# WEATHERING THE STORM

## A DIFFERENCE-IN-DIFFERENCES STUDY ON NORDIC PRIVATE EQUITY PERFORMANCE AND M&A ACTIVITY DURING THE COVID-19 PANDEMIC

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Bachelor Thesis Stockholm School of Economics 2023



## Weathering the Storm: A Difference-in-Differences Study on Nordic Private Equity Performance and M&A Activity During the Covid-19 Pandemic

#### Abstract

Using financial data for Nordic private equity-backed companies, this paper investigates the performance and M&A activity of private equity-owned firms during the covid-19 pandemic. The results show that sales, investments and the number of add-on acquisitions increased significantly for private equity-owned firms compared to their peers in 2020 and 2021. Robustness tests confirm the results for investments and the number of add-on acquisitions, but not for sales. Additionally, investments and private equity ownership increased the likelihood of purchasing an add-on acquisition during the covid-19 pandemic. This paper provides insight into how private equity-backed firms perform in times of crisis and whether private equity ownership contributes to financial stability. This study's findings have implications for PE investors since the results shed light on the importance of agility and flexibility in responding to unpredictable events and market conditions.

#### Keywords

The Nordics, Private Equity, Covid-19 Pandemic, Performance, M&A

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#### Acknowledgments

We would like to address our gratitude towards Ran Guo for valuable guidance and feedback. It goes without saying that any remaining faults are solely our own responsibility.

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## **1. Introduction**

The private equity (PE) industry is a fundamental part of the modern economy and is a significant driver of economic growth in the Nordics. Only in Sweden, the PE and venture capital (VC) industries have since 2007 increased the GDP level by 230bn SEK, around 5% of Sweden's GDP every year (Swedish Private Equity & Venture Capital Association, 2020). The PE industry contributes to the economy in a number of ways, including financing, operational and financial improvement, and delivering returns to investors. More specifically, PE investors can offer financing to companies that might not be able to secure funding through regular means, such as start-ups and firms in financial distress (Fenn, Liang and Prowse, 1997). PE houses also often take an active role in their portfolio companies, providing strategic guidance, operational know-how and access to networks of industry experts (Haas and Fumo, 2020). Additionally, PE funds create returns that benefit all citizens as the largest investors in the PE industry are public pension funds (American Investment Council, 2023).

In December 2019, a disease known as covid-19 began to circulate in Wuhan, China, and soon spread to other countries. The infections increased rapidly worldwide and by March 11, 2020, the World Health Organization classified covid-19 as a pandemic (World Health Organization, 2023). Numerous countries responded to the disease's spread by enforcing restrictions and lockdowns to mitigate the spread of covid-19 (Financial Times, 2022). As a consequence, enterprises lost consumers and global commerce came to a standstill (Statista, 2023). The PE industry was not immune to the unprecedented crisis. As in the global financial crisis in 2008, it was expected that investments, exits, leverage and fundraising would decrease. At the same time, PE houses had a record of unused capital in their funds, which was putting pressure on general partners to find new investment opportunities (MacArthur, Elton and Rainey, 2020). Thus, it is interesting to study the effects of the covid-19 pandemic on the PE industry. More specifically, the paper's objective is to answer the following research questions:

*RQ1.* What was the impact of the covid-19 pandemic on the financial performance of *PE*-backed firms in the Nordics?

*RQ2.* What was the level of mergers and acquisitions (*M&A*) activity among *PE*-backed firms in the Nordics before and under the covid-19 pandemic?

Previous research about PE performance in times of financial difficulty covers historical crises, such as the global financial crisis in 2008, but there are relatively limited studies about the covid-19 pandemic. Existing research on PE during the covid-19 crisis investigates performance merely until 2020. This study develops these findings by extending the time period with an additional year. By including 2021 in the data, we examine the whole impact of the covid-19 pandemic on PE performance. With regards to previous studies within this field, this paper also adds a new perspective by analysing the change in M&A activity during times of crisis. Additionally, the covid-19 crisis has received little attention in research due to its recent occurrence, which makes this study more rare.

We analyze Nordic target companies that were backed by PE investors at the end of 2019. These are compared with a control group of firms, which are matched to each PE-owned company based on industry, size, leverage and profitability. Using financial data from Valu8, we conduct tests on significant differences in performance and M&A activity between PE-backed firms and their peers during 2017-2021. The results indicate that PE-owned companies significantly increased sales, investments and the number of add-on acquisitions more than their peers during 2020 and 2021 when the covid-19 pandemic disrupted the financial markets. Furthermore, our findings suggest that PE ownership and increases in investments cause a higher probability of making at least one add-on acquisition in 2020 and 2021. All results are also validated by robustness tests with an exemption for sales. This paper's findings provide greater insight into how PE-backed companies perform in times of crisis and whether PE ownership contributes to financial stability. We believe the differences in financial performance and M&A activity during the covid-19 pandemic can be explained by theories in the finance literature, for instance papers related to debt raising, buy-and-build strategy and economic crises.

## 2. Theoretical Framework & Literature Review

To analyze the performance and M&A activity of PE-backed companies during the covid-19 pandemic, we have identified previous areas of research to relate to. One area of interest covers how PE houses can help their portfolio companies grow faster and improve their profit margins more than their peers, and which factors that could explain this overperformance. Other relevant research comprises how PE investors can help their portfolio companies raise more debt, increase investments and relax credit restraints. Another related area of study is

the buy-and-build strategy and how it can generate value. Studies made on prior economic crises and the covid-19 pandemic, showing how PE houses can support their portfolio companies in periods of financial difficulty is also relevant research.

#### **2.1 Private Equity Performance**

For a considerable time, PE investors have highlighted their role as investors who bring value to the companies they invest in. Jensen (1989) proposes that leveraged buyouts have an edge over public corporations because of their robust corporate governance, concentrated ownership and efficient capital structure, which enable managers to prioritize long-term value generation. Evidence also suggests that enhanced incentives may be the cause of the increases in operating income and net cash flow, and decreases in capital expenditures for management buyouts of public companies completed during the period 1980-1986 (Kaplan, 1989). Using 3,200 target firms, Davis, Haltiwanger, Handley, Jarmin, Lerner and Miranda (2014) show that while buyouts may result in some net job losses, they also generate increases in gross job creation and destruction, along with enhanced total factor productivity through accelerated exit of unproductive divisions and entrance of productive ones.

Focusing on changes in supermarket prices in local markets, Chevalier (1995) argues that leveraged buyouts tend to drive up prices in highly leveraged local markets with competition, but lower prices in concentrated markets with less leverage. Leveraged buyout companies may also become prey to rival firms in markets where they exit. Investments made by PE investors may also impact other parameters, including productivity, employment and compensation. Leveraged buyouts, and especially management buyouts, made between 1983-1986 showed a significant increase in productivity in the first three years following the buyout investment. In addition, the employment and salaries of white-collar employees fell during the same period, whilst those of blue-collar employees were unchanged (Lichtenberg and Siegel, 1990). Jensen (1993) finds that the impact of leverage, payout policy and ownership structure on organizational efficiency, cash flow and value is substantial, particularly in low-growth or declining companies where the agency costs of free cash flows are considerable. Reviewing restaurant chain buyouts, Bernstein and Sheen (2016) suggest that PE owners improve business activities. This phenomenon is more prevalent when owners possess prior experience within the sector.

