Private Equity: The Secret Sauce for Pandemic-Proof Performance or Just Another Quarantine Regret?

How PE-backed companies performed during COVID-19 pandemic compared to non-PE-backed companies

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Bachelor Thesis

Stockholm School of Economics

2023

Abstract

This study utilizes a dataset comprising 99 private equity-backed firms and 317 non-private equity-backed firms in Sweden to investigate whether private equity-backed firms were more resilient during the COVID-19 pandemic compared to similar firms. Our findings indicate that private equity-backed firms experienced a significant increase in investment, credit, and equity inflows, and exhibited better operational performance when compared to similar firms in the wake of the COVID-19 outbreak. Additionally, our analysis yields mixed results regarding the effect that private equity has on financially constrained firms. Most of the results are consistent with previous studies conducted during the 2008 financial crisis, which suggest that private equity-backed firms are better equipped to navigate financial instability during times of crisis.

Key Words

Private equity, COVID-19 crisis, Capital investment, Financial crisis, Financial fragility

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Bachelor Thesis

Bachelor Program in Business and Economics

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1. Introduction

1.1. Research focus

Private equity (PE) plays a significant role in the economy by providing capital and expertise to companies that may not have access to traditional sources of funding. Private equity firms invest in a wide range of companies, from small startups to large, established companies, and can help to spur innovation, create jobs, and drive economic growth. For example, by providing funding for research and development, private equity firms can help to bring new products and technologies to market (Lerner, Sørensen, & Strömberg, 2011), which can drive economic growth and improve the standard of living for consumers.

However, it is important to note that private equity is not without its controversies and criticisms. Some argue that private equity firms prioritize short-term profits over long-term growth which can lead to job losses and other negative impacts on the companies they invest in (Davis, Haltiwanger, Handley, Jarmin, Lerner, & Miranda, 2014). Additionally, some have raised concerns about the lack of transparency and regulation in the private equity industry known for its use of high leverage when acquiring companies that pose significant risks (Kaplan & Stein, 1993). If the acquired company's financial performance deteriorates, the private equity firm may struggle to meet its debt obligations, potentially leading to default, bankruptcy, or other financial distress. During economic downturns, high levels of leverage can exacerbate these risks, as companies may struggle to generate sufficient cash flow to service their debts. In the wake of the 2008 financial crisis, private equity firms that had used high levels of leverage to acquire companies were particularly vulnerable to market downturns, as they struggled to meet their debt obligations. As a result, many private equity-backed companies faced financial distress and bankruptcy. Some private equity firms have since reduced their use of leverage or pursued investments with less leverage to manage these risks.

Despite the risks of private equity ownership during turbulent periods, private equity firms can also play a role in helping companies weather economic crises. By providing capital and expertise, private equity firms can help struggling companies restructure their operations, reduce costs, and improve profitability (Cohn, Hotchkiss, & Towery, 2022). Bernstein, Lerner, and Mezzanotti (2019) in their research explore if and how private equity contributes to financial fragility during economic crises. Their analysis is focused on the Global Financial Crisis and finds that during the 2008 crisis, companies backed by private equity reduced their investments less than their non-PE-backed peers, and also saw higher inflows of equity and debt, increased asset growth, and greater market share. These effects were particularly significant for financially constrained companies and those with private equity investors who had greater resources at the beginning of the crisis.

Motivated by the ongoing discussion on the private equity firm role during crisis times and the results obtained by Bernstein, Lerner, and Mezzanotti (2019) we aim to analyze the private equity firm effect on companies during the recent

COVID-19 crisis. Our research is focused specifically on the Swedish market and compares PE-backed (target group) and non-PE-backed (control group) companies' performance during the pre-pandemic years from 2018 throughout the pandemic until 2021. The presence of comprehensive financial data on private companies in the Swedish market creates a favorable setting for us to bring this discussion further in new dimensions. There is a vast amount of research completed on the private equity firm impact on company performance worldwide and several such as Bernstein, Lerner, and Mezzanotti (2019) that focuses on crisis periods. With our research focused specifically on the COVID-19 crisis period we aim to contribute to the existing literature on the Swedish economy and private equity industry and further extend the existing research on PE-backed company performance during both normal times and crisis impact on company performance.

1.2. Private equity value creation

Before delving into the interpretation of our collected data and research findings, it is of great importance to underscore the significance of the private equity industry presented and thoroughly discussed in prior literature. The private equity firms have demonstrated their capacity to add value to their portfolio companies in different dimensions, many of which have surfaced as potential value drivers in our investigation. The articulation of these points is fundamental to our ensuing analysis which is why we aim to discuss both the value creation aspects of private equity ownership and later the possible risks that might come along with it.

An extensive range of research has analyzed the effects of private equity ownership in the form of productivity and efficiency increase in firms, specific industry growth where private equity firms are especially active and many other similar impact dimensions. Bernstein, Lerner, Sorensen, and Stromberg (2016) in their research explore the impact of PE on industry performance across nations and industries. They try to investigate the conflicting views of the impact of PE investments on aggregate growth and cyclicality by examining the relationship between the presence of PE investments and the growth rates of total production, employment, and capital formation across 20 industries in 26 major nations between 1991 and 2009. They found that industries where PE funds have invested in the past five years have grown more quickly additionally suggesting that the results are at least partly driven by spillover effects from PE-backed firms to other firms in the industry.

Several other researchers, on the other hand, specifically explore the many ways how private equity firms create value for their acquired companies and analyse different performance metrics of the private equity-backed companies in order to understand the effects of private equity ownership. Cohn, Hotchkiss, and Towery (2022), for example, focus their research on sources of value creation in private equity buyouts of private firms. They find that private equity-owned firms grow rapidly post-buyout, especially those undertaking add-on acquisitions, and profitability increases for both profitable and unprofitable targets. In the research, they also show that PE acquirers disproportionately target private firms

with weak operating profitability and those that have growth potential but are highly levered and dependent on external financing. One of the value levers that Cohn, Hotchkiss, and Towery (2022) find in their research results is the way how private equity acquirees create value by relaxing financing constraints for firms with strong investment opportunities and improving the performance of weak firms. Even though financial engineering could play a role in the increased performance results, for example as discussed in the research by Johnson, Ryan, and Tian (2009), the evidence obtained by Cohn, Hotchkiss, and Towery (2022) suggests the contrary. Notably, our obtained results possibly indicate a similar finding relating to the private equity ownership's role in helping their companies in securing financing which will later be elaborated upon.

Another study completed by Sraer and Thesmar (2011) gives insights into additional findings that play a meaningful role in our analysis relating to PE-backed company financing and investment policy decisions. Sraer and Thesmar (2011) in their analysis discuss the change in corporate behavior following a leveraged buyout (LBO) completed by a private equity firm relative to an adequately chosen control group by using a data set of 839 French deals. They found in their research that in the three years following a leveraged buyout, private equity-backed companies become more profitable, grow much faster than their peer group, issue additional debt, and increase capital expenditures. Similarly, to Cohn, Hotchkiss, and Towery's (2022) findings, their results also indicate that private equity funds create value by relaxing credit constraints, allowing LBO targets to take advantage of unexploited growth opportunities.

Somewhat contrary research is introduced by Kaplan (1989), which more closely looks at the effects of specifically management buyouts on companies' operating performance and value. By analyzing a sample of management buyouts of public companies completed between 1980 and 1986 he finds that in the three years after the buyout, these companies experience increases in operating income (before depreciation), however, saw decreases in capital expenditures, and increases in net cash flow.

Additional research looks at the effects of private equity buyouts on specific industries, such as manufacturing and the restaurant industry. Lichtenberg and Siegel (1990) chose to investigate the effect of LBOs on plant operating performance (total factor productivity (TFP) and related variables). The research shows that LBOs (particularly MBOs) that occurred during 1983-1986 had a strong positive effect on TFP in the first three post-buyout years. Plant productivity increased from 2.0% above the industry mean in the three pre-buyout years to 8.3% above the industry mean in the three post-buyout years. The restaurant industry also seems to experience operational improvements after a private equity buyout. Bernstein and Sheen (2016) explore the operational consequences of private equity buyouts in the restaurant industry, and they find that store-level operational practices improve after private equity buyout, as restaurants become cleaner, safer, and better maintained. Their research also indicates that these improvements are particularly apparent when private equity partners have prior industry experience. Therefore, industry expertise is another value lever identified which helps private equity firms improve firm operations. In our research even though one of the operating performance metrics EBITDA

over revenue turned out to be not a significant result the evidence provided by Lichtenberg and Siegel (1990) and Bernstein and Sheen (2016) in their analysis shows us the contrary and adds to the many value creation aspects of private equity ownership.

In summary, a large amount of prior research including the ones discussed above have explored the different value levers a private equity firm ownership can deliver to their portfolio companies, several of which we have indicated in our analysis. Next, we want to consider the possible risks that the companies and thus the economy at large might face as a result of private equity ownership.

1.3. Private equity potential threat

Despite the potential benefits of private equity during stable economic conditions, there is a significant issue regarding its potential to worsen economic downturns. Private equity has demonstrated a strong correlation with economic cycles and equity valuations, which has resulted in significant fluctuations in transaction volume. Additionally, deals executed at market peaks appear to exhibit significant variations compared to those made in other timeframes. Kaplan and Stein (1993) in their research explore the changes in the pricing and financial structure of large management buyouts in the 1980s. Notably, they find that market "overheating" results in higher valuations, transactions in riskier industries, higher leverage, and weaker alignment among key stakeholders. Blundell-Wignall (2007) in his analysis supports the trend of transactions increasingly happening in riskier industries. He writes that deals in Europe are spreading to industries such as airlines that are inherently more cyclical and exposed to risk factors (e.g., oil prices and terrorism). He also emphasizes that as the cycle continues to mature, making LBOs work gets increasingly tougher, therefore leverage becomes more risky.

