

INFLUENCE OF PRIVATE EQUITY INVESTMENTS AND ACQUISITIONS  
ON SMES PERFORMANCE IN GERMANY

by

Bohdan Hrinchenko

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Thesis Supervisor: \_\_\_\_\_ Professor Elena Besedina

Approved by \_\_\_\_\_  
Head of the KSE Defense Committee, Professor [Type surname, name]

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## LIST OF ABBREVIATIONS

**PE** Private equity

**SMEs** Small and medium-sized enterprises

**KfW** Credit Institute for Reconstruction

**NEEQ** National Equities Exchange and Quotations

**PSM** Propensity Score Matching

**OLS** Ordinary least squares

## CHAPTER 1. INTRODUCTION

In driving the progress and growth of all global nations, small and medium-sized enterprises are indispensable. The Federal Ministry of Economic Affairs and Climate Action notes that in Germany, SMEs comprise 35.3% of all sales and generate 58.5% of all employment positions, affirming their role as the prime impetus for economic innovation and development (Federal Ministry of Economic Affairs and Climate Action, 2019). These statistics reaffirm the significance of SMEs as engines of economic innovation and development, exemplifying their indispensable position.

Despite this, such establishments often face the challenge of inadequate funds to support their expansion and progress. In recent times, private equity investments have emerged as a promising solution to this financial challenge, gaining substantial attention from researchers, policymakers, and industry practitioners. These investments, beyond the infusion of capital, offer a multifaceted approach involving resource provisioning, knowledge transfer, and strategic direction. The consequential impact of private equity investments on SMEs' growth, profitability, and long-term viability has positioned them as a favored funding option.

This study embarks on an exploration of paramount importance, seeking to comprehend the profound influence of private equity investments on the performance of SMEs, specifically within the dynamic landscape of Germany. At its core, this research aspires to investigate how private equity investments wield their transformative power, with findings intended to inform and empower private equity firms, policymakers, and investors in making informed decisions.

In addition to financial resources, private equity firms offer managerial know-how, operational efficiency, and access to networks and markets. According to Deloitte Insights,



since the pandemic hit in early 2020, many private equity firms have stepped up to support their portfolio companies in myriad ways (Patrick Henry, Frank Fumai, Tania Lynn Taylor, Jagat Patel, 2020). Private equity firms have pushed back against the stereotype depicting them as strip miners of corporate assets, stressing their management expertise and examples of successful transformations of companies (James Chen, 2023). These contributions have the power to completely change SMEs, giving them the tools they need to overcome growth limitations, better operational performance, and become more competitive. Policymakers can build effective strategies and create an enabling environment to attract private equity funds and support the growth and sustainability of the SME sector by studying the effects of private equity investments.

This research expands on earlier work that looked into the connection between private equity investments and SME success. While some studies have discovered beneficial impacts (Fan Xin, Wu Xiumin. 2019), others have shown conflicting or unclear results (Yichun Chen. 2022), underscoring the necessity for additional research in the German setting. This study aims to add to the body of knowledge on private equity and SMEs by concentrating specifically on SMEs in Germany. It also attempts to offer insights that are pertinent to the local business environment.

To achieve the research objectives, this study employs a panel data regression analysis methodology, controlling for various factors that may influence SME performance. Additionally, the Propensity Score Matching method is utilized to address potential selection bias issues. The research utilizes financial performance indicators such as net income, size, and leverage to measure SME performance.

In essence, the primary aim of this research is to conduct a comprehensive and thorough assessment of how private equity investments affect the performance of Small and Medium-sized Enterprises in the German context. By delving into the intricate mechanisms of value enhancement and pinpointing the pivotal factors that drive

achievement, this study aspires to provide a wealth of knowledge. It is not limited to private equity stakeholders alone; the anticipated beneficiaries of these insights encompass policymakers and investors who are eager to enrich their understanding of this transformative economic landscape.

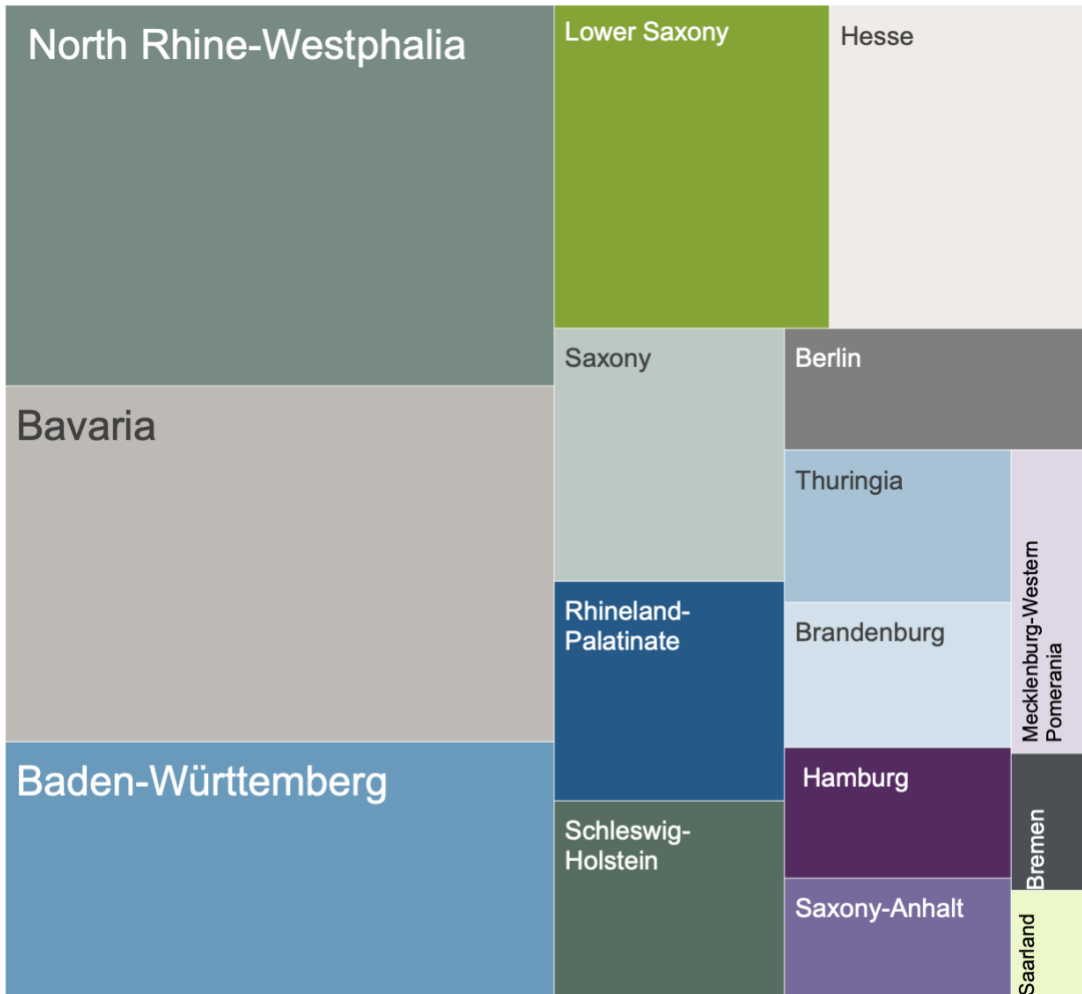
Through a multidimensional and multifaceted examination, this research endeavors to cast light on the intricate and diverse ways in which private equity exerts its influence. This influence extends beyond short-term gains, reaching into the realms of long-term growth, overall success, and the enduring sustainability of small and medium-sized enterprises in Germany.

## CHAPTER 2. INDUSTRY OVERVIEW AND RELATED STUDIES

To start with, according to the German Federal Statistical Office, SMEs are regarded as all enterprises which employ less than 250 persons and whose annual turnover does not exceed Euro 50 million (DE STATIS, 2023). Germany's small and medium-sized companies (SMEs), also known as the 'Mittelstand', are the country's strongest driver of employment, innovation and technology and are renowned across the world (Federal Ministry of Economic Affairs and Climate Action, 2019).