#### 2.2 Debt Raising

Boucly, Sraer and Thesmar (2011) study the change in corporate behavior for leverage buyouts in France, showing that PE investors can help their portfolio companies grow more by relaxing credit constraints. Target companies also increase profitability, grow more rapidly, issue additional debt and increase capital expenditures in the first three years after a leveraged buyout. This is in agreement with Acharya, Gottschalg, Hahn and Kehoe (2013), who suggest that extraordinary performance is linked to sales increase and operating margin expansion based on transactions made by large PE houses.

#### 2.3 Buy-and-Build Strategy

One approach for PE investors to expand a company is through a buy-and-build strategy, which involves buying a firm and utilizing it as a platform for subsequent acquisitions of companies or divisions that are strategically related to the platform company. The additional acquisitions are known as add-on acquisitions and create a single entity when they are combined (Fabozzi, 2002). Borell and Heger (2013) suggest that PE investors target fast-growing and profitable platform companies for further acquisitions, while slow-growing firms serve as add-on acquisitions. The buy-and-build strategy helps companies allocate resources more effectively, and it can improve profitability for some firms but lead to decreased performance for others.

Humphery-Jenner, Sautner and Suchard (2017) argue that PE ownership of an acquirer can signal deal quality and create positive market impression, which lead to increased announcement returns and operating performance in cross-border M&A, in particular for targets in poor information settings. Evidence also suggests that M&A announcements result in greater abnormal stock returns for transactions that involve PE investors compared to those that do not. The long-term annual stock returns following the M&A announcement are also higher for such deals, and they lead to improved operating performance as well (Brodmann, Danso, Jory and Ngo, 2021).

#### 2.4 Private Equity in Times of Economic Crisis

Based on a dataset of 42 economies during the period 1980-2017, Bian, Ge and Ji (2020) show that leverage growth can predict the occurrence of financial crises. High leverage growth increases the probability of a subsequent financial crisis. In turn, financial crises raise

the probability of bankruptcy for companies with high levels of leverage (Bernanke, Campbell, Friedman and Summers, 1988). Ivashina and Kovner (2011) suggest that the relationship between banks and PE investors play a significant role in the differences that exist between loan interest rates and the types of loan agreements or covenants that are established among those firms. This implies that the strength of a PE investor's relationship with a bank can impact the loan terms. PE funds tend to invest in industries that experience accelerated growth in both total production and employment, whilst also exhibiting greater resilience to aggregate shocks (Bernstein, Lerner, Sorensen and Strömberg, 2017).

Hotchkiss, Smith and Strömberg (2021) propose that PE-owned companies have greater leverage and default rates in loan markets, but they tend to manage financial distress better than their counterparties by restructuring rapidly, avoiding bankruptcy court and liquidating less often. Infusing capital after restructuring is a cost-effective way for PE owners to retain control while handling financial distress. Bernstein, Lerner and Mezzanotti (2019) find that PE-owned firms displayed higher resilience than comparable companies in the 2008 financial crisis by reducing their investments less and receiving higher equity and debt inflows, which resulted in increased asset growth and market share. PE investors were also more active during the global financial crisis, supporting their companies in operational and strategic matters.

#### 2.5 Private Equity in the Covid-19 Pandemic

Having effectively navigated previous economic crises, PE houses seem to be in a favorable position to manage the covid-19 crisis. In a survey of over 200 PE managers, Gompers, Kaplan and Mukharlyamov (2022) find that managers expect that 40% of their portfolio companies were slightly affected and 10% were very negatively impacted by the covid-19 pandemic. The crisis was expected to lead to a performance decline in existing funds, but PE managers remained focused on revenue growth and were actively seeking new investment opportunities. Focusing on PE-backed companies in the UK during the pandemic, Lavery and Wilson (2022) argue that PE-owned companies outperformed similar firms. The PE-backed companies were more likely to avoid liquidation by negotiating with creditors during the covid-19 pandemic, whilst the distressed firms in the control group were more likely to experience liquidation.

#### **2.6** Contribution

This study contributes to the previously mentioned research in multiple aspects. Using the methodology of Bernstein, Lerner and Mezzanotti (2019), we evaluate the performance and M&A activity of PE-backed companies in the Nordics during the covid-19 pandemic. Research has previously covered how PE-owned companies are impacted by financial crises, but there is relatively limited research on the topic of covid-19 in the Nordics. Existing research on PE performance during the covid-19 pandemic evaluates performance only until 2020. By including data from fiscal year 2021, this study extends existing research to provide insights into the whole effect of the crisis. By combining an extended time period with the unexplored aspect of M&A activity during times of crisis, our research becomes unique. In addition, examining M&A activity can increase the understanding of companies' approach to handling risk and seizing opportunities in a crisis. Thus, this study aims to make a valuable contribution by comparing the results of previous studies and providing new insights into the subject matter.

### 3. Hypotheses

*i.* We expect PE-backed firms to have unchanged levels of leverage, but to increase debt issuance and equity contribution more than their peers during 2020 and 2021.

This hypothesis is founded on the results of Bernstein, Lerner and Mezzanotti (2019), who suggest that PE-owned companies managed the 2008 financial crisis efficiently by receiving higher equity and debt inflows. The authors also show that the levels of leverage for PE-backed firms compared to their peers were unchanged throughout the crisis. This is in alignment with Hotchkiss, Smith and Strömberg (2021), who find that PE investors tend to infuse capital after restructurings to retain control while managing financial distress. Additionally, Ivashina and Kovner (2011) propose that PE houses have strong relationships with banks, implying improved opportunities to receive beneficial loan terms. As a consequence, we anticipate that PE-backed firms will have unchanged levels of leverage, but to increase debt issuance and equity contribution more than the control group during 2020 and 2021.

*ii. We predict PE-owned companies to reduce sales and return on assets (ROA) less than the control group during 2020 and 2021.* 

Following the findings by Bernstein, Lerner, Sorensen and Strömberg (2017), PE-backed firms tend to exhibit greater resilience to aggregate shocks. Thus, we expect to see a similar development regarding sales and ROA during 2020 and 2021 when covid-19 disrupted the financial markets.

*iii. We hypothesize PE-backed firms to increase investments in the balance sheet and grow total assets more than their peers during 2020 and 2021.* 

Bernstein, Lerner and Mezzanotti (2019) find that PE-owned companies increased investments and grew total assets in the 2008 global financial crisis, which led to higher resilience. This is consistent with Boucly, Sraer and Thesmar (2011), who suggest that PE-backed firms grow capital expenditures in the first three years following a leveraged buyout. As a result, we predict the PE group to raise investments and total assets more than the control group during the covid-19 pandemic.

*iv. We anticipate PE-owned companies to increase the number of add-on acquisitions more than their peers during 2020 and 2021.* 

This hypothesis is based on Borell and Heger (2013) who find that buy-and-build is a common growth strategy for PE-backed firms, and Bernstein, Lerner and Mezzanotti (2019) who show that PE houses support their portfolio companies more in strategic and operational matters in crises. Gompers, Kaplan and Mukharlyamov (2022) find that PE managers remained focused on sales growth and were actively seeking new investment possibilities in the covid-19 pandemic. Additionally, the sharp decline of the stock markets in 2020 caused lower valuation multiples, creating opportunities for new investments and add-on acquisitions (Kullving, 2022). As PE investors had a high share of uncalled capital in their funds during the same period (Strömberg, 2020), we expect the PE group to increase the number of add-on acquisitions more than the control group during 2020 and 2021.