Moreover, in another study, Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014) attempt to test the claims made by private equity critics that leveraged buyouts bring major job losses and few gains in operating performance. With a dataset covering US buyouts from 1980 to 2005 tracking target firms before and after acquisition, they found, among many other findings, that the results support the view that private equity buyouts lead to greater job loss at establishments operated by target firms as of the buyout year. However, tracking each firm’s constituent establishments, they found that target firms create new jobs in newly opened establishments at a faster pace than control firms. Even though we have decided not to focus on the private equity ownership effect on job loss or creation it is important to outline the different perspectives discussed in prior literature.

1.4. Private equity industry in Sweden

The Swedish private equity market is undoubtedly among the largest private equity markets globally and plays an instrumental role in the country's economic landscape, contributing significantly to investment, growth, and job creation. As a hub of innovation and entrepreneurial activity, Sweden has proven

to be an attractive destination for private equity investment, with a well-established ecosystem that supports business development and growth. The private equity sector in Sweden not only fuels the expansion of established companies but also fosters the emergence of start-ups, facilitating their transition to global competitors. This market's importance extends beyond immediate economic contributions, as it influences the broader Swedish economic structure and competitiveness on an international scale. Therefore, we think it is important to understand not only the importance of the Swedish private equity market but also its performance during our focus period, the COVID-19 crisis.

The Swedish private equity industry is globally recognized as a key player in the PE sector. Swedish PE firms manage substantial amounts of capital and have a strong international focus, with investments going to companies located outside of Sweden. The country's PE industry includes some of the largest and most active firms in Europe, which have created a competence cluster in the PE sector in Stockholm. When compared to the size of the country's economy, Sweden has the second-highest amount of PE funds raised in the European Union, with only Luxembourg having raised more according to SVCA (2022) report. In the pre-pandemic period, the higher-than-average amount of capital managed by Swedish PE firms is evidence of this trend, with an average of approximately EUR 730 million in 2019 according to SVCA (2019) report. This figure surpasses that of many other European countries, including Germany, the Netherlands, and even the UK. Moreover, the PE industry in Sweden boasts some of the biggest and busiest PE firms in Europe, primarily because of the extensive experience of prominent Swedish firms like EQT, Nordic Capital, Altor and FSN. These firms have established a hub of expertise in the PE sector in Stockholm. According to SVCA's (2020) report, over the last decade PE investments totalling more than SEK 240 billion have been provided to nearly 3,000 Swedish companies. If we consider the combined direct and indirect effects of PE investments and the influence of venture capital, SVCA (2020) report shows that since 2007, these investments in Swedish companies have contributed to an increase in the country's GDP by SEK 230 billion. This amount is roughly equivalent to nearly 5% of the GDP.

When considering the private equity market performance in Europe as a whole, despite the ongoing impact of the COVID-19 pandemic in 2021, including the reintroduction of lockdowns and restrictions, private equity and venture capital firms remained highly active, achieving unprecedented levels of investment and fundraising. According to Invest Europe (2021) research the amount of fundraising in Europe in 2021 reached an all-time high of €118 billion, which is a 7% increase from the previous year's figure. Additionally, in 2021, the total equity investment in European companies reached a level of €138 billion, which is a significant increase of 51% compared to the total of €91 billion recorded in 2020. A total of 8,895 companies received these investments, which is 13% higher than the average recorded in the previous five years.

When looking specifically at the Swedish private equity industry during the pandemic, SVCA's (2021) report shows an increase in funds raised from 50 billion in 2019 to 70 billion SEK in 2020. Year 2021 has been particularly strong with SEK 185 billion raised by funds which is an increase of 166% in 2021

compared to 2020 and the largest fundraising to date. During the initial stages of the pandemic in 2020, the Swedish private equity market, like many other markets in Europe, faced uncertainties and volatility due to the global economic downturn. However, the Swedish private equity market began to recover as the pandemic progressed, driven by various factors such as government support packages (White & Case LLP, 2020), low-interest rates, and overall resilience in the Nordic region's economy.

In summary, the Swedish private equity market has demonstrated its robustness and adaptability in the face of unprecedented challenges brought about by the COVID-19 pandemic. Despite initial uncertainties and disruptions, the sector has not only recovered but also thrived, achieving record-breaking fundraising and investment levels. Its significance as a pivotal player in Sweden's economic landscape, and its influence on a global scale, cannot be overstated and is the motivation behind our belief that it is meaningful to further extend the existing research focusing on Sweden and its private equity industry.

1.5. Sweden during COVID-19 crisis

In this section, we want to briefly discuss the Swedish economy during the COVID-19 crisis period and the several important initiatives that the Swedish government implemented in its efforts to reduce the severity of the COVID-19 crisis impact on Swedish businesses that in some ways impact our research findings later discussed.

According to OECD (2022) data, the Swedish economy's GDP dropped about 8% in the second quarter of 2020 and around 3% in 2020 due to several restrictions introduced related to gathering, reduced mobility, as well as plant closures. The many initiatives the government implemented in order to reduce the severity of the pandemic crisis accounted for almost 29% of the yearly GDP, inclusive of loans and guarantees. These efforts comprised 8.5% of GDP in fiscal measures during the 2020-21 period (OECD, 2021). Some of those support programs for Swedish businesses included an increased short-time work scheme subsidy. The subsidy, with a level during normal times of 33%, was set to 75% for 2020 and the first quarter of 2021 and 50% for the second quarter of 2021. The maximum working hour cut, normally 60%, was increased to 80% during May-July 2020 and January-September 2021 meaning that with a 60% (80%) reduction in working time, employees receive 92.5% (88%) of their wages and the employer’s wage costs are reduced by 53% (72%). The new initiative also implies that from January 2021, employers are eligible for financial support covering 60% of the cost of initiatives to develop or validate the competencies of employees on reduced working hours (OECD, 2021). Another government support initiative was reorientation support. According to OECD (2021) report this initiative implies that between March 2020 and January 2021, businesses having lost a sizeable share of their turnover (between 30% and 50% depending on the period of the year) were eligible for reimbursement of a share of their fixed costs, up to 70% (with exceptions), subject to ceilings. On 20 January 2021, the government announced that during the period of business closures imposed by the Pandemic Act (which started on 10 January 2021), businesses are entitled to receive

compensation for up to 100% of fixed costs, up to a maximum of SEK 75 million (EUR 7.4 million) per business and month. Additional government support included reduced employer social contributions from March to June 2020 with only old-age pension contributions payable, for up to 30 persons per company and up to a monthly salary of SEK 25 000 (EUR 2 470), providing monthly relief of up to SEK 5 300 (EUR 525) per employee.

Besides the government support, there were several notable measures (among many others) taken by the financial authorities during the crisis. The central bank (Riksbank) introduced a programme for corporate lending via banks that entailed that the Riksbank is providing long-term loans of up to SEK 500 billion at the repo rate, under certain conditions, against collateral to banks to stimulate onward lending to Swedish non-financial companies. Additionally, the Riksbank enhanced access to liquidity by offering banks the opportunity to borrow at the repo rate an unlimited amount on a weekly basis against collateral at three- and six-month maturity. The Riksbank also reduced the overnight lending rate to banks from +0.75% prior to the pandemic to a repo rate of + 0.10% (OECD, 2021).

In conclusion, the Swedish economy and its businesses faced significant challenges during the COVID-19 crisis. However, the swift and substantial response by the Swedish government and financial authorities, encompassing a range of fiscal measures and support programs, played a critical role in mitigating the pandemic's impact. The analysis of these government responses provides valuable insights for understanding the resilience of the Swedish economy in the face of global crises and highlights the vital role of government support in safeguarding businesses and stimulating economic recovery. Several of the discussed government initiatives are crucial to understand in order to better interpret our obtained results which we will elaborate on later in our research.

1.6. COVID-19 crisis compared to the Global Financial Crisis

Before discussing our research results, we want to briefly discuss why the COVID-19 crisis is particularly different from the other crisis in the past, especially the Global Financial Crisis as the implications are important to understand the context of our results. The COVID-19 crisis and the Global Financial Crisis of 2008 share similarities in that both had severe impacts on the global economy, but they have major differences in their causes, consequences, and policy responses. While the GFC originated from financial market vulnerabilities and the collapse of the housing market, the COVID-19 crisis stemmed from a global pandemic that led to widespread economic disruptions.

When compared to the Global Financial Crisis, COVID-19 crisis had a more abrupt and severe impact on the European economy due to entirely new factors companies had to face, such as widespread lockdowns and social distancing measures, which caused a sharp decline in economic activity. According to Anabela M. Santos, Karel Haegeman, Pietro Moncada-Paternò-Castello, (2021) during the 2008 economic crisis, European firms identified access to financing and customer acquisition as the primary obstacles to business activity. However, in 2020, the initial year of the COVID-19 crisis, access to

financing was deemed a less significant issue due to many new COVID-19-specific factors, such as lockdowns, travel restrictions, border closures, and disruptions in production and global supply chains, as well as logistical bottlenecks. Therefore, in the beginning of the COVID-19 crisis, the second most critical issue for EU firms was to attract new customers while facing demand as well as supply shocks at the same time.

The nature of this crisis required more direct fiscal support, leading to unprecedented stimulus packages from European governments to protect businesses, employment, and incomes. The ECB also introduced the Pandemic Emergency Purchase Programme (PEPP) to support the economy through asset purchases (European Central Bank, 2020). OECD (2020) report on the tax and fiscal policy response to the Coronavirus Crisis finds that most OECD member countries have introduced similar lending programs (such as tax filing extensions, tax payment deferrals, more flexible tax debt repayments, enhanced tax refunds, enhanced loss offset provisions etc.) as discussed in the analysis of Brown, Martinsson, and Thomann (2021). Ungku's (2022) article noted that Sweden re-launched the Global Financial Crisis lending program in 2020 nearly identical to the one introduced in 2009 but with a broader set of taxes eligible for deferral, such as VAT.