Figure 1. Distribution of SME employees by federal state

(KfW Group, 2018)



The SMEs sector is a vital component of Germany's economy, encompassing various types of businesses ranging from family-owned enterprises to high-tech startups. As per Statista (Statista Research Department, 2022), over 3.8 million small and medium-sized companies were operating in Germany in 2022, with the wholesale and retail trades sector being the most prominent at 580,383. Other significant sectors include professional, scientific, and technical activities at 433,792 and construction at 406,917. The German

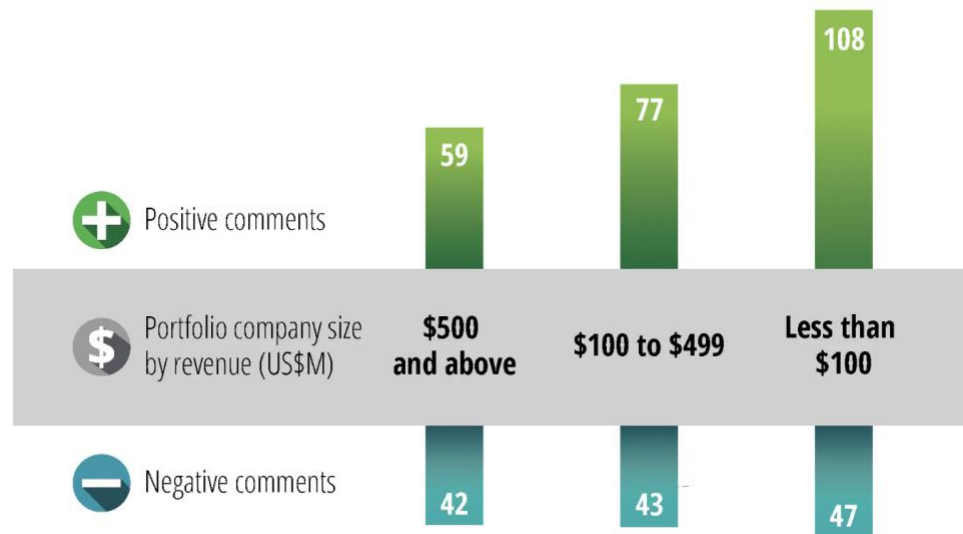
SMEs sector must overcome several challenges such as digital transformation, sustainability, innovation and globalization in the coming years. The Mittelstand 4.0 project, the SME Strategy 2030, and the SME Innovation Fund are just a few of the policies and initiatives the German government has used to boost the SMEs sector.

The COVID-19 pandemic and its associated economic repercussions presented substantial obstacles to the German SME sector. Nevertheless, SMEs displayed remarkable adaptability and ingenuity in response to these challenges. Many reconfigured their business models, products, and services to meet evolving market demands. Government intervention, through loans, grants, tax incentives, and short-term employment opportunities, further aided SMEs in navigating this turbulent period. Notably, the "Corona Shield" program, which includes the KfW Special Programme that ensured companies quick access to urgently needed liquidity loans (OECD, 2022). Despite their resilience, SMEs continue to grapple with persistent challenges, such as lack of skilled laborers (Federal Ministry of Economic Affairs and Climate Action, 2019), the imperative of digital integration, sustainable practices amidst globalization, and the need for financial support to meet evolving market demands. Private equity investments can provide much-needed capital infusion while offering expertise in governance structures alongside marketing strategies for long-term growth prospects.

Figure 2. Smaller portfolio companies are more positive about their PE firm's support

(Patrick Henry, Frank Fumai, Tania Lynn Taylor, Jagat Patel, 2020)

### Smaller portfolio companies are more positive about their PE firm's support



Note<sup>1</sup>: Respondents were asked to describe the high points and low points of support from PE firms since the onset of COVID-19. Positive comments include all responses mentioning high points, except respondents who answered "None." Negative comments include all responses mentioning low points, except respondents who answered "None." N=50 for companies with revenue US500 million and above, N=64 for companies with revenue US100 million to US499 million, and N=78 for companies with revenue less than US100 million.

Recent research by KfW Research sheds light on merger and acquisition (M&A) trends within the German SME sector (KfW Research, 2018). One critical characteristic in M&A transactions is the extent of participation in the acquisition target. An acquirer may acquire a target enterprise in full or only a portion of its equity, each carrying distinct implications for control and influence. Analysis of data from KfW Research reveals that full acquisitions

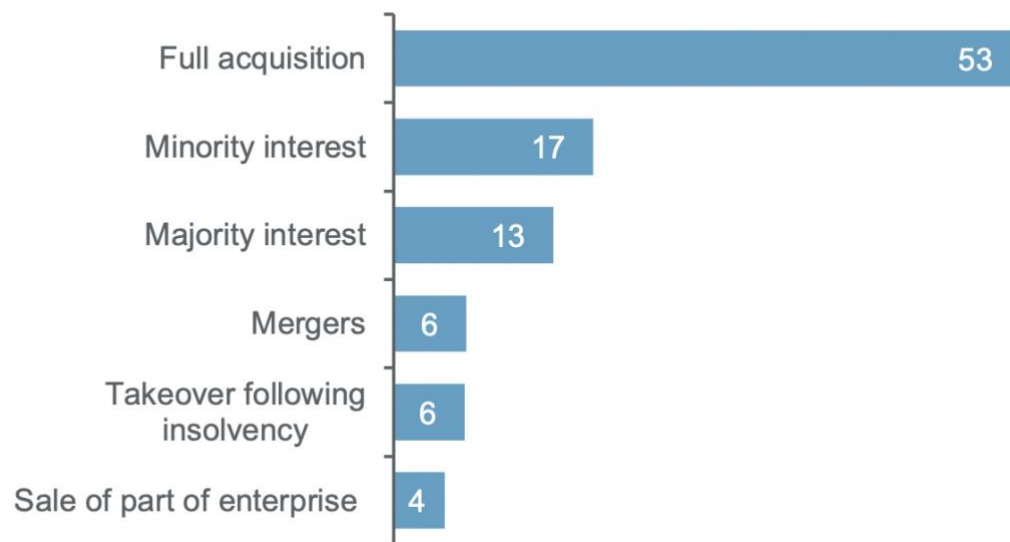
<sup>1</sup> Patrick Henry, Frank Fumai, Tania Lynn Taylor, Jagat Patel, 2020

of the target company predominated, with approximately one in two M&A deals involving a 100% acquisition of the SME (KfW Research, 2018).

In contrast, acquirers purchased less than 50% of the target's capital (minority interest) in 17% of M&A deals, limiting their influence over the target (KfW Research, 2018). This contrasts with majority interest acquisitions, where the acquirer takes ownership of more than 50% of the capital, granting them controlling influence. This occurred in 13% of M&A deals in the German SME sector (KfW Research, 2018).

Figure 3. Full acquisition is most common. Percentage share of all M&A deals (mean value 2005–2017) (KfW Research, 2018)

Percentage share of all M&A deals (mean value 2005–2017)



The private equity landscape in Germany has witnessed notable transactions. The EUR 17.2 billion thyssenkrupp elevator deal of 2020 remains the largest PE buyout deal in the country (Preqin Territory Guide, 2022). Led by a consortium including Advent International, Cinven, the Abu Dhabi Investment Authority, and RAG Stiftung (a

foundation for the German coal industry), this deal showcased the significant role of private equity in substantial transactions. Interestingly, while only a few mega deals occur annually, Germany-based PE deals span a range of sizes, with a notable presence at both the smaller and larger ends of the deal spectrum.

The landscape is characterized by a distribution of deals towards the larger and smaller ends, with the fewest PE deals in the EUR 50 million to EUR 100 million range (Preqin Territory Guide, 2022). Most PE deals fall below the EUR 50 million threshold, with eight such deals in 2021 (Preqin Territory Guide, 2022). In contrast, 19 deals exceeded EUR 100 million, including nine exceeding EUR 500 million, while only four ranged between EUR 50 million and EUR 100 million (Preqin Territory Guide, 2022). In 2022, this trend continued, with 11 deals below EUR 50 million, three between EUR 50 million and EUR 100 million, and eight surpassing EUR 100 million in size (Preqin Territory Guide, 2022).