#### 4. Data

#### **4.1 PE-Backed Companies**

To collect a sample of PE-owned companies, we use KPMG's (2023) annual PE report which covers firms backed by PE houses in Sweden, Norway, Denmark and Finland. The Nordic PE-owned companies are spread across different industries, sizes and ages, providing a

representative sample of the population of PE-owned companies in the Nordics. We collect the 36 PE investors in the report and thereafter manually gather each portfolio company that was owned or partly owned by these PE companies by the end of 2019 from respective PE house's website. We also cross-check in the KPMG (2023) report that each PE-owned firm was not acquired after 2019. In addition, recognizing that some PE investors may not publicly disclose all of their historic investments, we compare with the KPMG (2023) report to identify any additional PE-owned firms that may have been excluded, such as those with poor performance records. Through this process, we identify a total of 298 Nordic PE-backed companies. Thereafter, we gather financial data for each PE-backed company from Valu8's database. However, 47 companies are excluded since they are missing from the data register and 48 firms are excluded due to lack of financial data. This loss of data points may reduce the power of this study. In total, 203 PE-backed firms are identified through this process. After retrieving all financial information of interest for the PE-backed companies, the subsequent step is to determine an appropriate control group to conduct the difference-in-differences (DiD) analysis.

#### **4.2 Control Group**

Since PE-backed firms are not a random sample due to for instance greater size and leverage, it is necessary to define a proper control group. An appropriate control group is identified through a matching strategy for each company in the PE sample, inspired from Bernstein, Lerner and Mezzanotti (2019). Up to two Nordic control companies are matched to each PE-backed company based on industry (NACE code), size (total assets), firm leverage (equity ratio) and profitability (ROA). The matching process involves two parts. First, for each PE-backed company in the sample, we filter out all companies in Valu8 with the same two-digit NACE code; with total assets within a 30% bracket around the PE-backed company; with leverage, calculated as equity ratio, within a 30% bracket around the PE-owned firm; and with ROA, computed as net income divided by total assets, within a 30% bracket around the PE-backed company. This is done for each firm in the PE sample based on the 2019's data. Second, if more than two companies are identified in the first step, the two most similar companies are selected. This is based on quadratic distance calculated based on the size, leverage and profitability variables. If merely one firm is identified in the matching process, we use only one control company for that PE-backed firm. However, to ensure that each PE-backed company has at least one matched control firm, we exclude 54 companies in the PE sample. In total, 264 firms are identified in the control group for the remaining 149 companies in the PE sample.

#### 4.3 Variables

#### **4.3.1 Dependent Variables**

We use financial data from Valu8 to calculate financial performance and M&A activity variables for the PE sample and control group. Equity contribution is computed as the change in equity less net profit and debt issuance is calculated as the change in liabilities. We then normalize these variables with average total assets, calculated as the average of opening balance and closing balance of total assets for each year. Furthermore, investments is computed as the change in total assets, and is then normalized with total assets. Due to lack of data, we refrain from adding depreciation to investments, unlike Bernstein, Lerner and Mezzanotti (2019). We also construct a variable for firm leverage by dividing total liabilities with total assets, and debt issuance are interesting to study since they can help us understand companies' capital structure, risk profile and ability to raise capital in times of crisis. Studying leverage and investments can provide valuable insights into firms' solvency and risk management, while analyzing ROA can help us understand companies' profitability during the pandemic.

Additional variables are included such as sales, total assets and the number of add-on acquisitions. Sales and total assets are both key financial metrics used to evaluate firms' financial performance and stability. The number of add-on acquisitions is simply calculated as the number of add-ons that each firm has acquired. Examining the number of add-on acquisitions can gain insight into companies' approach to managing risk and seizing opportunities in the covid-19 pandemic. The complete formulas for the constructed dependent variables can be found in Table 16 in the appendix.

#### 4.3.2 Control Variables

Control variables are included in the DiD regression model to reduce the effect of other confounding factors that can impact the outcome variable. Inclusion of control variables can also improve the overall fit of the DiD regression model. This paper includes two control variables which are cash and net profit. Cash is used to control business size and net profit is

used for profitability. Both cash and net profit are indicators of a firm's financial performance and are thus suitable control variables. Both cash and net profit are used as control variables throughout all DiD regressions in this paper to capture each firm's financial situation.

#### 4.4 Data Summary

We start by displaying the distribution of the PE sample in the Nordic countries Sweden, Norway, Denmark and Finland in Table 1 below.

Country	All firms (%)	PE-backed firms (%)
Sweden	32.11	57.72
Norway	29.77	20.13
Denmark	19.99	13.42
Finland	18.13	8.72
Total	100.00	100.00

Table 1 – Country Distribution

Note: The table displays the country distribution of companies. Column "All firms" shows the distribution of all Nordic companies by March 2023 based on data from Valu8. Column "PE-backed firms" displays the distribution of PE-backed firms in our sample.

Compared to the universe of all Nordic companies, the PE sample is more concentrated in Sweden and less concentrated in Finland. The proportion of PE-owned companies in Norway and Denmark is similar to the overall distribution in the Nordics.

Below, we present Table 2 showing the industry distribution of the PE sample in the Nordics. The industries are based on the 21 two-digit NACE codes, which is the standard European nomenclature of economic activities (NACE, 2023).

Industry name	All firms (%)	PE-backed firms (%)
Agriculture, forestry and fishing	12.27	0.00
Mining and quarrying	0.12	0.00
Manufacturing	3.96	14.09
Electricity, gas, steam and air conditioning	0.22	0.00
Water supply; sewerage, waste management and remediation	0.23	0.67
Construction	8.44	2.01
Wholesale and retail trade	10.42	16.11
Transportation and storage	3.43	2.01
Accommodation and food service activities	2.69	0.67
Information and communication	4.72	14.09
Financial and insurance activities	4.46	11.41
Real estate activities	8.45	0.67
Professional, scientific and technical activities	12.27	33.56
Administrative and support service activities	4.86	2.68
Public administration and defense	0.10	0.00
Education	2.73	1.34
Human health and social work activities	4.08	0.00
Arts, entertainment and recreation	5.54	0.00
Other service activities	9.41	0.67
Activities of households as employers	0.63	0.00
Activities of extraterritorial organisations and bodies	0.98	0.00
Total	100.00	100.00

Table 2 – Industry Distribution

Note: The table shows the industry distribution of companies. Column "All firms" displays the distribution of all Nordic firms by March 2023 based on data from Valu8. Column "PE-backed firms" shows the distribution of PE-backed firms in our sample.

The PE sample has a high concentration of companies within Manufacturing, Wholesale and retail trade, Information and communication, Financial and insurance activities, as well as Professional, scientific and technical activities. The PE-backed firms are also active in Administrative and support service activities, and Education. Additionally, there is no or low concentration of PE-backed companies in relatively common industries such as Agriculture, forestry and fishing, Construction, Real estate activities, and Other service activities.

Table 3 below shows a comparison between the PE sample and the control group in sales, ROA, debt issuance, equity contribution, leverage, total assets, investments and number of add-on acquisitions.