On the other hand, the GFC in Europe was characterized by a banking crisis, sovereign debt issues, and a prolonged recession, particularly affecting countries like Greece, Spain, and Ireland. These countries experienced high levels of public debt, which led to austerity measures, high unemployment, and social unrest. The European Central Bank and other central banks implemented monetary policies, such as low-interest rates and quantitative easing, to stabilize financial markets and facilitate economic recovery (European Central Bank, 2018). According to an article written by Fathin Ungku (2022) and research done by Brown, Martinsson, and Thomann (2021) the Global Financial Crisis had a severe effect on the Swedish economy. Even though the Swedish government had introduced several support initiatives in order to lower the negative effects of the crisis as previously discussed, it was concerned that the financial crisis had spilled over to the real economy, constraining liquidity in otherwise healthy firms. Their analysis found that during the peak of the Global Financial Crisis in April 2009, more than 15% of Swedish firms reported a “considerably harder than normal” access to finance and more than half of the respondents said it was harder than usual to access normal bank loans. In order to improve the situation, the Swedish government introduced a program which allowed firms to postpone paying all labor-related taxes and fees typically due at the end of each month. Such payments included withheld personal income taxes, fees to cover employees’ social security, government-provided healthcare insurance and workers’ compensation. These payments were considered as a loan from the government that came with a non-trivial interest rate at about 5.3% a year and the maximum amount loaned amounted to approximately 9% of the firm’s annual total annual wage bill. Worth noting that by focusing on a company's employment taxes, businesses could obtain liquidity from the policy regardless of their profitability. Brown, Martinsson, and Thomann (2021) found that only around 6% of Swedish companies took part in the government’s support program with manufacturing and service firms being the most active ones. All the firms that participated in the

program mostly shared common characteristics of being younger, generated less internal cash flow, had lower cash buffers, had already used up a larger fraction of their granted credit line and had high debt-to-asset ratios on the Global Financial Crisis horizon. To a surprise, the results of the analysis showed that the newly issued loan by the government in most cases was used to increase the firm's investment level instead of paying down the existing debt thus further increasing the already large leverage level.

In summary, distinguishing the unique features of the COVID-19 crisis from the Global Financial Crisis is of paramount importance. The pandemic-induced economic disruption necessitated different business strategies and policy responses, with a shift in focus from access to financing to customer acquisition under unexpected supply and demand shock circumstances. The fiscal support extended during this period was unprecedented and instrumental in mitigating the crisis's impact. Recognizing these disparities not only contextualizes our research findings but also helps to further extend the existing literature on company performance during economic turmoils.

1.7. Overview of the main results

In our research, we focused on a sample of 99 Swedish companies that underwent a leveraged buyout before the pandemic in 2020 and for which we have financial data. We compared the financial performance and investment decisions of 99 PE-backed companies in the target group with 218 comparable peer companies in the control group using the difference-in-difference (DiD) model. The control group companies were selected from the same industry as the PE-backed firms and had comparable size, profitability, and leverage in 2019. The control group follows a similar pre-pandemic trend as the target firms, meeting the requirements of the DiD model which allows us to study the difference between the two group companies' performance.

We based our paper on research done by Bernstein, Lerner, and Mezzanotti (2019) where they instead focused on the difference between PE and non-PE-backed company performance during the 2008 Global Financial Crisis. Their results indicate that during the 2008 crisis, PE-backed companies decreased investments less than their peers did and experienced greater equity and debt inflows, higher asset growth, and increased market share, with effects being especially strong among financially constrained companies and those whose PE investors had more resources in the beginning of the crisis. By using a similar research approach used in Bernstein, Lerner, and Mezzanotti's (2019) paper, we aimed to extend their analysis by trying to understand if there is a significant difference in the trend of PE-backed company performance and investments compared to the control group during the pandemic years.

The main results show that investments over assets for PE-backed companies increased during the pandemic years when compared to the control group over the same period. The coefficient of the variable is significant and creates around 5.3% increase in the investments over assets compared to the control group. Net equity contribution over assets could provide insight into the heightened investments observed in PE-backed companies. Amid COVID-19

pandemic net equity contribution over assets was approximately 5.4% larger for the target group when compared to the control group companies and it was strongly statistically significant. Next, the findings indicate that private equity-backed companies exhibit a larger coefficient for net debt issuance over assets when compared to the control group. This observed difference is both statistically significant and equates to a roughly 3.9% increase for the target group in comparison to the control group during the pandemic period. Similarly, the debt over assets ratio increased around 3.5% more for PE-backed companies and is also statistically significant. The interest rate on debt resulted in around 1.1% increase for the target group during the pandemic years compared to the control group, however, the results were not statistically significant.

We also analyzed operational performance variables for companies during the pandemic years. Asset turnover decreased for the PE-backed companies during the COVID-19 crisis period which is in line with the obtained results of increased investments over assets. The asset turnover decrease is statistically significant, and it amounts to around 16.7%. We then find that asset growth for PE-backed companies has a statistically significant result of approximately 26.8% increase over the control group during the pandemic years. That helps to explain the decrease in asset turnover for the target group companies. EBITDA over revenue, however, did not result in a statistically significant difference between the target and the control groups.

In summary, our research results provide evidence that private equity ownership possibly helps companies to relax financial constraints during the COVID-19 pandemic crisis by providing necessary capital injections and help companies to maintain a desired investment level. Our analysis contributes to the existing research on private equity firms' effect on companies' financial performance post-buyouts in normal times and during crisis periods.

2. Data

2.1. Sample construction

To analyze the performance of PE-backed and non-PE-backed companies during the crisis, we use four different databases: Mergermarket, Capital IQ, Retriever, and Serrano.

We start the data collection process by obtaining information from Mergermarket regarding Swedish companies that have received backing PE groups prior to the onset of the COVID-19 pandemic. To ensure the accuracy of the data, we conducted a search for private equity deals with a target geography in Sweden, buyer sector in "Venture Capital / Private Equity", and completion date between 01/03/2010 and 01/03/2020. Our search criteria exclude investments made by venture capital, investment funds, and family office firms. We specifically focus on companies that meet the following criteria: (1) headquartered in Sweden at the time of the deal, (2) received a PE investment by 01/03/2020, and (3) did not experience an exit by the PE group throughout the

COVID-19 crisis. To determine the status of the transaction, we use CapitalIQ, Mergermarket and Retriever databases to identify corporate events that qualify as exits. These exits can take various forms, including (a) secondary buyouts where only the PE owner changes, (b) sale of the PE-backed firm to a non-PE owner, (c) bankruptcy or financial restructuring, (d) sale to management, or (e) Initial Public Offering (IPO). We did not exclude companies that have undergone acquisition, IPO or other PE exit in 2022 as most companies in dataset have not realized 2022 results and we're not able to use these the data from this year in our analysis. Our search criteria yielded 181 transactions during the defined focus period.

To ensure the accuracy and reliability of our data, we applied additional filters to our sample by retaining only those firms with balance sheet and income statement information in Retriever database. We also associated each company with its respective Swedish organization number, which enabled us to extract financial information from the Serrano database for the period from 2016 to 2021. The Serrano database is particularly useful for our study due to its reliable presentation of data, including a single data entry per calendar year for each field in the database and adjustments made for phenomena such as broken accounting periods and short or long accounting periods. Furthermore, Sweden provides an ideal setting for our study as limited companies are required to file annual reports with Bolagsverket in accordance with current regulations. Unlike previous studies that focused on medium-sized companies, we included smaller firms in our research as Swedish regulations mandate comprehensive financial reporting for these businesses. This approach not only introduces a fresh outlook to the current body of literature but also ensures that our sample remains diverse.

We match the financial data of PE-backed companies with the financial information of Swedish firms from the Serrano database. Our study employs a sample selection procedure that encompasses companies with financial statement data available from the years 2017 to 2021. Consequently, 104 firms were excluded from our sample due to the unavailability of financial data for the specified time frame.

To steer clear of company policies governed by regulation, we opted to exclude companies operating in regulated industries such as Mining and quarrying (05-08), Electricity, gas, steam, and air conditioning supply (35), Financial and insurance activities (64-65), certain segments of Real estate (68, excluding three digit code equal to 683), and Public Administration (84), as classified by the two-digit Swedish Standard Industrial Classification (SNI) code. This approach aligns with the methodology used by Michaely and Roberts (2012) and is a commonly used industry sample selection method in PE literature.

2.2. Empirical strategy

To investigate the influence of the financial crisis on the financial and investment policies of PE-backed companies, a preferred approach would involve comparing two identical companies during the crisis period, with the only difference being the presence or absence of PE backing. However, since such companies do not exist, we employ a difference-in-differences methodology. This

approach entails comparing PE-backed firms to a matched group of control companies during the financial crisis period. We first detail the process of selecting the matched firms before explaining the empirical specification employed. Our methodological approach allows us to examine the effect of PE backing on firms' responses to the financial crisis while controlling for other time-varying factors that may influence the outcomes of interest. It is important to note that our approach does not entirely eliminate the potential impact of unobservable firm characteristics differences between PE-backed and non-PE-backed firms, as discussed in detail later.

2.2.1. Constructing a matched control group

To assess the impact of PE operations, we adopt a matching approach that compares companies that have undergone such transactions to similar firms without PE backing. To identify an appropriate control group, we follow the methodology of Boucly, Sraer, and Thesmar (2011) and Bernstein, Lerner, and Mezzanotti (2019), which involves selecting matching companies that satisfy the following criteria: (1) belong to the same industry (two-digit SNI code) as the PE-backed firm; (2) have total assets within a 40% range of the target firm; (3) have firm leverage within a 50% range of the target firm; and (4) have ROA within a 20% range of the target firm on the onset of the COVID-19 crisis. We faced a tradeoff between matching accuracy and the inclusion of as many control firms as possible when selecting the brackets for total assets, firm leverage, and ROA. As we widened the brackets to allow for a larger pool of control firms, 86 targets were excluded due to the unavailability of a suitable match. If we had reduced the brackets to 30% as done in the method used by Bernstein, Lerner, and Mezzanotti (2019), the number of excluded targets would have increased, leading to a substantial reduction in the sample size.