Figure 4. Germany-based private equity investment by industry, 2013 - Q3 2022 (Preqin Territory Guide, 2022)

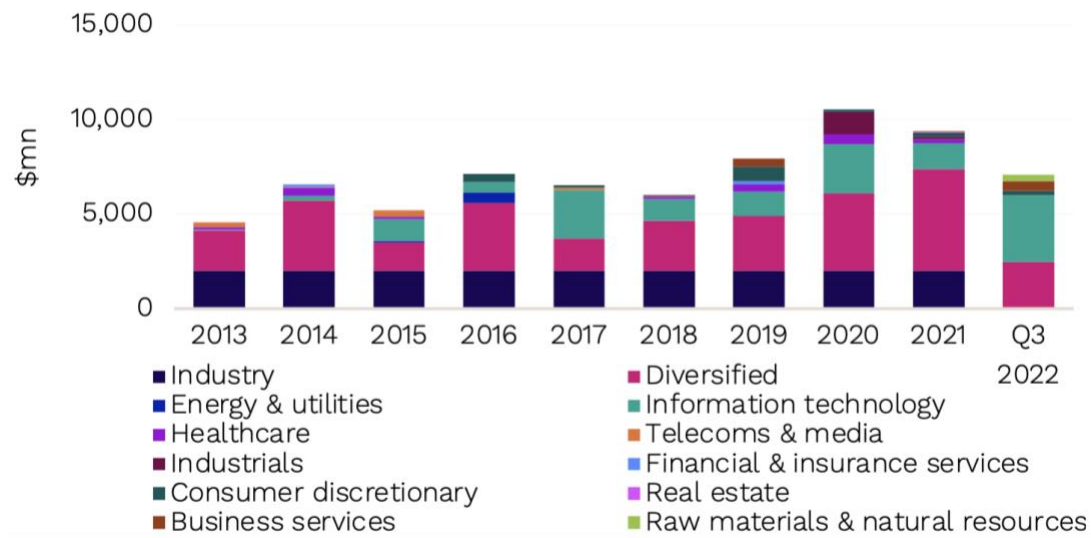
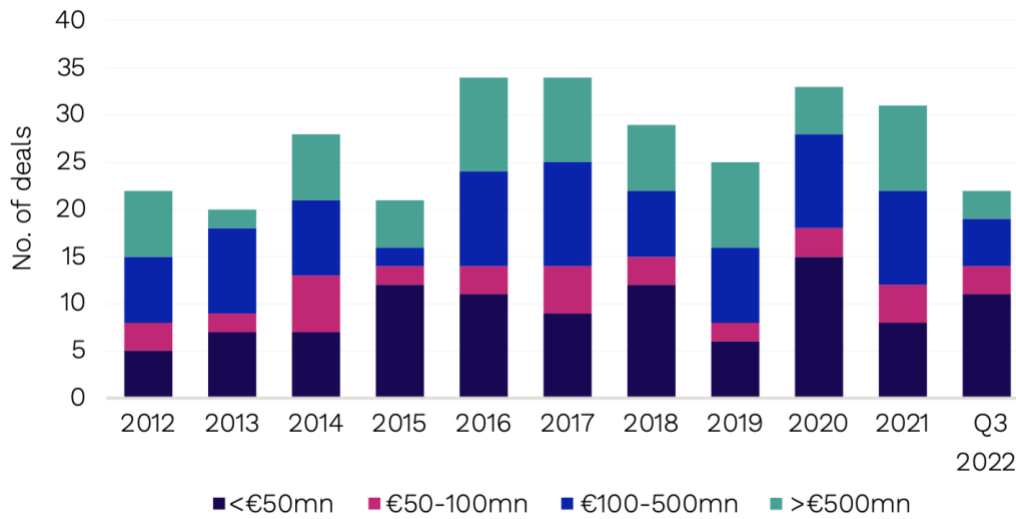




Figure 5. Germany-based private equity deals by size  
(Preqin Territory Guide, 2022)



Several studies have examined the relationship between private equity investments and SME performance in various contexts. However, limited research has specifically focused on SMEs in Germany, highlighting the need for further investigation. The following discussion summarizes relevant studies and explains how this paper will contribute to the existing research.

- 1) Fan Xin and Wu Xiumin (2019) conducted an empirical study on the impact of private equity investments on the operating performance of listed companies on the Shenzhen Growth Enterprise Market in China between 2014 and 2018. The aim was to investigate whether the private equity industry in China has developed in a healthy, standardized, and orderly way since the formal implementation of the Interim Measures on the Supervision and Management of Private Equity Funds in 2014. Their findings revealed a positive impact of private equity investments on corporate performance, with a higher shareholding ratio of private equity associated with better

- results. While this study provides valuable insights, it is crucial to examine whether similar findings can be observed in the German context.
- 2) Yichun Chen (2022) examined the impact of private equity participation on the business performance and innovation ability of 711 listed enterprises in the innovation layer of NEEQ from 2016 to 2020. The research measured the participation degree and investment background of PE and conducted multiple regression analysis to examine their effects on return on assets (ROA) and technology investment ratio (TIR). The findings indicated that PE investment has a significant negative impact on ROA of enterprises in the innovation layer of NEEQ, but a significant positive effect on TIR. Additionally, the study revealed that PE with state-owned background has no significant improvement effect on ROA and no significant impact on TIR, as compared to private PE. This highlights the importance of conducting research in different contexts to understand how the effects of private equity investments may vary.
  - 3) A study conducted by Ann-Kristin Achleitner, Reiner Braun, Nico Engel, Christian Figge, and Florian Tappeiner (2010) provided significant insights into the private equity business model in Europe. The research focused on analyzing the drivers of value creation in buyouts across Continental Europe and the UK, from the perspective of private equity sponsors. The study utilized a unique dataset of 206 realized transactions, allowing for a comprehensive analysis of value creation drivers. The analysis took into account different time periods, transaction sizes, and general market conditions to understand the factors contributing to value creation. The methodology employed in the study enabled the separation of the value contribution of leverage on private equity sponsors' returns from the effects of operational improvements and market conditions. The findings of the empirical analysis revealed that approximately one third of the private equity sponsors' returns could be attributed to the use of leverage, indicating the financial leverage's impact on investment outcomes. The remaining two-thirds of the returns were associated with

operational improvements and market effects, highlighting the significance of strategic and operational decision-making in driving value creation in buyout transactions.

While there is a lack of studies focusing specifically on the German SME context, there are numerous research papers, like the ones mentioned above, that explore the impact of private equity investments on SMEs in other countries.

The studies have presented conflicting outcomes regarding the impacts of initiatives on metrics such as sales growth, profitability, and productivity. While some research demonstrates positive effects (Fan Xin, Wu Xiumin, 2019), others highlight potential disadvantages like amplified financial risk and modifications in management strategy (Achleitner, Ann-Kristin, Reiner Braun, Nico Engel, Christian Figge, and Florian Tappeiner, 2010). Consequently, this study aims to enhance the current literature by providing empirical proof concerning German SMEs and considering their inherent features, regulatory structure, and market dynamics.

## CHAPTER 3. METHODOLOGY

### *3.1 Research Hypotheses*

To address research problem, this paper will test next hypothesis:

Hypothesis 1: Companies that receive private equity injections will show better corporate performance compared to those that do not receive such injections (regular companies).

Hypothesis 2: Companies that were acquired by private equity funds will show better corporate performance compared to those that were not (regular companies).

Hypothesis 3: Companies that were acquired by private equity funds will show better corporate performance compared to those that received capital injection by private equity.

### *3.2 Research Approach*

This study employs a quantitative research approach using panel data regression analysis. This approach has been selected due to its appropriateness for the chosen research question, as it enables the examination of the relationship between private equity investments and buyouts and SME performance while considering various control variables.

The chosen methodology is appropriate for the research question as it allows for the examination of the relationship between private equity investments and SME performance, considering various control variables. By using panel data, which includes observations of multiple SMEs over a specific period, this methodology captures both cross-sectional and time-series variations, enhancing the robustness of the analysis.