PE sample				Match	ed san	nple				
Ratio	Ν	Mean	SD	Median	N	Mean	SD	Median	Mean-diff	T-value
Sales	143	0.85	1.36	0.41	264	0.77	2.00	0.32	0.08	0.465
ROA	149	0.01	0.14	0.01	260	0.01	0.13	0.01	0.00	-0.240
Debt issuance	144	0.08	0.20	0.05	258	0.05	0.23	0.01	0.03	1.457
Equity contribution	149	0.03	0.23	0.00	260	0.00	0.16	-0.01	0.03	1.179
Leverage	145	0.65	0.20	0.66	262	0.63	0.22	0.64	0.02	0.662
Total assets	149	1.97	8.43	0.35	264	1.41	5.58	0.33	0.56	0.729
Investments	149	0.21	0.86	0.09	264	0.17	1.10	0.02	0.04	0.360
Nr of acquisitions	149	0.07	0.30	0.00	264	0.04	0.35	0.00	0.03	0.777

Table 3 – Group Comparison in 2019

Note: The table shows a comparison of performance in 2019 between the PE sample and the matched sample of sales, ROA, debt issuance, equity contribution, leverage, total assets, investments and the number of add-on acquisitions. Sales and total assets are in 100M EUR. Column "Mean-diff" shows the mean difference between the two groups in relative variables. Column "T-value" displays the t-value of a t-test on the mean difference of the two groups. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

The results presented in Table 3 indicate that, at a 10% confidence level, there are no significant differences in relative variables between the PE sample and the matched sample. This proposes that the differences in firm activity observed between the two groups in 2019 are largely eliminated when we match companies in the same industry and with similar size, leverage and profitability. Table 4 and 5 in the appendix also show that the performance of both groups are equal and that there are no significant differences in the variables in 2017 and 2018 before the covid-19 pandemic. Thus, the key assumption of the DiD method is fulfilled (Angrist and Pischke, 2009).

## 5. Methodology

#### **5.1 Statistical T-tests**

We start this study by performing Welch's t-tests, which is a statistical test that compares the averages of two datasets that are independent of each other. We use Welch's t-tests to analyze whether the equally weighted means of all variables of the treatment group and control group in 2017, 2018 and 2019 are statistically different from each other (Table 3, 4 and 5). To assess the significance of the difference between the two sample means, we utilize a test statistic and examine the associated p-value. The formula for the test statistic encompasses the sample means ( $\overline{x}$  and  $\overline{y}$ ), sample variance (s) and sample size (n) (Newbold, Carlson and Thorne, 2020):

$$t = \frac{\overline{x} - \overline{y}}{\sqrt{\frac{s_x^2}{n_x} + \frac{s_y^2}{n_y}}}$$
Eq. 1

The t-tests are conducted to confirm that there are no statistical differences in 2017, 2018 and 2019 between the PE-backed companies and the control group in order to fulfill the key assumption of the DiD method (Angrist and Pischke, 2009).

#### 5.2 Difference-in-Differences Analysis

Following Bernstein, Lerner and Mezzanotti (2019), we include a DiD regression in this study. DiD is a statistical approach used to study the differential effect of a particular treatment on a group receiving the treatment versus a control group (Angrist and Pischke, 2009). In this analysis, we compare the financial performance and M&A activity of PE-backed firms with a control group during 2017-2021. Hence, the treatment is when the covid-19 pandemic impacted the economy, the treatment group is the PE-backed firms and the control group is the matched firms. The DiD approach relies on the assumption of parallel trends, which we show in the data section and appendix that the two groups of companies performed equally in 2017, 2018 and 2019.

Without the outbreak of covid-19, we anticipate that PE-backed firms and matched companies would perform equally in each dependent variable. However, with covid-19, we expect the performance and M&A activity to diverge. By conducting a DiD regression, we test this differential effect. We construct one dummy variable for when covid-19 disrupted the financial markets and another dummy variable if the firm is PE-backed or not. We then create a DiD variable which is a product of the two other dummy variables. Thereafter, we run a regression on each dependent variable based on the equation below:

$$y_{it} = \alpha_i + \alpha_t + \beta_1 DiD + \Theta X_{it} + \epsilon_{it}$$
 Eq. 2

CovidDummy = 0 if 2017, 2018 or 2019, 1 if 2020 or 2021 PEDummy = 0 if not PE-backed, 1 if PE-backed DiD = CovidDummy × PEDummy In the equation for each dependent variable  $y_{it}$ , we also include firm  $(\alpha_i)$  and time  $(\alpha_t)$  fixed effects.  $X_{it}$  represents a number of control variables, which are net profit and cash, for the company's financial situation with the corresponding coefficient  $\Theta$ . The error term  $\epsilon_{it}$  is clustered on a firm level.

#### 5.3 Probit Model

The third step in this study is to conduct a probit regression to obtain a deeper understanding of the findings from the DiD analysis. A probit regression is a binary response model, meaning that the dependent variable Y is a binary random variable that can solely take the values one or zero. The probit model estimates the conditional probability that Y = 1, considered as a function on several explanatory variables (Horowitz and Savin, 2001).

In this paper's probit model, the dependent variable *Y* equals one if the firm has made at least one add-on acquisition in 2020 and 2021, and zero if the firm has not engaged in any M&A activity during the covid-19 pandemic. The two explanatory variables in this probit regression are investments and a dummy variable for PE ownership. Thus, we study how the probability of making at least one add-on acquisition during the pandemic changes for each unit increase in investments, and also consider the impact of being PE-owned.

$$P(Y = 1 | X = x) = \beta_0 + x\beta_1 + PEDummy\beta_2$$
Eq. 3

Y = 1 if the firm makes at least one add-on acquisition in 2020 and 2021, 0 if not X = Investments

*PEDummy* = 0 if not PE-backed, 1 if PE-backed

## 6. Empirical Results

#### 6.1 Main Results

	(1) Sales	(2) Sales	(3) Total Assets	(4) Total Assets	(5) ROA	(6) ROA
DiD	8.235*	6.708*	41.260	43.957	-0.006	-0.003
Cluster s.e.	(4.414)	(4.067)	(27.350)	(26.934)	(0.012)	(0.011)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES	NO	YES
Cash	N/A	0.849**	N/A	1.000	N/A	0.001**
Net profit	N/A	0.292	N/A	-1.170	N/A	0.005***
Ν	1,534	1,530	1,593	1,584	1,529	1,526
Adjusted R-squared	0.969	0.970	0.932	0.934	0.462	0.556

Table 6 – Regression Summary (1)

Note: The table displays the estimates of the DiD fixed effect model on sales, total assets and ROA. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

Table 6 shows the differential effect of the covid-19 pandemic on the PE sample versus the control group for sales, total assets and ROA. Column 1 of Table 6 displays that the effect brought by the DiD estimator on sales is significant at a 10% confidence level and has a positive estimate. After adjusting for control variables for each company's financial position, sales is still significant at a 10% confidence level but with a lower coefficient in Column 2 of Table 6. A positive and significant DiD estimator entails that PE ownership had a positive impact on sales. More specifically, the difference in sales between the PE sample and control group during the pandemic was greater than the difference in sales between the two groups before covid-19. However, the significant effect of the control variable cash suggests that there may be other factors, such as cash, influencing sales. Furthermore, Column 3 and 4 of Table 6 show that there is no significant differential effect of covid-19 on total assets between the PE sample and control group. The DiD estimator is also insignificant for ROA as shown in Column 5 and 6 of Table 6. This implies that the difference in total assets and ROA between the PE group and control group was unchanged when the covid-19 outbreak caused turmoil in the financial markets. On the contrary, cash and net profit are statistically significant and could potentially explain the variation in ROA. Additionally, the relatively high R-squared value for sales and total assets can mainly be explained by the firm fixed effects.