If this screening returned more than three companies for a certain target company, we calculated the Least Square Distance using the following equation:

$$d^2{}_{ij} = \frac{(ROA_i - ROA_j)^2}{\sigma_{ROA}} + \frac{(Assets_i - Assets_j)^2}{\sigma_{Assets}} + \frac{(Leverage_i - Leverage_j)^2}{\sigma_{Leverage}}$$

We measured the distance between two firms, i and j, using the squared distance metric ($d^2{}_{ij}$). Each accounting metric, such as return on assets (ROA), total assets (Assets), and leverage (Leverage) was subscripted with i and j, respectively. We calculated the sample standard deviation (σ) for all the matched companies for each treatment company. To ensure that each variable contributed equally to the distance measure, we scaled the distance in each dimension by the sample standard deviation of that variable. This approach prevented variables with larger absolute values from having a greater influence on the distance measure than variables with smaller absolute values. We then selected the closest three neighbors to our treatment company. If a company in our treatment sample didn't match any companies using the criteria described above, we excluded it from our data sample.

Overall, this procedure is a more conservative version of the method used by Boucly, Sraer, and Thesmar (2011), since, similarly to Bernstein, Lerner, and Mezzanotti (2019), we added leverage in our matching process, however, we use a wider matching bandwidth than Bernstein, Lerner, and Mezzanotti (2019) to avoid a significant decrease in our sample size. We end up with 99 target PE-backed firms and 218 control firms in the final sample.

For each firm in the final sample, we extracted income and financial information from the Serrano database from 2016 to 2021 and complemented it with data from the Retriever database. To supplement the Serrano data, we followed the method used by Bernstein, Lerner, and Mezzanotti (2019) by including additional measures of firm activity for both control and treatment groups. Specifically, we calculated investments as the change in assets plus reported depreciation, computed equity contributions as the change in equity minus profit for the year, and estimated net debt issuance as the change in total debt. We normalized these calculations by total assets and limited outliers by winsorizing all data at 2%.

2.2.2. Data summary

Table 1 displays the industry distribution of both the PE-backed firms and the matched group in our test sample. The largest proportion of firms in our sample are engaged in wholesale and retail trade (26%), followed by the information and communication (25%) and professional and technical activities (17%) industries. Manufacturing and construction industries also account for a significant portion of the sample, at 11% and 8%, respectively. Notably, the industry distribution of the PE-backed firms is highly similar to that of the control group, which is a result of the matching procedure employed.

In Table 2, we compare the characteristics of firms in the PE group and the matched control group in 2019. The average firm in the sample is a mid-sized firm with around mSEK 250 in revenue. Across the two groups, firms have very similar profitability, asset turnover, ROA, investment, leverage, and equity and debt issuance. The only notable difference is that the control group companies are slightly larger than the PE-backed companies in terms of revenue, however, all differences are insignificant. Based on this matching procedure, it appears that variations between the PE-backed, and control groups are largely eliminated when we examine companies within the same industry that have similar sizes, leverage ratios, and profitability.

As the main method employed in this paper is difference-in-differences analysis, it is important to explore whether the assumption of pre-COVID-19 parallel trends holds. We check whether this assumption holds in the observables by testing the significance of the mean difference in Table 3 for the firm one- and two-year growth trends ending in 2019 for the relevant firm characteristics.

Table 1: Industry distribution

	PE sample		Matched sample		Total	
	N	Share (%)	N	Share (%)	N	Share (%)
Construction	6	6%	19	9%	25	8%
Entertainment & Recreation	3	3%	7	3%	10	3%
Finance & Real Estate	6	6%	10	5%	16	5%
Health & Education	2	2%	4	2%	6	2%
Information & Communication	27	27%	52	24%	79	25%
Manufacturing	11	11%	25	11%	36	11%
Professional & Technical Activities	19	19%	35	16%	54	17%
Transportation & Storage	3	3%	5	2%	8	3%
Wholesale & Retail Trade	22	22%	61	28%	83	26%
Total	99	100%	218	100%	317	100%

This table provides the industry distribution of firms in each group. Columns ”PE sample” represents the distribution of PE-backed firms in our test sample. Column ”Matched sample” represents the distribution of all non-PE-backed firms our test sample.

Table 2: Firms’ characteristics in 2019

	PE sample			Matched sample			
	Mean	Median	SD	Mean	Median	SD	Mean diff.
Revenue	2.66	1.19	3.69	2.40	0.92	3.78	0.26
Asset turnover	1.54	1.48	1.23	1.61	1.40	1.32	-0.07
EBITDA/revenue	0.01	0.06	0.33	0.02	0.09	0.40	-0.01
ROA	0.06	0.03	0.12	0.08	0.06	0.12	-0.02
Investment/assets	0.16	0.13	0.26	0.14	0.11	0.22	0.03
Net equity contribution/assets	-0.02	0.00	0.11	-0.04	0.00	0.12	0.02
Net debt issuance/assets	0.10	0.08	0.21	0.07	0.04	0.18	0.04
Debt/assets	0.67	0.69	0.20	0.64	0.64	0.20	0.03
Interest rate on debt	0.02	0.01	0.03	0.02	0.00	0.03	0.01

Table 2 reports the summary statistics of sample firms in 2019 across treated (PE-backed companies) and nontreated firms (non-PE-backed companies). The last column reports the mean difference across the two groups. Level variables are in hundred-millions SEK. The appendix provides more information about the variable definitions. * denotes significance at the 1% level.

Table 3: Firms' trends in 2019

	PE sample			Matched sample			
	Mean	Median	SD	Mean	Median	SD	Mean diff.
1-year growth							
Revenue	0.15	0.10	0.33	0.16	0.07	0.35	0
Asset turnover	0.00	-0.01	0.26	0.03	0.01	0.26	-0.03
EBITDA/revenue	-0.51	-0.14	1.82	0.01	0.02	1.67	-0.51
ROA	-0.27	-0.16	5.15	0.53	0.04	4.49	-0.8
Investment/assets	0.46	-0.09	2.80	0.64	0.08	2.54	-0.18
Net equity contribution/assets	83.01	0.06	1,369.16	56.69	0.05	1,560.80	26.32
Net debt issuance/assets	1.18	-0.12	5.35	1.60	0.12	5.08	-0.42
Debt/assets	0.04	0.01	0.20	0.02	0.01	0.21	0.02
2-year growth							
Revenue	0.41	0.24	0.66	0.33	0.19	0.63	0.08
Asset turnover	0.07	-0.05	0.54	0.11	0.03	0.51	-0.04
EBITDA/revenue	-0.37	-0.12	1.50	-0.06	0.05	1.74	-0.31
ROA	-0.32	-0.54	4.47	0.65	0.01	5.27	-0.97
Investment/assets	1.78	0.05	6.48	2.05	-0.16	6.77	-0.28
Net equity contribution/assets	358.20	0.93	3,147.12	-713.57	0.07	13,135.58	1071.77
Net debt issuance/assets	1.65	0.21	5.66	1.47	-0.11	5.82	0.19
Debt/assets	0.07	0.01	0.31	0.05	0.01	0.31	0.01

Table 3 reports the 1- and the 2-year growth as a percentage increase in the characteristics in 2019. The last column reports the mean difference across the two groups. The appendix provides more information about the variable definitions. * denotes significance at the 1% level.

The results show that the growth rates between the two groups are not significantly different from zero across all metrics. Figures A.1., A.2., A.3., A.4., A.5., A.6. graphically present similar patterns. In these figures, both PE group and control firms follow similar trends in the years leading to the crisis, which alleviates concerns that PE-backed companies were outperforming the control group before the crisis. As we discuss below, our estimates are consistent with the assumption of parallel trends between treated and control groups during the period leading to the crisis, the main identification assumption in our difference-in-differences design according to Angrist and Pischke (2008).

2.2.3. Empirical strategy

Our research utilizes panel data from 2017-2019 to establish a baseline model, which is then compared to data from the years 2020-2021, during the Covid-19 crisis. The decision to begin our analysis in 2020 was based on the widespread impact of the COVID-19 pandemic on the global economy that year. We define the following equation:

$$y_{it} = \alpha_t + \alpha_i + \beta_1(PE\ firm * CRISIS) + \theta X_{it} + \varepsilon_{it},$$

where y_{it} is an outcome variable measured for company i at time t, (α_t, α_i) is a set of company and year fixed effects, PE firm is a dummy for the companies that are backed by PE investors, and CRISIS is a dummy for the period from 2020 to 2021. We also incorporate a set of firm-specific covariates X_{it} into our model. To account for potential clustering at the firm level, we use the approach of Bertrand, Duflo, and Mullainathan (2004) to cluster standard errors.

To ensure a more causal interpretation of our results, we incorporate firm fixed effects to eliminate time-invariant differences between the treatment and control groups. However, the validity of our findings relies on the parallel trend assumption, which assumes that the behavior of PE-backed companies would have followed a similar trajectory to non-PE-backed companies in the absence of the COVID-19 crisis. We address this assumption by examining pre-shock trends, thereby assessing whether the groups exhibited similar patterns prior to the onset of the crisis. By doing so, we aim to strengthen the robustness of our analysis and provide greater confidence in the causal inference of our results.