In recognition of potential selection bias arising from the non-random assignment of private equity investments and buyouts to SMEs, this study incorporates the Propensity

Score Matching (PSM) method. It is essential to note that the dataset was preliminarily handpicked to ensure its relevance and alignment with the study's objectives. PSM, a widely recognized technique in observational studies, facilitates the construction of a quasi-experimental design by matching treated and control groups based on their propensity scores. These scores reflect the likelihood of receiving the treatment (private equity investment or buyout) based on observed characteristics. By carefully selecting the dataset, PSM assists in minimizing the influence of selection bias and bolsters the strength of causal inference.

The next step is estimating the difference in post-PE injection or buyout net income (NI) between the treatment and control groups utilizing an OLS regression analysis. The following model is used in this paper:

$$\begin{aligned}
 NI_{post} = & \beta_0 + \beta_1 PE_{inji} + \beta_2 PE_{acqi} + \beta_3 NI_{priori} + \beta_4 Assets_{priori} + \\
 & \beta_5 Assets_{post_i} + \beta_6 Liabilities_{priori} + \beta_7 Liabilities_{post_i} + \beta_8 IT_i + \\
 & \beta_9 Construction_i + \beta_{10} Healthcare_i + \beta_{11} PE_{inji} * NI_{priori} + \varepsilon_{it}
 \end{aligned}$$

To start with, estimation of treatment effect by Welch Two Sample t-test for all hypotheses will be conducted. This test allows for statistically comparing the means of the treatment and control groups to determine if there is a significant difference between them. Then, utilizing OLS analysis, if the treatment group shows a greater increase in Ni than the control group after the investment, this would suggest a positive effect of the private equity investment on corporate performance. If the treatment group shows a greater increase in Ni than the control group after the buyout, this would suggest a positive effect of the private equity buyout on corporate performance. If the treatment group shows a greater increase in Ni than the control group after the buyout, this would suggest a positive effect of the private equity buyout on corporate performance, rather than PE injection.

## CHAPTER 4. DATA

### *4.1 Data Overview*

The data for this study will be collected from reputable source – PALTURAI, with a primary focus on private equity investments made in SMEs in Germany over a pre-COVID-19 period. The dataset will include information on the size of the investment, industry sector, and performance indicators (net income, assets and liabilities) of the invested companies. The dataset will consist of three groups: N=50 companies with no private equity investment, N=50 companies that received private equity investment, and N=50 companies that were acquired by private equity funds, resulting in a total of 150 observations. These groups provide the foundation for the analysis of private equity's impact on SME performance.

### *4.2 Key Variables*

-Net Income (NI) serves as a crucial financial performance indicator for SMEs. This variable represents the profitability of the companies in the dataset.

-The presence or absence of private equity investment is indicated by a dummy variable (PE\_inj). This variable categorizes companies into those that received private equity injections (coded as 1) and those that did not (coded as 0).

- The presence or absence of private equity acquisition is indicated by a dummy variable (PE\_acq). This variable categorizes companies into those that were acquired by private equity (coded as 1) and those that did not (coded as 0).

To account for potential influences on corporate performance, this study incorporates control variables:

-Total Assets (Assets) represents the size of the SMEs in the dataset. This variable captures the extent of the company's resources and operations.

-Financial Leverage (Liabilities) measures the financial risk of SMEs. This variable helps control for the impact of financial structure on corporate performance.

-IT sector (IT) variable represents if company belongs to the technology sector.

-Construction sector (Construction) variable represents if company belongs to the plant construction, development, or engineering sectors.

-Healthcare sector (Healthcare) variable represents if company belongs to medical, pharma or life sciences sectors.

-Interaction term (PE\_inj \* Net\_Income\_prior) helps understand how the relationship between private equity injection and post-net income is modified by the level of prior net income. It tells whether this relationship is stronger, weaker, or unchanged for companies with different initial net income levels.

Values representing net income, assets and liabilities are in thousands US dollars.

Table 1: Descriptive statistics

	Net_income_prior	Net_income_post	Assets_prior	Assets_post	Liabilities_prior	Liabilities_post
Min.	-17483870	-9995549	118382	147641	21985	29817
1 <sup>st</sup> Qu	-31265	0	2241864	2713448	696833	945604
Median	215052	271071	4185704	4480886	1774222	2302602
Mean	433626	666158	7673502	8153211	4366856	4699715
3 <sup>rd</sup> Qu	972949	978144	7245115	8223350	3635198	4226627
Max.	8636056	9054418	116164016	118187936	78518526	86981000

#### 4.3 Data Visualization

The following figures provide visual representations of the data, illustrating key characteristics and groupings within the dataset.