	(7) Debt iss.	(8) Debt iss.	(9) Equity con.	(10) Equity con.	(11) Invest	(12) Invest.
DiD	0.017	0.014	0.018	0.015	0.145**	0.143**
Cluster s.e.	(0.021)	(0.021)	(0.015)	(0.015)	(0.070)	(0.069)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES	NO	YES
Cash	N/A	0.002**	N/A	0.001	N/A	0.006***
Net profit	N/A	-0.001	N/A	-0.001**	N/A	0.004***
Ν	1,505	1,501	1.529	1,526	1,524	1,519
Adjusted R-squared	0.062	0.065	0.246	0.249	0.023	0.029

Table 7 – Regression Summary (2)

Note: The table displays the estimates of the DiD fixed effect model on debt issuance, equity contribution and investments. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

Column 7 and 8 of Table 7 illustrate that the differential impact of the covid-19 pandemic on debt issuance is insignificant between the PE sample and control group. The significant effect of cash on debt issuance proposes that the control variable may play a crucial role in describing the variation in the dependent variable. Moreover, the p-value of the DiD estimator is above 10% for equity contribution as shown in Column 9 and 10 of Table 7, meaning that there is no statistically significant difference in the treatment effect between the two groups. The statistically significant impact of net profit, which has a negative estimate, implies that it may explain the variation in equity contribution, potentially indicating a negative relationship between equity contribution and net profit. Looking at investments in Column 11 and 12 of Table 7, we see that the effect caused by the DiD estimator has a positive estimate at a 5% level of significance with and without control variables. This implies that PE ownership had a favorable influence on investments during the covid-19 pandemic. To be more precise, this indicates that the difference in investments between the PE group and the control group in 2020 and 2021 was larger than the difference in investments between the two groups in the pre-pandemic period. However, the significant effect of both cash and net profit suggests that there may be other factors influencing investments than the DiD estimator.

	(13) Leverage	(14) Leverage	(15) Nr of acquisitions	(16) Nr of acquisitions
DiD	-0.013	-0.014	0.122**	0.122**
Cluster s.e.	(0.018)	(0.018)	(0.051)	(0.051)
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES
Cash	N/A	0.000	N/A	0.000
Net profit	N/A	-0.002***	N/A	0.000
Ν	1,570	1,566	1,639	1,584
Adjusted R-squared	0.617	0.624	0.235	0.239

Table 8 – Regression Summary (3)

Note: The table displays the estimates of the DiD fixed effect model on leverage and number of add-on acquisitions. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

Column 13 and 14 of Table 8 indicate that there is no significant difference in the treatment effect on leverage between the two groups at a 10% level of significance. This suggests that PE ownership did not have a significant effect on leverage of the companies in the treatment group in comparison with the control group. The negative coefficient of net profit, along with its statistical significance as a control variable, proposes that it may describe the variation in leverage, potentially suggesting a negative relationship between net profit and leverage. Examining the number of add-on acquisitions in Column 15 and 16 of Table 8, we notice that the effect generated by the DiD estimator has a positive estimate at a 5% level of significance. These findings propose that companies with PE ownership tended to do more add-on acquisitions during the covid-19 pandemic. To be more specific, this means that the difference in add-on acquisitions between the PE sample and control group during the pandemic was greater than the difference in add-on acquisitions between the two groups before covid-19 appeared. As both cash and net profit as control variables are insignificant, this indicates that the treatment effect brought by the DiD estimator is the most important driver influencing the number of add-on acquisitions.

As shown above, the DiD estimator is positive and significant for sales, investments and the number of add-on acquisitions. In order to gain a deeper understanding of these three variables, we intend to analyze them separately and review their development from 2017 to 2021 in the figures below. By displaying the historical development of each variable

separately, we can identify eventual patterns over several years. Additionally, the figures can help us understand the performance between the PE group and control group in normal times.



Figure 1 – Sales Development

Note: The figure shows yearly average sales in 100M EUR for the PE sample and control group between 2017 and 2021. The green line represents the PE group and the blue line represents the control group. The estimates are plotted with 1.65 standard errors above and below the means. The black dashed line illustrates when the covid-19 pandemic began.

Figure 1 illustrates the historical development of average sales during 2017-2021 for the PE group and control group. The confidence intervals overlap each other during each year and the overall trend is that both groups experienced a steady increase in sales from 2017 to 2021. Both lines are relatively close to each other before the treatment period and then slightly diverge when the covid-19 pandemic begins. In addition, one can observe that the greatest difference between the PE group and control group is in 2021. As the parallel trend assumption is fulfilled, parts of the observed increase in difference between the two groups in sales during 2020 and 2021 can be attributed to PE ownership. This suggests that PE-backed firms managed to grow sales more than their peers during the pandemic years.



Figure 2 – Investments Development

Note: The figure shows yearly average investments for the PE sample and control group between 2017 and 2021. The green line represents the PE group and the blue line represents the control group. The estimates are plotted with 1.65 standard errors above and below the means. The black dashed line illustrates when the covid-19 pandemic began.

Figure 2 displays the historical development of average investments during 2017-2021 for the PE sample and the control group. The two lines are relatively close to each other during 2017-2019 and thereafter move in opposite directions. While the control group experiences a decline in investments, the PE group shows an increase in investments. In addition, the range from top to bottom of the estimates of investments in 2020 for the PE group is relatively high, which suggests that there is a lot of variability in the data for that year. However, since the confidence intervals of the PE group and control group do not overlap in 2020, there is a substantial difference between the two groups. Furthermore, as the parallel trend assumption is satisfied, the observed increase in difference between the two groups in investments during the pandemic can be partly explained by PE ownership. This indicates that companies backed by PE houses were able to make greater investments than their peers during the covid-19 pandemic.



Figure 3 - Number of Add-on Acquisitions Development

Note: The figure shows the yearly average number of add-on acquisitions for the PE sample and control group between 2017 and 2021. The green line represents the PE group and the blue line represents the control group. The estimates are plotted with 1.65 standard errors above and below the means. The black dashed line illustrates when the covid-19 pandemic began.

Figure 3 shows the historical development of the average number of add-on acquisitions during 2017-2021 for the PE group and control group. Both lines are relatively near each other in the pre-pandemic period and then the PE group's number of add-on acquisitions increase considerably more. Particularly in 2021, the difference grows substantially. In addition, the broadness of the confidence interval in 2021 for the PE group proposes that there is a high degree of variation in the data. However, the confidence intervals of the PE group and control group do not overlap, which indicates that there is a significant difference. As the parallel trend assumption is fulfilled, the observed increase in difference between the two groups in add-on acquisitions can be partially attributed to PE ownership. This suggests that PE-owned companies made more add-on acquisitions during the covid-19 pandemic than their peers.

#### 6.2 M&A Likelihood

As previously shown, the DiD estimator is significant and has a positive estimate for sales, investments and the number of add-on acquisitions. In order to comprehend the results more profoundly, we extend the analysis by examining if there is a relationship between investments and the number of add-on acquisitions during the pandemic years since this can

provide insights into how firms were responding to the crisis. Using the dataset, we predict the likelihood of making at least one add-on acquisition using investments and a dummy variable for if the company is PE-backed or not. We apply a probit model and the outcome variable is binary, meaning that the firm either makes an add-on acquisition or not. Thus, the probit regression computes a predicted probability of making an add-on acquisition based on the two predictors in 2020 and 2021. Control variables are excluded in the probit regression since we want to specifically investigate the relationship between investments and PE ownership on the number of add-on acquisitions. In addition, we have already included control variables in the regular DiD regressions to account for possible confounding factors.