First, it is important to acknowledge that our treatment and control groups exhibit considerable similarity in terms of observable characteristics. Both groups have identical industry distributions and display similar levels of profitability, investment, and leverage, as previously discussed. Additionally, the pre-crisis growth rates of both PE and non-PE companies are comparable, as demonstrated in Table 3. To further support the parallel trend assumption, we can formally evaluate the time-varying behavior of the treatment effects for the primary outcomes of our study with the following equation:

$$y_{it} = \alpha_t + \alpha_i + \Sigma\beta_k(PE\ firm) + \theta X_{it} + \varepsilon_{it},$$

where we estimate different values of the parameter βk for each year before the COVID-19 crisis. This allows us to examine the time-varying behavior of the treatment effect and evaluate whether the parameter βk is capturing the causal effect of the crisis on private equity firms or simply a differential trend between the two groups. If the effect of private equity is indeed being correctly captured by βk, we would expect it to be insignificant before the onset of the crisis. In the robustness section, we will present supporting evidence for this argument.

We include two additional measures to further reinforce the analysis. Firstly, to account for the differences in key characteristics among firms before the crisis, we introduce controls for firm size (revenue's logarithm), revenue growth, profitability (ROA), and leverage. To avoid any endogeneity concerns

with controls, we measure these variables in 2019 and then interact them with the Crisis dummy, enabling them to have varying impacts around the shock. These controls also address any concerns regarding any observable imbalances across treatment and control groups before 2020.

Secondly, we add a complete set of time-varying industry fixed effects to test the robustness of the primary results. These fixed effects account for changes in industry demand and other industry considerations around the financial crisis. We specifically interact industry fixed effects with the Crisis dummy.

2.2.4. Limitations of the method

We must recognize a significant limitation in our matching approach and methodology, as PE transactions are not exogenous occurrences. For example, PE funds may be inclined to invest in companies exhibiting distinct qualitative attributes, which could potentially result in a correlation between PE backing and unobservable firm quality. This hidden elevated firm quality may contribute to the increased resilience of these companies during the COVID crisis.

While controlling for pre-crisis characteristics, as done in this study, alleviates this issue to some extent, it is impossible to definitively eliminate all unobservable differences in firms that may have influenced the PE group's decision to acquire a specific company. The observed differences between the two groups that appear precisely on the onset of the crisis are reassuring; however, lacking a reliable source of exogenous variation in the likelihood of deal involvement, our findings may be prone to endogeneity bias. As a result, the results presented in this study should be regarded as descriptive rather than causal.

3. Regression analysis

3.1. Investment and funding

We decided to analyze the private equity firm effect on their backed companies by looking at the change in two types of variables: Investments and performance-based. First, we look at the investment variables. In Column 1 of Table 4, we look at the investment and funding policies' differences for the PE-backed companies and the control group in the pandemic years 2020 and 2021. The results show that during the pandemic period the coefficient of investments made at the PE-backed companies have been larger when compared to the control group. This difference portrayed in the results is statistically significant and amounts to around 5.3%. Bernstein, Lerner, and Mezzanotti (2019) completed a similar analysis, however, their research centered around the 2008 Global Financial Crisis. They find that PE-backed companies decreased investments less than non-PE-backed companies around the crisis period which is similar to our results. Another previously completed study by Sraer and Thesmar (2011) analyzed the change in corporate behavior following a leveraged buyout and

found that three years after becoming PE-owned, companies issued additional debt and increased capital expenditures. Even though we have not specifically analyzed the difference in the level of capital expenditures for the PE-backed and non-PE-backed companies it somewhat supports our results that private equity ownership possibly creates value by helping companies to maintain a desired level of investments. However, research done by Kaplan (1989) finds that three years after a management buyout of public companies they experience a decrease in capital expenditure and an increase in net cash flow which possibly contradicts our result for increased investment level. Important to note that the previously completed research that we are referring to has been completed much earlier in different market conditions and specifically focusing on capital expenditures, not investment level.

Next, we want to understand what might have contributed to the higher investments for the PE-backed companies. Several research papers, such as Cohn, Hotchkiss, and Towery (2022) and Sraer and Thesmar (2011) have provided evidence that private equity firms help their portfolio companies by relaxing financial constraints either by injecting additional capital or securing debt financing from banks thus allowing companies to take advantage of unexploited growth opportunities. Ivashina and Kovner (2011) in their research show that private equity firms tend to have strong relationships with banks which makes it easier for PE-backed companies to secure financing from credit institutions during economic crisis periods. In order to understand the high coefficient of investment level for PE-backed companies during the pandemic compared to the control group we need to look at the differences in both the equity contributions and debt issuance between the target and control group companies. During the pandemic years, the results portray that the coefficient for equity contribution over assets for the target group was larger when compared to the control group of non-PE-backed companies amounting to approximately 5.4% difference between the two groups. This effect in Column 2, Table 4 is not only statistically significant but also large in economic magnitude. Next, the results in Column 3, Table 4 show that the net debt issuance over assets is approximately 3.9% higher for the PE-backed companies than for the control group and the result is statistically significant. Similarly, in Column 4, Table 4 debt over assets is also larger for the target group when compared to the control group. The difference in debt to assets ratio between the two groups amounts to 3.5% and is statistically significant. The obtained results are in line with the prior research findings that indicate that private equity firms support companies with both equity injections and securing debt financing during crisis periods. Next, we try to understand whether the difference in the cost of debt is significant and could have possibly been one of the reasons for the increased debt ratio. In column 5, Table 4, however, we see that the result for the difference in interest rate for the PE-backed and non-PE-backed companies is not statistically significant implying that the cost of debt does not have a notable difference in the pandemic period for PE-backed and non-PE-backed companies.

In conclusion, these findings show that private equity firms do support their portfolio companies in maintaining high investment level by relaxing financial constraints during the pandemic both by providing equity and debt injections.

Table 4: Investment and funding policies

	(1) Investment/assets	(2) Equity contr./assets	(3) Net debt iss./assets	(4) Debt/assets	(5) Interest rate
PE x CRISIS	0.053**	0.054***	0.039*	0.035**	0.011
	(0.049)	(0.001)	(0.076)	(0.014)	(0.441)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585	1,585
Adjusted R-squared	0.134	0.351	0.076	0.749	0.352

Table 4 reports the estimates of a difference-in-differences fixed effects model on the investment and funding variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is investment scaled by assets; in Column 2 the outcome is net equity contribution over assets; in Column 3 the outcome is the net debt issuance scaled by assets; in Columns 4 the outcome is the total leverage; and in Columns 5 the outcome is average interest rate. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

3.2. Operational performance

In the previous section, we learned that the PE-firms have a positive effect on companies' ability to maintain a high investment level. Now, we want to examine whether this effect might also result in increased company operational performance.

In Column 1, Table 5 we can see that the result for the asset turnover coefficient during the pandemic period is negative implying that PE-backed companies experienced a lower asset turnover when compared to their peer group. The result is statistically significant and amounts to a negative 16.7% difference between the two groups. That is in line with the asset growth variable in Column 2, Table 5. The results show that the asset growth coefficient for PE-backed companies during 2020 and 2021 is positive which would possibly explain the lower asset turnover for PE-backed companies. The coefficient for asset growth for PE-backed companies during the COVID-19 crisis was 26.8% higher than for the non-PE-backed companies and it is a statistically significant result. Bernstein, Lerner, and Mezzanotti's (2019) analysis shows similar findings of PE-backed firms' assets growing faster than those of the matched firms.

When looking at the operational performance ratio EBITDA over revenue, our and Bernstein, Lerner, and Mezzanotti's (2019) analysis did not produce a

statistically significant result neither during the pandemic years or during the Global Financial Crisis.

Table 5: Performance analysis

	(1) Asset turnover	(2) Asset growth	(3) EBITDA/revenue
PE x CRISIS	-0.167** (0.013)	0.268* (0.053)	-0.038 (0.184)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.914	0.016	0.710

Table 5 reports the estimates of a difference-in-differences fixed effects model on the performance variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is asset turnover; in Column 2 the outcome is 1-year assets growth; in Column 3 is the total EBITDA scaled by revenue. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

3.4. Heterogeneity

The analysis so far supports the notion that PE can aid in financial turmoil by alleviating the financial constraints encountered by their portfolio companies. To further analyze this hypothesis, we examine the situation of financially constrained firms through several measures that serve as proxies for financing constraints. We focus on the differences across firms in size and leverage.

First, we analyze the impact of PE backing between large and small firms as the effects of financial crisis are passed on to firms through credit contraction, which particularly negatively affects the investment decisions of smaller firms according to Bottero, Lenzu, and Mezzanotti (2015). We determine large firms by identifying those with net sales at the top 20% of the distribution in 2019, which serves as the final year in our pre-shock period, while the remaining firms are classified as small. Based on the results presented in Panel A of Table 6, we observe that the only statistically significant difference between big and small firms is related to the EBITDA/revenue measure. Specifically, we find that the decline in EBITDA/revenue was more pronounced for larger companies, which contrasts with the findings reported in Bottero, Lenzu, and Mezzanotti's (2015) literature. This discrepancy may arise from differences in the crisis's characteristics or the industry distribution of the larger firms in our sample. If big firms were disproportionately concentrated in industries that were particularly vulnerable to supply chain disruptions during the COVID-19 crisis, this would manifest in our results as a larger decrease in EBITDA/revenue for these firms. This is partly mitigated by the inclusion of industry control variables, however,

these findings still offer insightful implications for future research in this area. By way of contrast, EBITDA/revenue developed similarly for all PE-backed companies. Another interesting observation is that the interaction variable of PE with the crisis and size dummy is significant and negative in asset growth. This indicates that the positive effect of private equity on asset growth is stronger among small firms. However, all other operational variables are insignificant, indicating that there is no clear difference between the effect of private equity on small and large firms. According to the results presented in Panel A of Table 7, we observe that there are also no significant variations in the investment and funding of firms between small and large firms.