Figure 6: Sample PE-injected companies, by sector

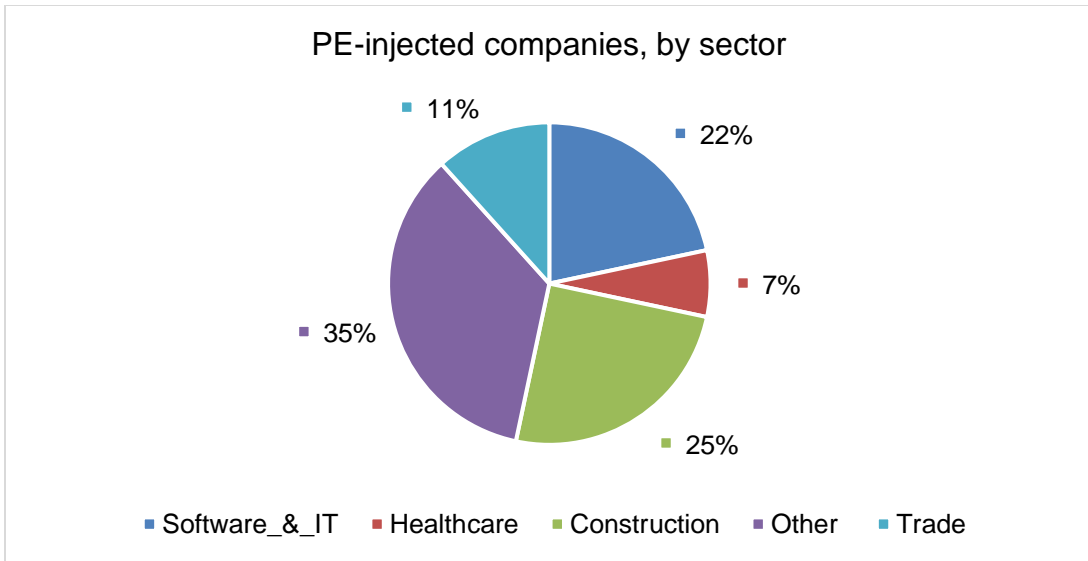


Figure 7: Sample Non-PE-injected (regular) companies, by sector

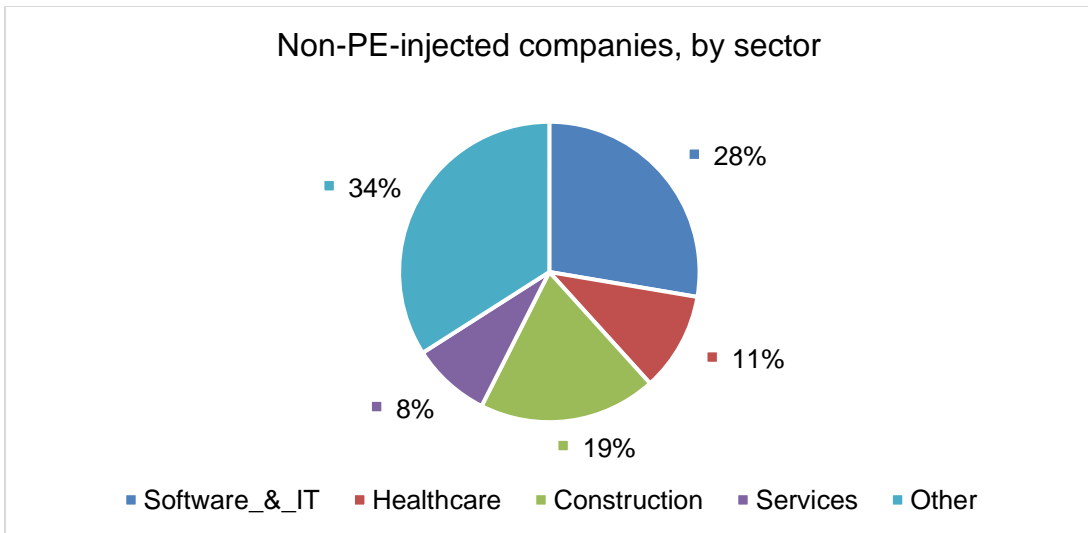




Figure 8: Sample acquired companies, by sector

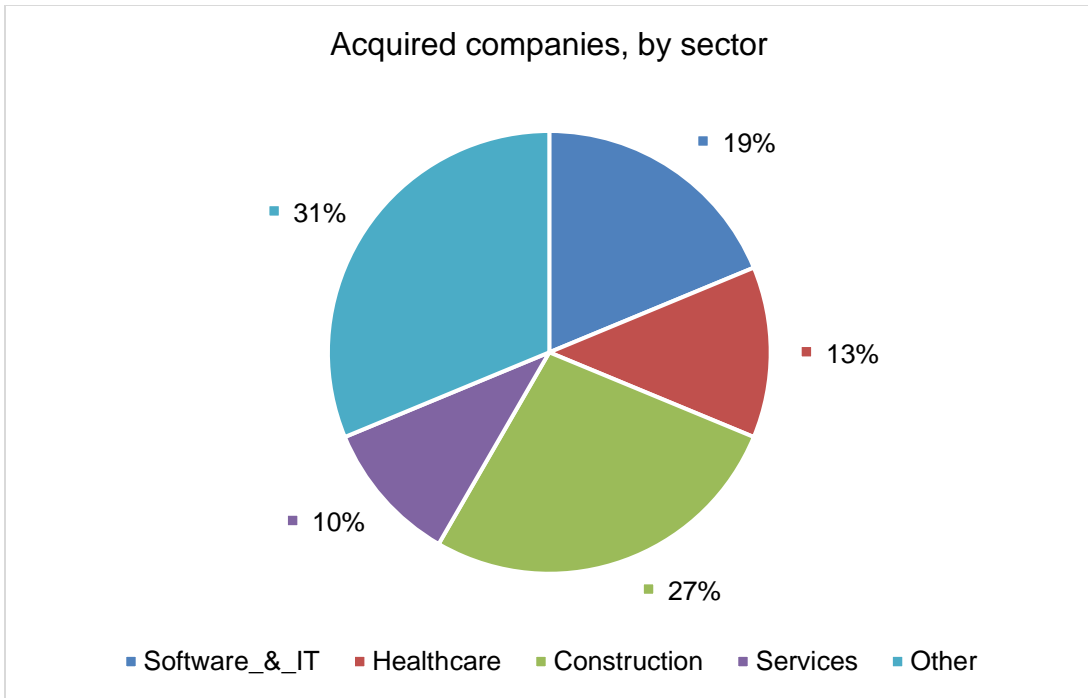


Figure 9: Sample PE-injected companies, by revenue

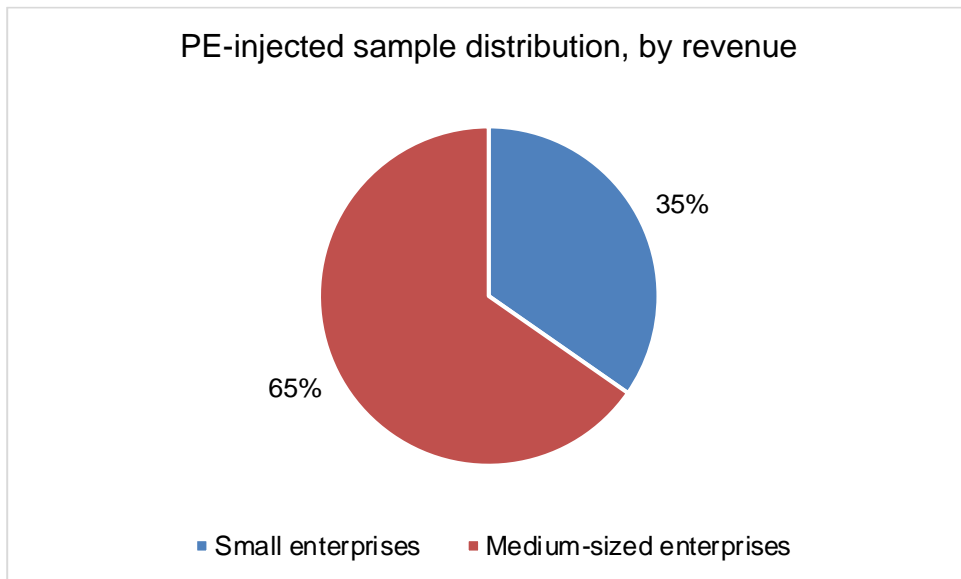


Figure 10: Sample non-PE-injected companies, by revenue

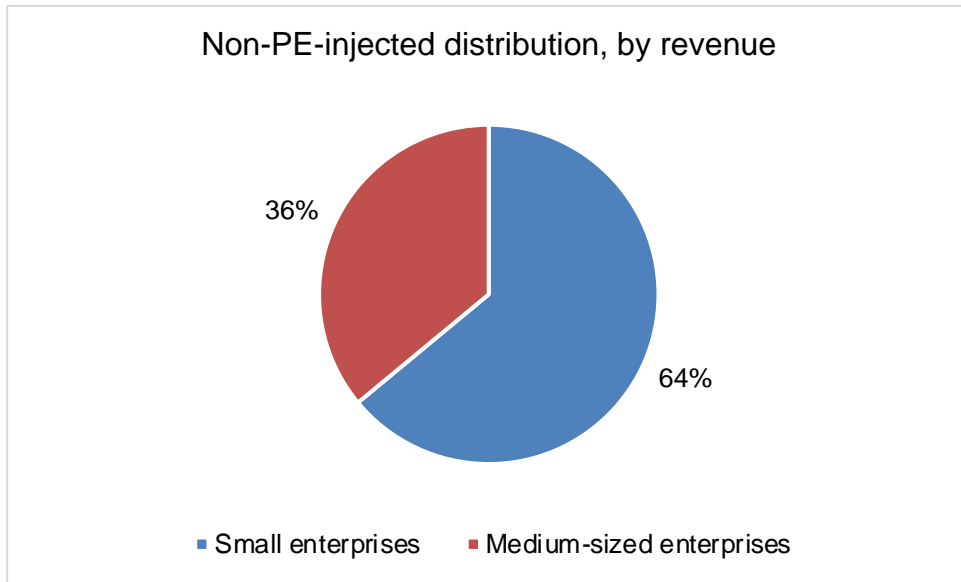
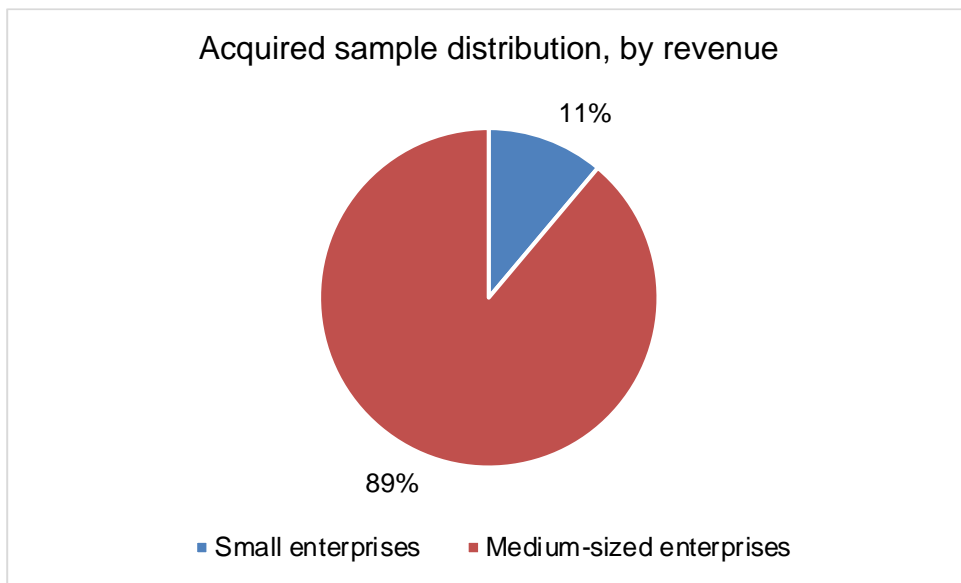


Figure 11: Sample acquired companies, by revenue



## CHAPTER 5. RESULTS

This section is presenting the results of analysis, which involved propensity score matching (PSM), OLS regression analysis and Welch t-test to estimate the Average Treatment Effect (ATT) of receiving private equity investment on net income. Also cluster-robust standard errors (see Appendix A), distribution of propensity scores (see Appendix B), confidence intervals (see Appendix C), were calculated to assess the significance of findings.