Table 9 – Probit Regression

Coefficients	Estimate	Std. Error	Z-value
Intercept	-1.860***	0.108	-17.275
Investments	0.164**	0.083	1.975
PEDummy	0.447***	0.151	2.954

Note: The table displays the estimates of a probit regression model consisting of investments and a PE dummy variable. The model includes only the fiscal years 2020 and 2021. We focus on the estimates and the related p-value. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

Table 9 shows the output from the probit model with estimates, standard errors and z-values for the intercept, investments and PE dummy variable. The estimates for both investments and the PE dummy variable are positive at a 5% level of significance, implying that both variables have a positive relationship with add-on acquisitions. Furthermore, the coefficient of the PE dummy variable is greater than the estimate of investments, indicating that PE ownership is a more important driver of add-on acquisitions.



Note: The figure shows the predicted probability of doing at least one add-on acquisition based on investments in 2020 and 2021. The green line represents PE-backed companies and the blue line represents non-PE-backed companies.

Figure 4 illustrates the predicted probabilities for the input data in 2020 and 2021. Since both lines have a positive slope, investments has a positive impact on the likelihood of doing at least one add-on acquisition. Additionally, given the same amount of investments, PE-backed firms had a higher probability of making an add-on acquisition during the covid-19 pandemic as the green line is above the blue line. More specifically, the likelihood to acquire an add-on is about twice as much if the firm was PE-owned. The model has a p-value below 0.1%, which indicates that it fits significantly better than an empty model.

#### **6.3 Robustness Tests**

To test the sensitivity and reliability of the statistical results in the DiD regressions, we include robustness tests on the three significant variables sales, investments and the number of add-on acquisitions. In the first robustness test, we exclude all PE-backed firms that were acquired in 2019 as PE investors tend to support their portfolio companies to grow more in the first years after a leveraged buyout (Boucly, Sraer and Thesmar, 2011). The results of the first robustness test are presented in Table 10 in the appendix, which shows that sales in Column 1 and 2 loses its significance when including control variables. The significant effect of the control variable cash proposes that there may be other factors impacting sales instead.

Both investments and the number of add-on acquisitions remain significant at a 10% level of significance with positive estimates, both with and without firm controls. However, both cash and net profit are significant in Column 4 of Table 10, indicating that there may also be other parameters influencing investments. When introducing control variables to the number of add-on acquisitions, the magnitude of the DiD estimator slightly falls but the control variables are insignificant.

In the second robustness test of the DiD regression, we exclude all PE-owned companies that were acquired before 2015 since firms that have been backed by PE houses for more than 5 years may no longer be representative of a typical PE-backed company (KPMG, 2023). Excluding this group of PE-owned companies can ensure that the sample is more representative of the broader population of PE-backed firms. Table 11 in the appendix shows the results of the second robustness test. All three variables retain positive estimates at a 10% level of significance, with and without control variables. In addition, Table 11 displays that control variables are significant on sales and investments, and insignificant on the number of add-on acquisitions. This indicates that there may be other factors impacting sales and investments, whereas the DiD estimator mainly explains the variation in the number of add-on acquisitions.

As the Nordic economies began to recover in 2021 (Nordic Statistics database, 2022), we exclude this year and run a DiD regression merely on 2017-2020 in the third robustness test. Including 2021 could potentially dilute the impact of the covid-19 pandemic on financial performance, resulting in less accurate estimates of the treatment effect. Table 12 in the appendix illustrates the results of the third robustness test. While investments and the number of add-on acquisitions have a positive estimate and are significant, sales in Column 1 and 2 becomes insignificant with firm controls when excluding fiscal year 2021. The control variable cash is significant at a 5% confidence level on sales in Column 2 of Table 12, indicating that there may be other factors, such as cash, influencing sales. Although investments remain significant when introducing control variables in Column 4 of Table 12, the significance of the firm controls show that other parameters may impact investments as well.

To assess the accuracy and dependability of the statistical results in the probit model, we include two robustness tests. In the first robustness test, we exclude all PE-owned companies

that were bought in 2019 by PE houses since PE investors typically provide assistance to their companies to achieve greater growth during the initial years following a buyout (Boucly, Sraer and Thesmar, 2011). Table 13 in the appendix illustrates the results of the first robustness test, showing that both investments and the PE dummy have positive estimates that are significant. The coefficients of investments and the PE dummy variable both slightly decrease in this robustness test compared to the probit regression in Table 9. The model has a p-value of less than 5%, suggesting that it fits relatively better than an empty model.

In the second robustness test of the probit regression, we exclude all companies, both from the PE sample and control group, with the 20% highest ROA in 2020 and 2021. Excluding the most profitable companies is a suitable way to test the sensitivity of the results as PE investors target fast-growing and profitable companies as platforms for add-on acquisitions (Borell and Heger, 2013). By excluding these firms, we are testing whether the results hold true in the absence of the most influential cases. The results are presented in Table 14 in the appendix, illustrating that both investments and the PE dummy are significant with positive estimates. The estimate of investments decreases but the coefficient of the PE dummy variable increases in the second robustness test in comparison with the probit regression in Table 9. Furthermore, the estimate of the PE dummy variable is greater than the coefficient of investments, indicating that PE ownership might be a more important driver of add-on acquisitions. The model has a p-value below 0.1%, which indicates that it fits significantly better than an empty model.

The robustness tests help us validate this paper's findings and increase confidence in the results. The results from the robustness tests of the DiD regression display that the significance is unchanged in the DiD estimator for investments and the number of add-on acquisitions, while the significance ceases for sales when we exclude buyouts made in 2019 and fiscal year 2021. Additionally, the results from the robustness tests of the probit model show that both investments and the PE dummy variable have positive estimates with significance.

#### 7. Discussion

#### 7.1 Analysis

The DiD estimator is insignificant for several variables, including total assets, ROA, debt issuance, equity contribution and leverage. The results indicate that there is no significant difference in the treatment effect, implying that PE ownership did not have a significant impact on these parameters during the pandemic. For sales, investments and the number of add-on acquisitions, we observe that the DiD estimator is significant with positive estimates. The findings suggest that companies with PE ownership increased sales, investments and the number of add-on acquisitions more than their peers in 2020 and 2021. Robustness tests validate these results for investments and the number of add-on acquisitions, but not for sales. The significance ceases in sales when we exclude all PE-backed firms that were acquired in 2019 and fiscal year 2021. Thus, we partly confirm the first, second and third hypothesis, and confirm the fourth hypothesis in Table 15 below.

Table 15 – Hypotheses Results

Hypothesis	i	ii	iii	iv
Results	Partly	Partly	Partly	Confirmed

Note: The table shows the outcomes of whether the hypotheses were rejected, confirmed or partly confirmed.

Interestingly, this paper's results are partly in line with Bernstein, Lerner and Mezzanotti's (2019) findings from the global financial crisis in 2008. In their research, they show that the difference between PE-backed firms and their peers significantly increased in debt issuance, equity contribution and investments during the financial crisis in 2008. The authors also show that leverage did not substantially increase for PE-owned companies. Thus, this study's results are consistent with Bernstein, Lerner and Mezzanotti (2019) for investments and leverage, but not for debt issuance and equity contribution. One possible explanation for this is that PE-backed companies were perhaps already highly leveraged prior to the covid-19 crisis. As a result, PE-owned companies may have been careful of taking on additional debt in a time of economic uncertainty to avoid the risk of bankruptcy and retain financial stability (Bernanke, Campbell, Friedman and Summers, 1988). One could also argue that PE-backed companies performed relatively well during the pandemic as they were exposed to certain industries that may have been positively impacted by the crisis. For example, PE houses invested heavily in Information and communication, Financial and insurance activities, as

well as Professional, scientific and technical activities, as shown in the data section. In such cases, these PE-backed companies and their matched firms may not have required additional debt issuance and equity contribution to weather the storm, since they were already performing relatively well.