The second measure we consider for assessing financial constraints is a firm's leverage. In general, companies with high leverage tend to have limited financial leeway and are more susceptible to increased default risks, resulting in a higher debt cost. Consequently, they are more vulnerable during unexpected credit market fluctuations. To determine high leverage firms, we use leverage in 2019 as a benchmark and categorize firms with the top 20% of the highest leverage as high leverage firms. The outcomes presented in Panel B of Table 6 reveal that there are no differences in the operational performance of firms with different leverage levels. Conversely, Panel B of Table 7 discloses that firms with high leverage exhibit significantly lower debt issuance compared to firms with low leverage. Moreover, highly leveraged companies experience a slightly higher net equity contribution during the crisis. However, these variations between highly leveraged firms and firms with low leverage are absent when PE backs the firms during the crisis.

Our findings are somewhat contrary to the results obtained by Bernstein, Lerner, and Mezzanotti (2019), which suggest that the positive effect of PE on investments was stronger among firms that were more likely to be financially constrained. When it comes to firm size being the constraining factor, one difference in our research results could stem from the fact that our sample selection generally includes smaller firms due to the accessibility of financial data for small companies in the Swedish setting compared to the UK setting where Bernstein, Lerner, and Mezzanotti (2019) was conducted. Thus, when defining the dummy variable BIG, we select smaller firms compared to the previous research. However, these differences in our research also provide interesting results for further potential analysis on the impact that PE-backing has on the likelihood of receiving government support. As introduced in section 1.6. of this paper, the firms that participate in government support programs during crisis shared common characteristics of being financially constrained according to Brown, Martinsson, and Thomann (2021). In the face of these findings, it is important to recall that in section 1.6, we delineated the unique nature of the COVID-19 crisis, which necessitated exceptional stimulus packages from European governments and the implementation of the Pandemic Emergency Purchase Programme (PEPP) by the European Central Bank (2020). Consequently, it may be worthwhile to broaden the scope of the investigation and explore the possibility that financially constrained firms and their non-constrained counterparts exhibit no discernible differences, particularly concerning the private equity effect, as these differences may have been mitigated

by substantial government support specifically aimed at financially constrained firms during the COVID-19 pandemic.

Table 6: Heterogeneity across firms' financial constraints

Panel A	(1) Asset turnover	(2) Asset growth	(3) EBITDA/revenue
CRISIS x BIG	-0.003 (0.966)	0.180 (0.229)	-0.055** (0.032)
PE x CRISIS x BIG	-0.234 (0.140)	-0.349* (0.082)	0.052 (0.209)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.915	0.015	0.710
Panel B	(1)	(2)	(3)
CRISIS x High Leverage	0.016 (0.812)	-0.052 (0.802)	0.016 (0.706)
PE x CRISIS x High Leverage	0.006 (0.980)	-0.069 (0.786)	-0.053 (0.544)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.914	0.015	0.710

Table 6 reports results of standard difference-in-difference fixed effects model and repeat the specification of Table 5 in exploring the effect of pandemic and PE on firms with heterogeneous financial constraints in 2019. All specifications include firm, year, and industry fixed effect. Panel A investigates interacted effect with business size. BIG is a dummy variable equal to one of the firm's net sales in the year 2019 is in the top 20% and zero otherwise. Panel B investigates interacted effect with firms' leverage. High Leverage is the dummy variable that describes firms' leverage that will equal one if the firm's leverage is in the top 20%, and zero otherwise. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is asset turnover; in Column 2 the outcome is 1-year assets growth; in Column 3 is the total EBITDA scaled by revenue. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 7: Heterogeneity across firms' financial constraints

Panel A	(1) Investment/assets	(2) Equity contr./assets	(3) Net debt iss./assets	(4) Debt/assets	(5) Interest rate
CRISIS x BIG	0.044	-0.007	0.018	-0.011	-0.033
	(0.197)	(0.706)	(0.459)	(0.554)	(0.501)
PE x CRISIS x BIG	-0.064	0.002	-0.039	-0.030	0.051
	(0.303)	(0.937)	(0.424)	(0.367)	(0.310)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585	1,585
Adjusted R-squared	0.136	0.350	0.075	0.750	0.352
Panel B	(1)	(2)	(3)	(4)	(5)
CRISIS x High Leverage	-0.040	0.020*	-0.080***	-0.001	0.017
	(0.231)	(0.098)	(0.004)	(0.919)	(0.206)
PE x CRISIS x High Leverage	-0.006	0.028	-0.025	0.023	0.007
	(0.934)	(0.494)	(0.671)	(0.463)	(0.725)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585	1,585
Adjusted R-squared	0.136	0.352	0.085	0.749	0.352

Table 7 reports results of standard difference-in-difference fixed effects model and repeat the specification of Table 7 in exploring the effect of pandemic and PE on firms with heterogeneous financial constraints in 2019. All specifications include firm, year, and industry fixed effect. Panel A investigates interacted effect with business size. BIG is a dummy variable equal to one of the firm's net sales in the year 2019 is in the top 20% and zero otherwise. Panel B investigates interacted effect with firms' leverage. High Leverage is the dummy variable that describes firms' leverage that will equal one if the firm's leverage is in the top 20%, and zero otherwise. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is investment scaled by assets; in Column 2 the outcome is net equity contribution over assets; in Column 3 the outcome is the net debt issuance scaled by assets; in Columns 4 the outcome is the total leverage; and in Columns 5 the outcome is average interest rate. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

3.5. Robustness and limitations

The first concern that we address is the possibility that PE-backed companies' and the control group companies' industries may respond differently to concurrent changes in demand during the crisis. In general, this should not be a concern since we matched our PE group with the control group within the same two-digit SNI industries, however, due to the limited availability of control companies, some PE-backed companies were matched with more control companies than others, resulting in slight differences in the industry distribution between the two groups. To address this concern, we included a set of industry fixed effects, which were interacted with the Crisis dummy, to further control for variations in demand and other time-varying industry characteristics, which could be especially relevant during the supply and demand shocks throughout COVID-19 crisis. We have presented the results of these tests in Table A.2. and A.3. Despite the introduction of the fixed effects, our primary results remain consistent. The estimates are similar in size and statistical significance to those reported in the main text.

Next, we test the robustness of our results by using different firm controls to ensure the validity of our findings. In this case, we have previously used size, growth in revenue, ROA, and leverage measured before the crisis in 2019 and interacted with the Crisis dummy as our firm controls. However, we have now incorporated new firm controls to capture the heterogeneity across firms along important characteristics one year before each test year, including lagged one year of firm leverage, lagged one year of log of net sales, and relative one-year net sales growth. After presenting the results in Table A.4.and A.5., we can confirm that our primary findings remain consistent despite the introduction of new firm controls. The estimated effects are of a similar magnitude and level of statistical significance as those reported in the main body of our research. These results indicate that the inclusion of different firm controls has not altered the conclusions drawn from our analysis.

Finally, to the extent possible, we address the concern that firms in the PE-backed group exhibit elevated firm quality that would prevent us from establishing a causal relationship between PE backing during crisis and firm performance. The chosen matching procedure, robust standard errors along with inclusion of control variables and firm fixed effects should to a high degree elevate these concerns. However, we go one step further and examine the differences in the variable development pre-crisis. In tables A.6. and A.7., where the main parameter of interest is the interaction between individual years before the crisis and the PE-backed company dummy variable, we can observe that differences in investment and main operational variables of concern do not appear to be significant. With this, we confirm that the impact of private equity remains insignificant before the pandemic, which strengthens the causal interpretation of our results. At the same time, this only elevates the concern of differences between the two groups in the observable firm characteristics. This leads us to the main limitation of our study and the study done by Bernstein, Lerner, and Mezzanotti (2019) which relates to the allocation of PE backing and unobservable firm characteristics. As previously expounded upon in the discourse concerning the constraints of our empirical approach, we recognize that PE transactions are

not exogenous occurrences. Companies backed by PE might be chosen on the basis of distinct qualitative characteristics, leading to correlation between PE backing and unobservable firm quality differences. This could impede our ability to establish a causal inference regarding the effects of PE backing and the firm financial performance during the crisis. To further explore the possible differences in the unobservable firm characteristics, a possible next step would be to conduct a thorough qualitative analysis of the firms in the PE-backed group and the practices of PE general managers. This analysis could involve surveys or interviews with PE general managers, as well as consultations with industry experts, to identify any significant differences in the unobservable characteristics of these firms and possible managerial and funding decisions during the crisis that could have led to the positive differences in funding and operational metrics between the PE-backed and non-PE-backed groups.

3.6. Conclusion

In this paper, we examined how PE-backed companies' financial performance, investments and funding policies differed during the COVID-19 crisis when compared to a control group of non-PE-backed companies. Understanding the impact of private equity on firms during crisis periods, and specifically during the COVID-19 crisis, is critical for several reasons. The unprecedented nature of the pandemic and its ripple effects throughout the global economy have put to test the resilience of PE-backed firms. Therefore, the performance of these firms during this period can offer valuable insights into the role of private equity in crisis management, the effectiveness of their strategies, and their potential to foster economic recovery.

Our analysis reveals that throughout the turbulent years of 2020 and 2021, companies backed by private equity were able to sustain elevated investment levels, asset growth, and lower asset turnover when benchmarked against a control group of non-PE-backed companies. Similarly, the issuance of debt and equity infusions were also noticeably higher among PE-backed firms, reinforcing the perspective that private equity ownership plays a pivotal role in mitigating financing constraints. Interestingly, despite the contrasting nature of the COVID-19 crisis and the 2008 financial crisis, marked by unique challenges such as government-imposed distancing measures during the former, our findings remain consistent with those of Bernstein, Lerner, and Mezzanotti's 2019 study on the 2008 crisis. This congruity underscores the resilience and adaptability inherent in private equity-backed firms across varied crisis environments.