### *5.1 Propensity Score Matching stage*

First, PSM was employed to create a matched dataset that balanced the covariates between the treated and control groups. The matching was performed using the "nearest" method with a ratio of 1. The summary of balance for all data and matched data is presented in Tables 2, 3, 4. Also, the visualization of matching was done (see Appendix B).

Table 2: Propensity Score Matching for PE injected and non-PE companies

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max
Distance	0.5302	0.4698	0.4230	2.1136	0.1052	0.24
Net Income prior	540361.9200	158309.4	0.2024	0.3679	0.0416	0.14
Assets post	8033488.2	6841667.42	0.1251	1.6638	0.0416	0.14
Assets prior	7359225.1	6621241.04	0.0733	0.8195	0.0324	0.08
Liabilities post	4414965.08	3522400.98	0.1053	4.1470	0.03	0.10
Liabilities prior	3917554.46	3813082.02	0.0125	1.2138	0.046	0.14
Sample sizes:						
	Control		Treated			
All	50		50			
Matched	50		50			
Unmatched	-		-			

Discarded	-	-
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Table 3: Propensity Score Matching for PE injected and acquired companies

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max
Distance	0.5086	0.4914	0.3375	0.4324	0.0640	0.22
Net Income prior	602206.58	540361.92	0.0270	1.4678	0.0611	0.14
Assets post	9584477.4	8033488.2	0.0707	5.3022	0.0632	0.2
Assets prior	9040038.84	7359225.1	0.078	4.5879	0.0524	0.14
Liabilities post	6161777.52	4414965.08	0.1050	3.8578	0.0568	0.14
Liabilities prior	5369930.84	3917554.46	0.0956	3.2950	0.0720	0.18
Sample sizes:						
		Control		Treated		
	All	50		50		
	Matched	50		50		
	Unmatched	-		-		
	Discarded	-		-		

Table 4: Propensity Score Matching for non-PE injected and acquired companies

	Means Treated	Means Control	Std. Mean Diff.	Var. Ratio	eCDF Mean	eCDF Max
Distance	0.5401	0.4599	0.5278	1.5139	0.1200	0.26
Net Income prior	602206.58	158309.4	0.1941	0.54	0.0525	0.16
Assets post	9584477.4	6841667.42	0.1250	8.8219	0.0408	0.12
Assets prior	9040038.84	6621241.04	0.1122	3.7596	0.04	0.14
Liabilities post	6161777.52	3522400.98	0.1586	15.9981	0.0504	0.14

Liabilities prior	5369930.84	3813082.02	0.1025	3.9993	0.0780	0.22
Sample sizes:						
	Control		Treated			
All	50		50			
Matched	50		50			
Unmatched	-		-			
Discarded	-		-			

The balance measures, such as the standardized mean differences and variance ratios, indicate that the matching process not improved balance across the covariates, hence not reducing the potential bias introduced by confounding variables.

### 5.3 Welch Two Sample t-test stage

To examine whether there is a significant difference in means between the treatment and control groups, a Welch Two Sample t-test was conducted. The results are presented in Tables 5, 6, 7.

Table 5: Welch Two Sample t-test for PE and non-PE injected companies

t = 1.2683	df = 92.118	p-value = 0.2079
95% confidence interval:		
-323616.2	1467215.1	

The t-test indicates that the difference in means between the treatment and control groups is not statistically significant ( $p = 0.2079$ ), meaning that receiving private equity investment does not lead to a significant difference in net income.

Table 6: Welch Two Sample t-test for PE injected and acquired companies

t = -0.22007	df = 96.684	p-value = 0.8263
95% confidence interval:		
-1052891.4	842711.9	

The t-test indicates that the difference in means between the treatment and control groups is not statistically significant ( $p = 0.8263$ ), meaning that receiving private equity investment does not lead to a significant difference in net income.

Table 7: Welch Two Sample t-test for non-PE injected and acquired companies

$t = 1.1104$	$df = 96.111$	$p\text{-value} = 0.2696$
95% confidence interval:		
1012328.2		545618.5

The t-test indicates that the difference in means between the treatment and control groups is not statistically significant ( $p = 0.2696$ ), meaning that being acquired by private equity fund does not lead to a significant difference in net income.

### *5.2 OLS regression analysis stage*

Next, a regression model was estimated using the matched dataset, examining the relationship between the treatment variables (PE\_inj and PE\_acq) and the outcome variable (Net\_Income\_post). The results are shown in Table 8.

Table 8: OLS regression output

	Dependent variable:
	Net_Income_post
PE_inj	-710.702400** (303.530800)
PE_acq	-185.397000 (303.539700)
Net_Income_prior	0.519459*** (0.071613)
Assets_post	0.175592*** (0.052281)
Assets_prior	-0.089829 (0.061623)
Liabilities_post	-0.553244*** (0.071994)
Liabilities_prior	0.442515*** (0.089183)
IT	271.174200 (318.651700)
Construction	145.409700 (300.926800)
Healthcare	200.547900 (469.161700)
PE_inj * Net_Income_prior	0.452165*** (0.141354)
Constant	463.481300* (270.618700)

Observations	150
R2	0.603553
Adjusted R2	0.571953
Residual Std. Error	1,471.791000 (df = 138)
F Statistic	19.099300*** (df = 11; 138)
Note	*p<0.1; **p<0.05; ***p<0.01

**(Intercept):** The intercept's coefficient is 463.48, but it's not statistically significant ( $p = 0.089$ ). This suggests that when all other variables are zero, the expected net income does not significantly differ from zero.

**PE Injection:** The coefficient for PE\_inj is -710.70, and it is statistically significant ( $p = 0.0206$ ). This negative coefficient suggests that receiving private equity injections has a negative effect on net income.

**PE Acquisition:** The coefficient for PE\_acq is -185.40, but it's not statistically significant ( $p = 0.5424$ ). This implies that being acquired by a private equity firm does not significantly impact net income.

**Net Income Prior:** The coefficient for Net\_Income\_prior is 0.5195, and it is highly statistically significant ( $p < 0.0001$ ). This indicates that prior net income is strongly associated with current net income, with a positive coefficient.

**Assets Post:** The coefficient for Assets\_post is 0.1756, and it is statistically significant ( $p = 0.0010$ ). This suggests that an increase in post-asset values is positively related to net income.



**Assets Prior:** The coefficient for Assets\_prior is -0.0898, but it's not statistically significant ( $p = 0.1472$ ). This indicates that prior asset values do not significantly impact net income.

**Liabilities Post:** The coefficient for Liabilities\_post is -0.5532, and it is highly statistically significant ( $p < 0.0001$ ). This suggests that an increase in post-liability values is negatively associated with net income.

**Liabilities Prior:** The coefficient for Liabilities\_prior is 0.4425, and it is highly statistically significant ( $p < 0.0001$ ). This indicates that prior liability values have a positive relationship with net income.

**IT:** The coefficient for the IT sector is 271.17, but it's not statistically significant ( $p = 0.3962$ ). This suggests that being in the IT sector does not significantly impact net income.