Bernstein, Lerner, Sorensen and Strömberg (2017) propose that PE-owned companies have a tendency to demonstrate increased resilience to aggregate shocks. This paper partly supports this insight since PE-backed firms managed to increase sales and the number of add-on acquisitions significantly more during the pandemic, but not total assets and ROA. A possible explanation for this is that PE managers remained focused on sales growth and new investment opportunities throughout the pandemic (Gompers, Kaplan and Mukharlyamov, 2022). PE investors often have a short-term focus and prioritize revenue growth, and perhaps used the pandemic as an opportunity to grow sales and purchase add-on acquisitions. Interestingly, the significance of the DiD estimator on sales disappears in the first robustness test when we exclude all PE-backed firms that were acquired in 2019. This implies that companies that were bought by PE houses in 2019 are partly driving the overall effect of the DiD estimator on sales. This could be explained by the fact that PE investors are often more active and support their portfolio companies in the first years following a buyout. Additionally, when excluding fiscal year 2021, the significance of the DiD estimator on sales ceases in the third robustness test of the DiD regression. This indicates that the difference in sales in 2020 is insignificant and that the sales difference in 2021 mainly explains the overall effect of the DiD estimator on sales.

Borell and Heger (2013) suggest that buy-and-build is a common growth strategy that PE houses use in their portfolio companies. This paper's results are partly consistent with this insight since the dummy variable for PE ownership in the probit model has a positive coefficient at a 1% level of significance. The results imply that being PE-owned increases the likelihood of buying an add-on acquisition. However, this is only true for 2020 and 2021 since we specifically examine the pandemic years. Furthermore, the coefficient on investments is positive with 5% confidence level, suggesting that companies that invested more during the pandemic were more likely to purchase add-on acquisitions. This finding is reasonable as firms that invest to a greater extent are likely more active and may thus be better equipped to pursue a buy-and-build strategy. Additionally, since the coefficient is higher for the PE dummy than for the investments variable, this could entail that PE

ownership was a more important driver of M&A activity than investments. This result is plausible given that PE investors often take a hands-on approach to managing their portfolio companies and can achieve synergies through the acquisition of add-on businesses (Borell and Heger, 2013).

This paper's findings propose that Nordic PE-backed companies managed to weather the covid-19 pandemic and continue to invest in new opportunities, despite disrupted financial markets. The positive impact on sales may indicate an increase in demand for certain industries, whereas the growth in investments and the number of add-on acquisitions may reflect a willingness to take risk and exploit opportunities in an unstable market. This can be related to Kaplan's (1989) findings that enhanced incentives can lead to performance improvement. Enhanced incentives could have played a role in motivating managers to take advantage of the pandemic-induced market fragility and pursue growth opportunities. By offering incentives that reward performance, PE investors can encourage managers in target companies to take risks and make strategic investments that have the potential to generate high returns. Furthermore, the lack of significant impact on total assets, ROA, debt issuance, equity contribution and leverage imply that PE-owned firms were not able to achieve material returns or change their capital structure during the crisis. This may reflect the broader economic conditions induced by the pandemic and the specific challenges that PE-backed companies encountered during the crisis. This paper's findings have implications for PE houses since the results shed light on the importance of agility and flexibility in responding to unpredictable events and market conditions. Additionally, the findings also suggest that PE investors may need to be careful and have a long investment horizon when supporting their portfolio companies in crises.

#### 7.2 Limitations

There are some limitations to consider with the study-environment as a whole. While this paper analyzes the performance of PE-backed firms during the covid-19 pandemic in the Nordics, it is worth recognizing that there may exist variations between these countries. For example, the Nordic countries responded to the pandemic in various ways (Blach-Orsten, Ihlen, Johansson and Lindholm, 2023), which could have an impact on the companies and in turn the results. However, we regard companies in Sweden, Norway, Denmark and Finland to

be directly comparable to each other due to the countries' similarities in terms of business environment.

Furthermore, there are parts in the methodology that are subject to limitations. We gather a sample of PE-owned companies through PE investors' websites and KPMG's (2023) PE report, which is broadly recognized as a trustworthy source of information about PE in the Nordics. Although KPMG's (2023) report covers the whole Nordics and we identify a large initial sample consisting of 298 Nordic PE-backed firms, it is possible that a few companies are missing. However, the article includes a diverse range of PE-owned companies across various industries, sizes and ages, providing a representative sample of the population of PE-owned companies in Sweden, Norway, Denmark and Finland. Also, by using the KPMG (2023) report, the data is traceable and this study becomes easy to replicate.

The matching method we use to collect a control group may be subject to limitations. Inspired by Bernstein, Lerner and Mezzanotti (2019), we match Nordic control companies to PE-owned firms based on industry, size, firm leverage and profitability. While these four filters are appropriate to find companies with similar characteristics, it is important to mention that additional filters may need to be considered to more precisely identify similar firms. Filters such as country, fiscal year period and other financial metrics could also be suitable. Nevertheless, including too many filters in the matching method can risk losing several data points.

Finally, the R-squared value in several DiD regressions is low, indicating that the DiD variable and control variables do not explain much of the variation in the dependent variables. In this complicated context, several components describe the variation in the dependent variables, and the model includes merely a few of them. However, the DiD variable is significant for sales, investments and the number of add-on acquisitions, meaning that they contribute to the regression model. Additionally, an increase in difference between PE and non-PE for these three dependent variables can be observed in Figure 1, 2 and 3.

## 8. Conclusion Remarks

#### 8.1 Conclusion

This paper examines the financial performance and M&A activity of Nordic PE-backed firms during the covid-19 pandemic. More specifically, we analyze sales, total assets, ROA, debt issuance, equity contribution, investments, leverage and the number of add-on acquisitions. We conclude that the covid-19 pandemic had a significant impact on the financial performance of PE-backed firms in the Nordics. More precisely, PE-owned companies increased sales, investments and the number of add-on acquisitions more than their peers in 2020 and 2021. Based on the results, one can also conclude that the level of M&A activity among Nordic PE-backed firms significantly increased during the pandemic. The results indicate that PE-owned firms were more active during the pandemic, rather than being passive in uncertain times. Thus, PE-backed firms managed to weather the storm better by using the pandemic as an opportunity to invest and purchase add-on acquisitions.

#### 8.2 Future Research

There are at least three logical extensions of this study that could be analyzed in future research. We study the Nordic market as a whole, but we see a need that future research could examine Sweden, Norway, Denmark and Finland separately. Although many similarities exist between the Nordic countries, there are several differences among them and particularly in the management of the covid-19 pandemic that could explain potential differences in PE performance. Another area of future research is to examine other variables that could explain financial performance differences. This paper's findings suggest that PE-backed firms invested and purchased add-on acquisitions to a greater extent, but there are other potential variables of interest such as board composition and CEO experience. Future studies could also include additional years to review the long-term recovery after the covid-19 pandemic as more financial data becomes available.