Our main objective of this research was to understand whether private equity ownership increased the fragility of the economy during this pandemic period or helped companies to get through the economic turmoil of the pandemic as found by the research conducted by Bernstein, Lerner, and Mezzanotti (2019) thus further extending the scope of their analysis. Additionally, our aim was to contribute with our research result implications to the existing literature on the Swedish private equity market both during normal times and in crisis periods.

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Appendix

Table A.1.: Variable definitions

Variable	Definition
Investment / assets (t)	(Total Asset(t) - Total Asset(t-1)+Depreciation(t)) / Avg Total Asset(t)
Net debt issuance / assets (t)	(Total Liability(t) - Total Liability(t-1)) / Avg Total Asset(t)
Equity contribution / assets (t)	(Total Equity(t)-Total Equity(t-1)-Net profit(t)) /Avg Total Asset(t)
Firm leverage (t) or Debt/assets (t)	Total Liability(t) / Total Asset(t)
ROA(t)	Net Profit(t) / Avg Total Asset(t)
EBITDA/revenue (t)	(Operating Profit(t)+Depreciation(t))/Net Sales(t)
Asset turnover (t)	Net Sales / Total Asset (t)
Asset growth (t)	(Total Asset(t)-Total Asset(t-1))/Total Asset(t-1)
Log of revenue	Ln(Net Sales(t))
Growth in revenue	(Net Sales(t)-Net Sales(t-1))/Net Sales(t-1)
Lagged one year of firm leverage (t)	Lag(Total Liability(t) / Total Asset(t))
Lagged one year of log of revenue (t)	Lag(Ln(Net Sales(t)))
Relative one year revenue growth (t)	Ln(Net Sales(t))- Ln(Net Sales(t-1))
Avg total assets (t)	(Total Asset(t) + Total Asset(t-1))/2

(t) represents year when the variable of interest is measured

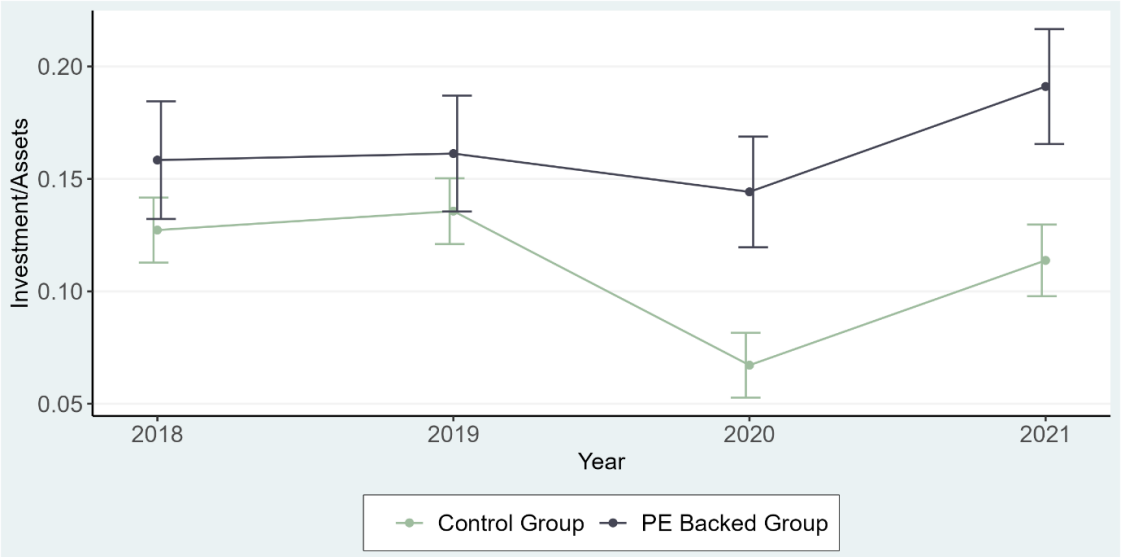

Figure A.1.: Average investments over time

This figure illustrates the change in the variable 'average investments' for PE-backed and non PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

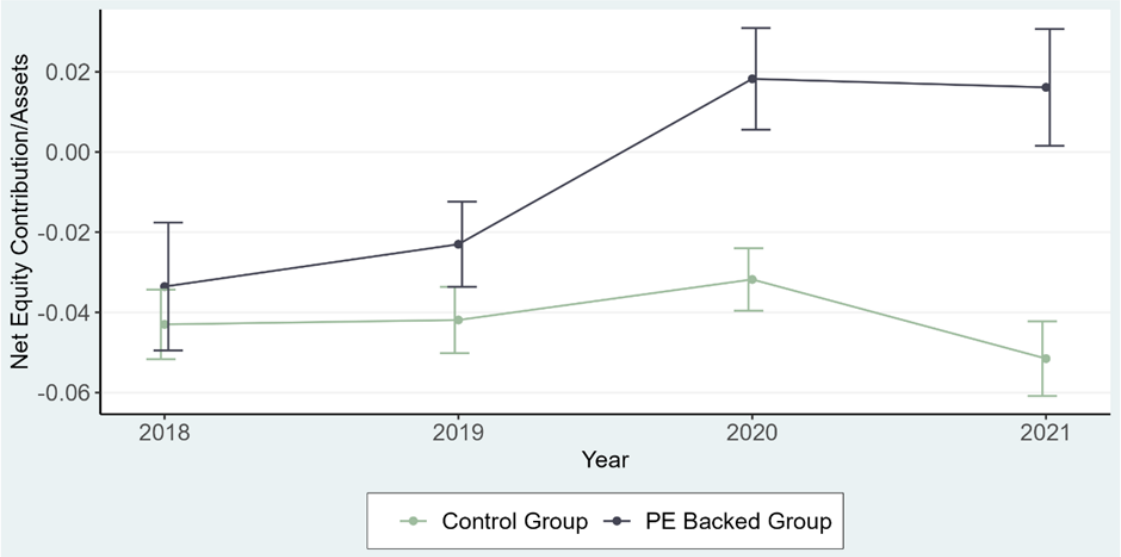

Figure A.2.: Average net equity contribution over time

This figure illustrates the change in the variable 'net equity contribution' for PE-backed and non-PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

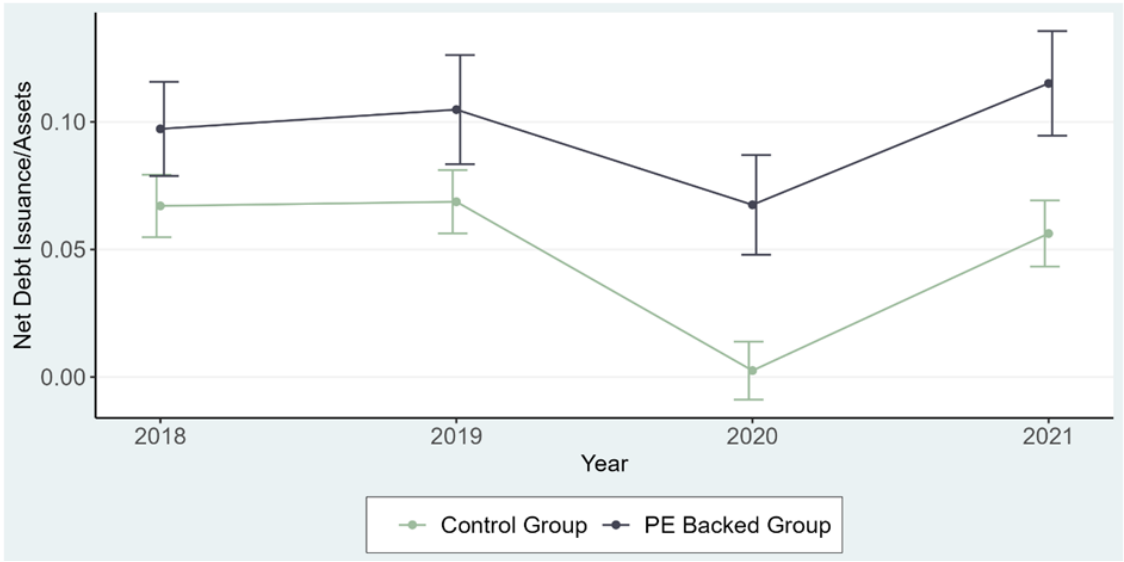

Figure A.3.: Average net debt issuance over time

This figure illustrates the change in the variable 'net debt issuance' for PE-backed and non-PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

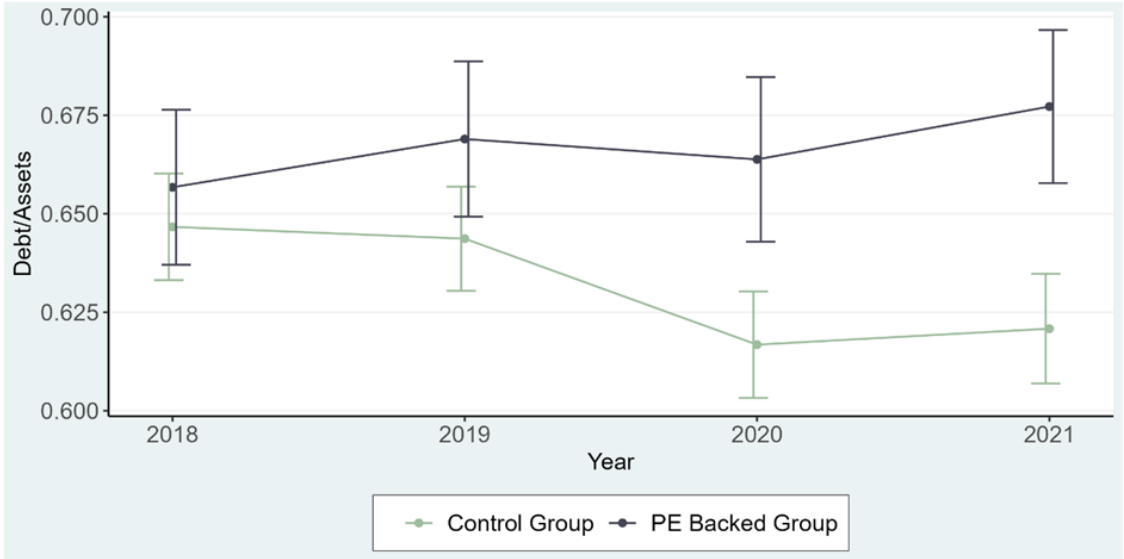

Figure A.4.: Average leverage over time

This figure illustrates the change in the variable 'leverage' for PE-backed and non-PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