**Construction:** The coefficient for the Construction sector is 145.41, but it's not statistically significant ( $p = 0.6297$ ). This implies that being in the Construction sector does not significantly affect net income.

**Healthcare:** The coefficient for the Healthcare sector is 200.55, but it's not statistically significant ( $p = 0.6697$ ). This indicates that being in the Healthcare sector does not significantly impact net income.

**Interaction Term (PE\_inj \* Net\_Income\_prior):** The coefficient for the interaction term is 0.4522, and it is statistically significant ( $p = 0.0017$ ). This suggests that the interaction between receiving private equity injections and prior net income has a positive effect on net income. The effect of private equity injection on post-net income is not

constant; it depends on the initial net income level. This could indicate that the effect of private equity injection differs for companies with varying levels of prior net income.

Overall, this regression model highlights the significant role of private equity injections, prior net income, assets post-acquisition, and liabilities (both post-acquisition and prior) in explaining variations in net income. The effects of acquisitions, and industry sectors appear to be less significant. The interaction term suggests that the influence of private equity injections may depend on the company's prior net income.

## CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

In this study, an analysis was done of the influence of private equity investments and acquisitions on the performance of Small and Medium-sized Enterprises (SMEs) in the German context. Goal was to contribute valuable insights into how these financial arrangements impact corporate performance, specifically focusing on net income.

### *6.2 Summary of Key Findings*

Upon careful examination of data and rigorous statistical analysis, several key findings have emerged:

1. **Net Income Impact:** Results reveal that there is statistically significant negative difference in net income between SMEs that received private equity investments and those that did not. Moreover, the interaction term between prior net income and PE injection implies that the impact of private equity injection on post-net income is not consistent; instead, it varies based on the initial net income level. This observation suggests that the influence of private equity injection differs among companies with differing levels of prior net income. However, results for those companies that were acquired by private equity funds were not statistically significant.

2. **Sample Size Consideration:** It's important to acknowledge that analysis was conducted with a sample size of 150 observations after matching. While findings provide valuable insights, further research with a larger sample size could potentially yield more nuanced results.

### *6.3 Implications for Businesses*

The outcomes of study hold significance for SMEs considering private equity investments or acquisitions. The following recommendations can be distilled from findings:

**-Strategic Alignment:** Businesses should diligently evaluate the alignment of their strategic objectives with the investment goals of potential private equity partners. Ensuring congruence in growth plans, financial targets, and the envisioned time frame for returns is pivotal for a fruitful partnership.

**-Due Diligence:** Thorough due diligence on prospective private equity partners is paramount. This entails a comprehensive assessment of their track record, investment strategy, and the value they can contribute beyond financial capital. Scrutinizing their industry expertise, network, operational capabilities, and alignment with the company's long-term vision is pivotal in selecting the right partner.

**-Diversification of Funding Sources:** While private equity investment can provide a substantial capital infusion, reliance solely on this source may limit financial flexibility. Exploring alternative financing avenues, such as debt financing, strategic collaborations, or internal cash flow generation, can offer greater financial stability and autonomy.

**-Operational Excellence:** Regardless of private equity investment, maintaining a strong operational focus is critical. Businesses should prioritize operational performance and financial health by establishing efficient processes, robust governance structures, and a relentless focus on profitability. This not only enhances attractiveness to potential investors but also ensures sustainable long-term growth.

**-Transparent Communication:** After securing private equity investment, fostering transparent communication with private equity partners is vital. Regular assessments of the investment's impact on key financial metrics and sharing progress updates facilitate a strong relationship with investors. It also allows for proactive resolution of challenges or concerns.

**-Leveraging Expertise and Networks:** Although the influence on net income may not be pronounced, businesses can still harness the expertise and networks of private equity investors. Actively engaging in dialogue, seeking strategic guidance, and tapping into the

investor's industry connections can provide valuable insights and open doors to new growth opportunities.

#### *6.4 Future Research Avenues*

While study offers significant insights into the relationship between private equity and net income for SMEs in Germany, there are avenues for future research. Expanding the sample size and exploring more nuanced factors influencing corporate performance in the context of private equity could yield deeper insights. Additionally, investigating the long-term effects of private equity investments and acquisitions on SMEs' growth and sustainability is an area ripe for further exploration.

In conclusion, study contributes to the body of knowledge surrounding private equity investments and acquisitions in the SME sector, offering valuable guidance for businesses navigating this financial landscape. The decision to engage with private equity should be informed, strategic, and aligned with the unique goals and circumstances of each SME.

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## APPENDIX



APPENDIX A

Cluster-robust standard error analysis for PE and non-PE injected companies, for correct inference

t-test	Estimate	Std. Error	t-value	p-value
Intercept	2.2727e+04	2.1833e+05	0.1041	0.91733
PE_inj	-1.4219e+04	1.9663e+05	-0.0723	0.94251
Net_Income_prior	5.3085e-01	6.6577e-02	7.9734	4.625e-12
Assets_post	3.7514e-01	4.6715e-02	8.0305	3.528e-12
Assets_prior	-1.2774e-01	5.8631e-02	-2.1787	0.03197
Liabilities_post	-8.4819e-01	8.7084e-02	-9.7399	9.919e-16
Liabilities_prior	5.2824e-01	9.9896e-02	5.2879	8.605e-07
IT	2.4591e+05	2.4401e+05	1.0078	0.31625
Construction	3.2103e+05	2.7604e+05	1.1630	0.24791
Healthcare	2.1526e+05	3.0930e+05	0.6959	0.48825

Cluster-robust standard error analysis for PE-injected and acquired companies, for correct inference

t-test	Estimate	Std. Error	t-value	p-value
Intercept	-2.2920e+05	2.3005e+05	-0.9963	0.32178
PE_acq	1.5555e+05	3.0648e+05	0.5076	0.61301
Net_Income_prior	8.5612e-01	7.1621e-02	11.9534	<2e-16
Assets_post	9.4966e-02	4.2195e-02	2.2507	0.02684
Assets_prior	-9.8529e-02	6.1242e-02	-1.6088	0.11115
Liabilities_post	-1.0384e-01	1.6347e-01	-0.6353	0.52687
Liabilities_prior	8.6439e-02	1.3700e-01	0.6310	0.52967
IT	6.0267e+05	6.3768e+05	0.9451	0.34714
Construction	4.0986e+05	2.5073e+05	1.6347	0.10561
Healthcare	2.3719e+05	2.5470e+05	0.9312	0.35423

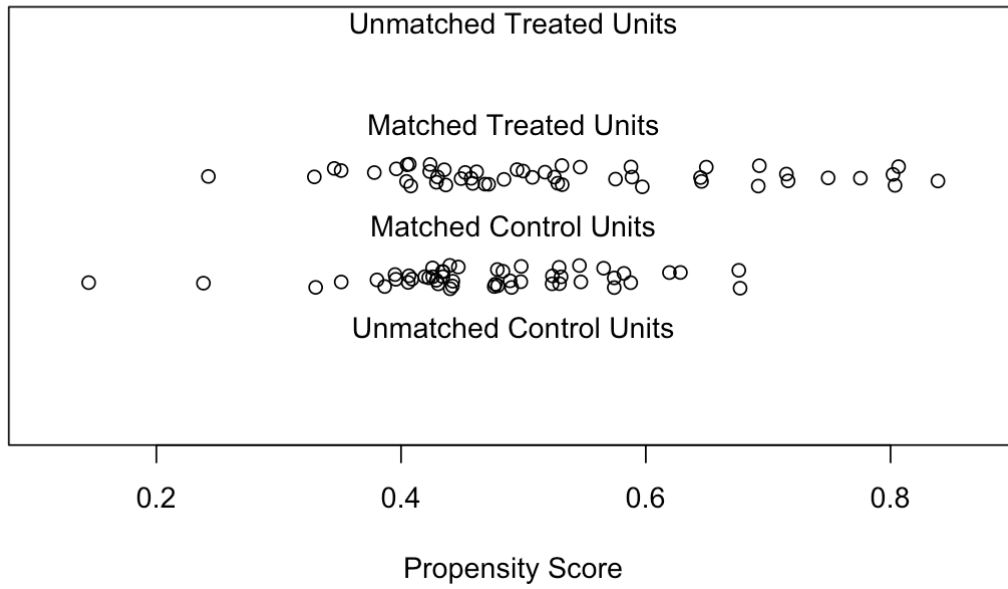
Cluster-robust standard error analysis for non-PE injected and acquired companies, for correct inference

t-test	Estimate	Std. Error	t-value	p-value
Intercept	2.2727e+04	2.0779e+05	0.1094	0.91315
PE_acq	-1.4219e+04	1.7162e+05	-0.0828	0.93416
Net_Income_prior	5.3085e-01	6.6828e-02	7.9435	5.330e-12
Assets_post	3.7514e-01	4.2461e-02	8.8349	7.592e-14
Assets_prior	-1.2774e-01	5.7939e-02	-2.2047	0.03002
Liabilities_post	-8.4819e-01	7.3741e-02	-11.5022	<2.2e-16
Liabilities_prior	5.2824e-01	9.2519e-02	5.7095	1.440e-07
IT	2.4591e+05	2.4154e+05	1.0181	0.31135
Construction	3.2103e+05	2.7876e+05	1.1516	0.25252
Healthcare	2.1526e+05	2.9771e+05	0.7230	0.47153

