector - the test of resilience - Startup Estonia*. Retrieved April 7, 2024, from https://startupestonia.ee/statistics-surveys/chapter-2022-of-the-estonian-startup-sector-the-test-of-resilience/#:~:text=According%20to%20the%20State%20of%20European%20Tech%202022%2C%20Estonia%20is,one%20startup%20per%201%2C000%20inhabitants).

Teimouri, S., & Zietz, J. (2018). The impact of surges in net private capital inflows on manufacturing, investment, and unemployment. *Journal of International Money and Finance*, *88*, 158–170. https://doi.org/10.1016/j.jimonfin.2018.07.007

Torpey, W. J., & Viscione, J. (1987). *Mezzanine Money for Smaller Businesses*. Harvard Business Review. Retrieved February 8, 2024, from https://hbr.org/1987/05/mezzanine-money-for-smaller-businesses

Tykvovà, T., & Borell, M. (2012). Do private equity owners increase risk of financial distress and bankruptcy? *Journal of Corporate Finance*, *18*(1), 138–150. https://doi.org/10.1016/j.jcorpfin.2011.11.004

Valladares, M. R. (2019, October 30). Private equity firms have caused painful job losses and more are coming. *Forbes*. https://www.forbes.com/sites/mayrarodriguezvalladares/2019/10/30/private-equity-firms-have-caused-painful-job-losses-and-more-are-coming/

Vidal, K. A., & Sabater, A. (2024, January 16). *Global private equity deal activity plunges in 2023*. S&P Global Market Intelligence. Retrieved February 27, 2024, from https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/global-private-equity-deal-activity-plunges-in-2023-80032940

Wilson, D., & Sabater, A. (2023, August 1). *Baltic states lead private equity investment volume in Europe*. S&P Global Market Intelligence. Retrieved September 16, 2023, from https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/baltic-states-lead-private-equity-investment-volume-in-europe-76711351

Witte, P. (2023, October 25). *Private Equity Pulse: Five takeaways from Q3 2023*. EY. Retrieved November 23, 2023, from https://www.ey.com/en_in/private-equity/pulse

Witte, P. (2024, January 11). *Private Equity Pulse: key takeaways from Q4 2023*. EY. Retrieved March 29, 2024, from https://www.ey.com/en_gl/insights/private-equity/pulse

Wright, M., Amess, K., Weir, C., & Girma, S. (2009). Private equity and Corporate governance: retrospect and prospect. *Corporate Governance: An International Review*, *17*(3), 353–375. https://doi.org/10.1111/j.1467-8683.2009.00744.x

Yazdanfar, D., & Öhman, P. (2015). Debt financing and firm performance: an empirical study based on Swedish data. *Journal of Risk Finance*, *16*(1), 102–118. https://doi.org/10.1108/jrf-06-2014-0085

Zhao, Q., Luo, J., Su, Y., Zhang, Y., Tu, G., & Luo, Z. (2021). Propensity score matching with R: conventional methods and new features. *Annals of Translational Medicine*, *9*(9), 812. https://doi.org/10.21037/atm-20-3998

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Appendices

Variables	Definition	N	Mean	Median	St.dev.	Min	Max
SALES	Ln(Sales)	106	9 289	3 100	17 301	0	118 320
ASSETS	Ln(Total Assets)	108	9 243	2 416	16 438	0	129 037
EMPLOYEES	Ln(Number of Employees)	101	89	31	154	0	953
PROFITABILITY	EBIT/Total Assets	100	-2.47%	0.25%	65.50%	-601.65%	190.15%
PRODUCTIVITY	Ln(Sales/Employees)	97	292	56	1 634	0	15 994
LEVERAGE	Interest-bearing Debt/(Equity + interest- bearing Debt)	107	0.47	0.46	0.53	-0.05	4.32
CAPGROWTH	The logarithm of the growth rate in shareholders' funds in the deal year (paid-in capital)	93	-1.23	0.03	16.49	-149.50	16.75
EXPERIENCE	The logarithm of the number of companies the lead investor has invested in since the creation of the PE firm	109	22.98	10	23.49	0	74
MAX_INVESTMENT	The logarithm of the upper limit of the fund's investment specified by the investment firm	99	11 611	15 000	8 011	3 000	30 000
MIN_INVESTMENT	The logarithm of the lower limit of the fund's investment specified by the investment firm	99	2 101	1 000	2 096	500	10 000
FIRM AGE	Age of the company	115	10.94	9	8.68	0	27
BUYOUT	Dummy variable that is equal to 1 if the private equity fund is specialized in the buyout investment stage; 0 otherwise	27	0.23	-	-	-	-
INFRASTRUCTURE	Dummy variable that is equal to 1 if the private equity fund is specialized in the infrastructure investment stage; 0 otherwise	4	0.03	-	-	-	-
GROWTH	Dummy variable that is equal to 1 if the private equity fund is specialized in the growth investment stage; 0 otherwise	56	0.49	-	-	-	-
LATE	Dummy variable that is equal to 1 if the private equity fund is specialized in the late investment stage; 0 otherwise	14	0.12	-	-	-	-
MEZZANINE	Dummy variable that is equal to 1 if the private equity fund is specialized in the mezzanine investment stage; 0 otherwise	14	0.12	-	-	-	-

Appendix A. Descriptive statistics and variable definitions for PE portfolio firm variables on deal year t. Although regression analysis uses ln-transformed variables, the table reports values in thousands of units for sales, total assets, productivity, and min and max investment which are not ln-transformed for comprehension. The number of employees is also not ln-transformed.