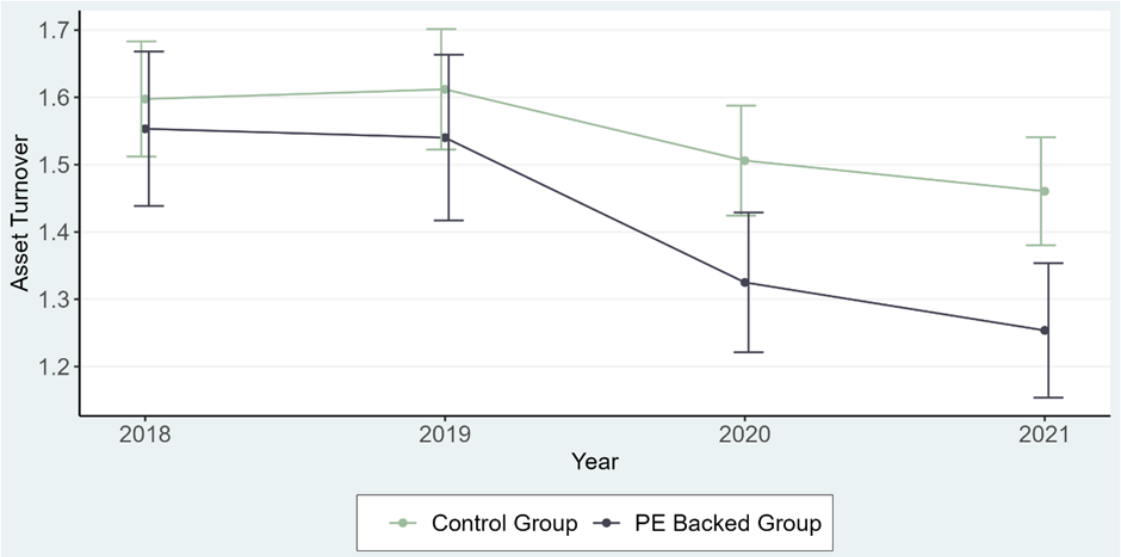

Figure A.5.: Average asset turnover over time

This figure illustrates the change in the variable 'asset turnover' for PE-backed and non-PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

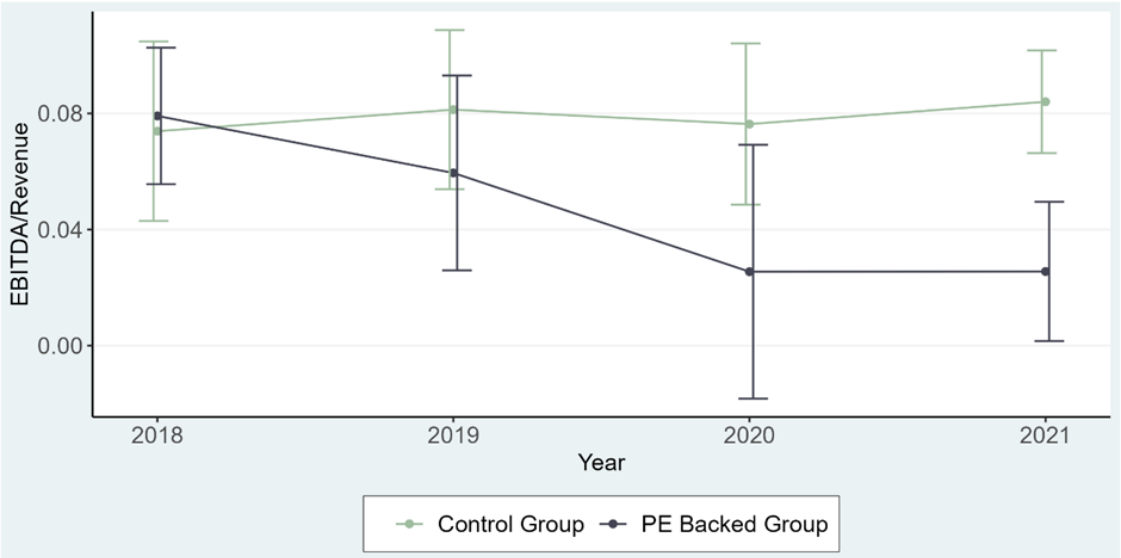

Figure A.6.: Average profitability over time

This figure illustrates the change in the variable 'EBITDA/revenue' for PE-backed and non-PE-backed companies for the time period between 2018 and 2021. Standard errors are plotted at group level.

Table A.2.: Robustness adding time-varying industry fixed effects

	(1) Asset turnover	(2) Asset growth	(3) EBITDA/revenue
PE x CRISIS	-0.166** (0.012)	0.273* (0.057)	-0.044 (0.139)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.916	0.013	0.715

Table A.2. reports a robustness test, where we estimate the standard difference-in-differences fixed effects model on various outcomes adding set of fixed effects generated as the product of industry and the Crisis dummy. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is asset turnover; in Column 2 the outcome is 1-year assets growth; in Column 3 is the total EBITDA scaled by revenue. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A.3.: Robustness adding time-varying industry fixed effects

	(1) Investment/assets	(2) Equity contr./assets	(3) Net debt iss./assets	(4) Debt/assets	(5) Interest rate
PE x CRISIS	0.053* (0.051)	0.054*** (0.001)	0.040* (0.069)	0.034* (0.022)	0.014 (0.392)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585	1,585
Adjusted R-squared	0.137	0.350	0.081	0.750	0.367

Table A.3. reports a robustness test, where we estimate the standard difference-in-differences fixed effects model on various outcomes adding set of fixed effects generated as the product of industry and the Crisis dummy. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is investment scaled by assets; in Column 2 the outcome is net equity contribution over assets; in Column 3 the outcome is the net debt issuance scaled by assets; in Columns 4 the outcome is the total leverage; and in Columns 5 the outcome is average interest rate. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A.4.: Robustness adding different firm-level controls

	(1) Asset turnover	(2) Asset growth	(3) EBITDA/revenue
PE x CRISIS	-0.179*** (0.007)	0.284* (0.082)	-0.041 (0.155)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.915	0.239	0.716

Table A.4. reports the estimates of a difference-in-differences fixed effects model on the performance variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis. These control variables include lagged one year of firm leverage, lagged one year of log of net sales, and relative one-year net sales growth. In Column 1 the outcome is asset turnover; in Column 2 the outcome is 1-year assets growth; in Column 3 is the total EBITDA scaled by revenue. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A.5.: Robustness adding different firm-level controls

	(1) Investment/assets	(2) Equity contr./assets	(3) Net debt iss./assets	(4) Debt/assets
PE x CRISIS	0.061* (0.019)	0.049*** (0.001)	0.056*** (0.009)	0.030** (0.015)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585
Adjusted R-squared	0.137	0.350	0.081	0.750

Table A.5. reports the estimates of a difference-in-differences fixed effects model on the performance variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the Crisis dummy and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis. These control variables include lagged one year of firm leverage, lagged one year of log of net sales, and relative one-year net sales growth. In Column 1 the outcome is investment scaled by assets; in Column 2 the outcome is net equity contribution over assets; in Column 3 the outcome is the net debt issuance scaled by assets; in Columns 4 the outcome is the total leverage. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A.6.: Investment and funding policies pre-crisis

	(1) Investment/assets	(2) Equity contr./assets	(3) Net debt iss./assets	(4) Debt/assets	(5) Interest rate
PE x 2018	0.015	0.022	0.029	-0.003	-0.0005
	(0.699)	(0.291)	(0.307)	(0.806)	(0.980)
PE x 2019	0.009	0.032	0.035	0.012	0.026
	(0.809)	(0.112)	(0.256)	(0.520)	(0.437)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes
Observations	1,585	1,585	1,585	1,585	1,585
Adjusted R-squared	0.134	0.351	0.075	0.749	0.352

Table A.6. reports the estimates from a time-varying fixed effects model the investment and funding variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the year and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is investment scaled by assets; in Column 2 the outcome is net equity contribution over assets; in Column 3 the outcome is the net debt issuance scaled by assets; in Columns 4 the outcome is the total leverage; and in Columns 5 the outcome is average interest rate. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A.7.: Performance analysis pre-crisis

	(1) Asset turnover	(2) Asset growth	(3) EBITDA/revenue
PE x 2018	-0.078* (0.087)	0.475 (0.114)	0.013 (0.607)
PE x 2019	-0.106* (0.085)	0.467 (0.127)	-0.053 (0.154)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Observations	1,585	1,585	1,585
Adjusted R-squared	0.914	0.017	0.710

Table A.7. reports the estimates from a time-varying fixed effects model on the performance variables. All specifications include firm and year fixed effects. The main parameter of interest is the interaction between the year and PE-backed company dummy variable. All specifications include a set of firm-level controls measured before the crisis and interacted with the Crisis dummy. These variables include firm size (log of revenue), growth in revenue, ROA, and leverage. In Column 1 the outcome is asset turnover; in Column 2 the outcome is 1-year assets growth; in Column 3 is the total EBITDA scaled by revenue. Standard errors are clustered at the firm level. The appendix provides more information about the variable definitions. Standard errors are clustered at the firm level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.