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## **10. Appendix**

	PE sample			Matched sample						
Ratio	Ν	Mean	SD	Median	Ν	Mean	SD	Median	Mean-diff	T-value
Sales	140	0.76	1.33	0.37	260	0.74	2.05	0.29	0.02	0.118
ROA	126	0.04	0.14	0.02	252	0.03	0.13	0.02	0.01	0.683
Debt issuance	123	0.09	0.22	0.06	248	0.06	0.22	0.03	0.03	1.036
Equity contribution	126	0.00	0.25	-0.01	252	-0.02	0.16	-0.01	0.02	0.606
Leverage	147	0.63	0.20	0.65	258	0.63	0.22	0.64	0.00	0.130
Total assets	149	1.79	8.01	0.33	260	1.22	4.76	0.34	0.57	0.786
Investments	124	0.19	0.44	0.07	251	0.13	0.48	0.04	0.06	1.133
Nr of acquisitions	149	0.06	0.29	0.00	264	0.05	0.29	0.00	0.01	0.375

#### **10.1 Group Comparison**

Table 4 – Group Comparison in 2018

Note: The table shows a comparison of performance in 2018 between the PE sample and the matched sample of sales, ROA, debt issuance, equity contribution, leverage, total assets, investments and the number of add-on acquisitions. Sales and total assets are in 100M EUR. Column "Mean-diff" shows the mean difference between the two groups in relative variables. Column "T-value" displays the t-value of a t-test on the mean difference of the two groups. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

	PE sample					Match	ed san			
Ratio	N	Mean	SD	Median	N	Mean	SD	Median	Mean-diff	T-value
Sales	118	0.72	1.31	0.33	253	0.73	1.95	0.28	-0.01	-0.070
ROA	111	0.07	0.17	0.03	241	0.06	0.18	0.03	0.01	0.341
Debt issuance	108	0.08	0.24	0.04	239	0.05	0.25	0.02	0.03	0.920
Equity contribution	111	-0.03	0.19	-0.01	243	-0.01	0.22	-0.01	-0.02	-0.967
Leverage	123	0.65	0.21	0.68	250	0.62	0.22	0.63	0.03	1.373
Total assets	124	1.53	7.83	0.26	253	1.31	5.16	0.29	0.22	0.283
Investments	110	0.19	0.52	0.09	241	0.21	0.94	0.04	-0.02	-0.273
Nr of acquisitions	149	0.03	0.18	0.00	264	0.04	0.22	0.00	-0.01	-0.406

Table 5 – Group Comparison in 2017

Note: The table shows a comparison of performance in 2017 between the PE sample and the matched sample of sales, ROA, debt issuance, equity contribution, leverage, total assets, investments and the number of add-on acquisitions. Sales and total assets are in 100M EUR. Column "Mean-diff" shows the mean difference between the two groups in relative variables. Column "T-value" displays the t-value of a t-test on the mean difference of the two groups. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

#### **10.2 Robustness Tests**

	(1) Sales	(2) Sales	(3) Invest.	(4) Invest.	(5) Nr of acquisitions	(6) Nr of acquisitions
DiD	8.417*	6.505	0.155**	0.149**	0.104*	0.101*
Cluster s.e.	(4.875)	(4.439)	(0.077)	(0.075)	(0.055)	(0.055)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES	NO	YES
Cash	N/A	0.873**	N/A	0.006***	N/A	0.000
Net profit	N/A	0.273	N/A	0.005***	N/A	0.000
Ν	1,465	1,462	1,446	1,442	1,559	1,506
Adjusted R-squared	0.967	0.969	0.018	0.024	0.236	0.240

Table 10 – Robustness Test 1 of DiD Regression

Note: The table displays the estimates of the DiD fixed effect model on sales, investments and number of add-on acquisitions without the PE-backed firms that were acquired in 2019. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

	(1) Sales	(2) Sales	(3) Invest.	(4) Invest.	(5) Nr of acquisitions	(6) Nr of acquisitions
DiD	11.200**	9.577*	0.171*	0.172*	0.121*	0.119*
Cluster s.e.	(5.510)	(5.011)	(0.091)	(0.089)	(0.062)	(0.063)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES	NO	YES
Cash	N/A	0.876**	N/A	0.006***	N/A	0.000
Net profit	N/A	0.299	N/A	0.005***	N/A	-0.001
Ν	1,379	1,375	1,366	1,361	1,479	1,426
Adjusted R-squared	0.968	0.969	0.020	0.026	0.253	0.258

Table 11 - Robustness Test 2 of DiD Regression

Note: The table displays the estimates of the DiD fixed effect model on sales, investments and number of add-on acquisitions without the PE-backed firms that were acquired before 2015. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

	(1) Sales	(2) Sales	(3) Invest.	(4) Invest.	(5) Nr of acquisitions	(6) Nr of acquisitions
DiD	7.676*	6.729	0.191*	0.184*	0.064*	0.062*
Cluster s.e.	(4.224)	(4.222)	(0.109)	(0.105)	(0.036)	(0.036)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Firm controls	NO	YES	NO	YES	NO	YES
Cash	N/A	0.492**	N/A	0.004*	N/A	-0.001
Net profit	N/A	0.119	N/A	0.007**	N/A	-0.001
Ν	1,147	1,144	1,124	1,121	1,229	1,185
Adjusted R-squared	0.977	0.977	0.027	0.031	0.362	0.364

Table 12 - Robustness Test 3 of DiD Regression

Note: The table displays the estimates of the DiD fixed effect model on sales, investments and number of add-on acquisitions without the fiscal year 2021. All tests include year fixed effects and firm fixed effects. Odd-numbered columns consist of baseline regressions and even-numbered columns contribute to the baseline model with the control variables cash and net profit. We mainly look at the effect brought by the DiD estimator. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.

Table 13 – Robustness Test 1 of Probit Regression

Coefficients	Estimate	Std. Error	Z-value
Intercept	-1.857***	0.108	-17.266
Investments	0.145*	0.080	1.806
PEDummy	0.331**	0.162	2.035

Note: The table displays the estimates of a probit regression model consisting of investments and a PE dummy variable without the PE-backed firms that were acquired in 2019. The model includes only the fiscal years 2020 and 2021. We focus on the estimates and the related p-value. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.



Figure 5 – Robustness Test 1 of Probit Regression

Note: The figure shows the predicted probability of doing at least one add-on acquisition based on investments in 2020 and 2021. The green line represents PE-backed companies and the blue line represents non-PE-backed companies. This probit model has excluded PE-backed companies that were acquired in 2019.

Table 14 – Robustness	Test 2 of	Probit R	legression
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Coefficients	Estimate	Std. Error	Z-value
Intercept	-1.865***	0.122	-15.279
Investments	0.134*	0.081	1.667
PEDummy	0.510***	0.168	3.043

Note: The table displays the estimates of a probit regression model consisting of investments and a PE dummy variable without the firms with the 20% highest level of ROA. The model includes only the fiscal years 2020 and 2021. We focus on the estimates and the related p-value. \*\*\* denotes significance at a 1% level, \*\* at a 5% level, \* at a 10% level.



Figure 6 – Robustness Test 2 of Probit Regression

Note: The figure shows the predicted probability of doing at least one add-on acquisition based on investments in 2020 and 2021. The green line represents PE-backed companies and the blue line represents non-PE-backed companies. This probit model has excluded the firms with the highest 20% ROA.

## **10.3 Variable Descriptions**

10 - variable Description	Table 16 –	Variable D	Descriptions
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Variable	Formula
Debt issuance(t)	(Total liabilities(t) – Total liabilities(t–1)) / Avg total assets(t)
Equity contribution(t)	(Total equity(t) – Total equity(t–1) – Net profit(t)) / Avg total assets(t)
Investments(t)	(Total assets(t) – Total assets(t–1)) / Total assets(t–1)
ROA(t)	Net profit(t) / Avg total assets(t)
Firm leverage(t)	Total liabilities(t) / Total assets(t)
Avg total assets(t)	(Total assets(t) + Total assets(t-1)) / 2

Note: The table shows the formula for each dependent variable. \*"t" represents the year.