## APPENDIX B

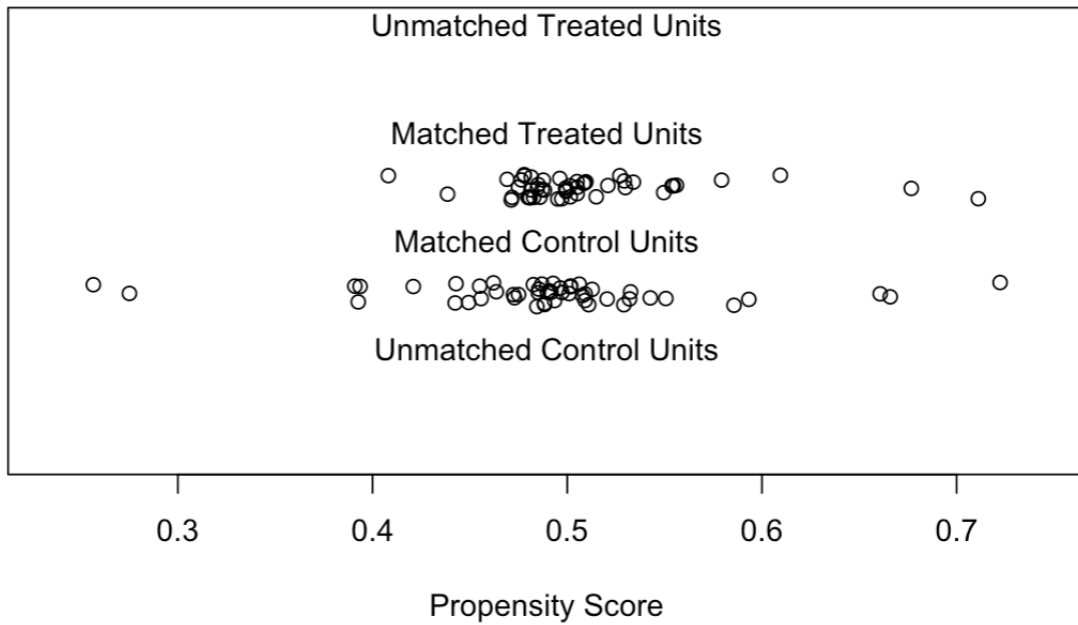
Distribution of Propensity Scores for PE and non-PE injected companies

### Distribution of Propensity Scores



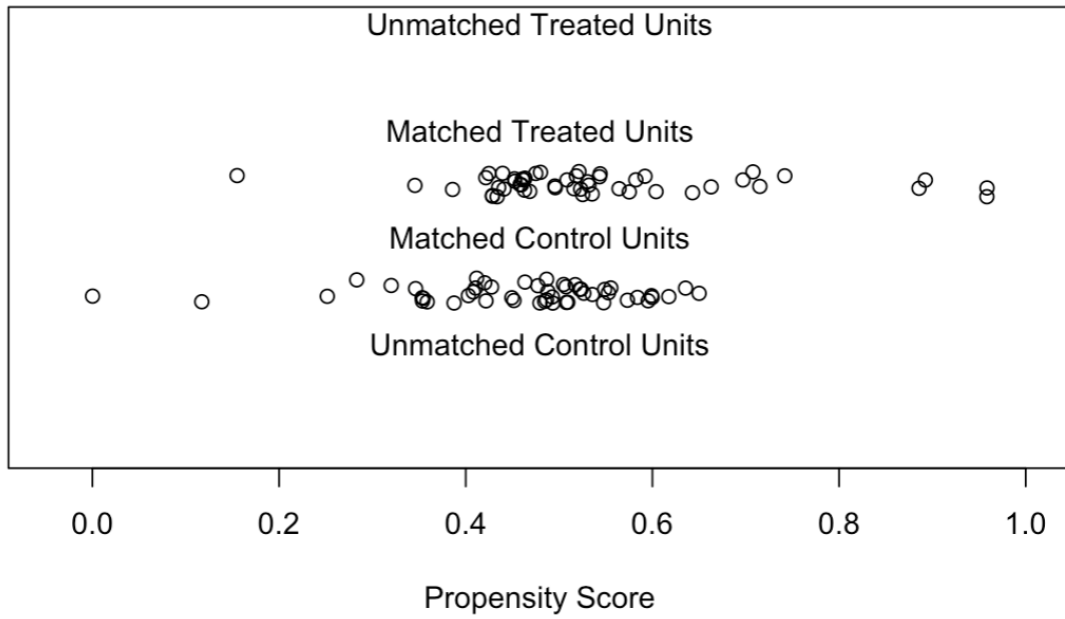
Distribution of Propensity Scores for PE-injected and acquired companies

### Distribution of Propensity Scores



Distribution of Propensity Scores for non-PE injected and acquired companies

### Distribution of Propensity Scores



## APPENDIX C

Confidence intervals for assessing the precision and significance of the estimated coefficients for PE injected and non-PE companies

	2.5%	97.5%
Intercept	-4.110204e+05	4.5647e+05
PE_inj	-4.0485e+05	3.7642e+05
Net_income_prior	3.9858e-01	6.6311e-01
Assets_post	2.8233e-01	4.6794e-01
Assets_prior	-2.4421e-01	-1.1259e-02
Liabilities_post	-1.0211e+00	-6.7517e-01
Liabilities_prior	3.2977e-01	7.2669e-01
IT	-2.3885e+05	7.3068e+05
Construction	-2.2736e+05	8.6943e+05
Healthcare	-3.9922e+05	8.2974e+05

Confidence intervals for assessing the precision and significance of the estimated coefficients for PE-injected and acquired companies

	2.5%	97.5%
Intercept	-6.8623e+05	2.2783e+05
PE_acq	-4.5331e+05	7.6442e+05
Net_income_prior	7.1382e-01	9.9840e-01
Assets_post	1.1138e-02	1.7879e-01
Assets_prior	-2.2019e-01	-2.3138e-02
Liabilities_post	-4.2860e-01	-2.2091e-01
Liabilities_prior	-1.8572e-01	3.5860e-01
IT	-6.6420e+05	1.8695e+06
Construction	-8.8256e+04	9.0797e+05
Healthcare	-2.6882e+05	7.4320e+05



Confidence intervals for assessing the precision and significance of the estimated coefficients for non-PE and acquired companies

	2.5%	97.5%
Intercept	-3.9008e+05	4.3553e+05
PE_acq	-3.5518e+05	3.2674e+05
Net_income_prior	3.9808e-01	6.6361e-01
Assets_post	2.9078e-01	4.5949e-01
Assets_prior	-2.4284e-01	-1.2633e-02
Liabilities_post	-9.9468e-01	-7.0168e-01
Liabilities_prior	3.4442e-01	7.1204e-01
IT	-2.3394e+05	7.2577e+05
Construction	-2.3277e+05	8.7483e+05
Healthcare	-3.7619e+05	8.0671e+05