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The Differential Impact of Private Equity Takeovers in Capital-Intensive Industries

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Abstract

Private equity (PE) firms have been researched for a long time as they take up more prominent spaces in the headlines with their impressive returns. Extensive research is conducted to understand if such firms contribute to the operation and profits of the target companies, and the general consensus seems to be positive. This is why it is of interest to understand how these value add methods work and how are they adapted per industry. By analyzing data from European and UK firms involved in PE buyouts between 2009 and 2023, this study aims to address a gap in the existing literature by exploring the industry-specific value-add strategies employed by PE firms. An Ordinary Least Squares (OLS) analysis is conducted to understand the changes a target firm goes through after a buyout. The results portray that labor-heavy industries experience significant changes in their employee count and wages whilst capital-heavy sectors see notable negative changes in their sales statistics. This shows that the PE firms employ various value enhancement strategies accommodating for the nature of the industry of the firm, providing new insights into the diverse strategies of PE investments.

Keywords— Private Equity, Buyouts, Corporate Governance, Value-add Strategies, Industry Characteristics

JEL Classification: G24, G34

Contents

1 Introduction

Private equity (PE) firms are playing an increasingly important role in the finance sector, leading to extensive research on their impact. It is shown that private equity firms lead to improvements in the operations of the companies which are reflected through different characteristics such as profitability, productivity, and employment. These improvements are facilitated by PE firms utilizing market timing and their industry expertise as stated in Kaplan and Strömberg (2009). While there are numerous research conducted to understand if PE firms create value on the companies they take over, there are limited research regarding whether this value-add strategies differ across geographies or industries. This paper aims to address this gap by analyzing the changes that companies undergo after a PE takeover, particularly in different industries. I show that firms operating in capital-intensive industries such as mining and transportation indeed undergo different or stronger changes compared to labor-intensive sectors. Additionally, most of the papers written in the space are at least 5 years old creating a need for more recent researches. Furthermore, many papers work with small number of data due to the challenges with finding high quality data. The paper also tries to accommodate for these shortcomings by utilizing a dataset with approximately 66,000 observations although the unbalanced panel problem maintains regardless of the observation count.

The paper is inspired by Bernstein et al. (2017), which demonstrates that private equity activity in an industry leads to faster growth in that industry. Additionally, the study by Breuer (2021) investigates the impact of firms' reporting mandates on industry-wide allocation. These studies suggest that there is potential to delve deeper into the effects of PE firms on industries, which is the focus of this paper.

I gather the data from Orbis M&A where I find PE buy-out deals between 2009-2023 in Europe and the UK. I only use the data regarding completed deals to avoid noise in the observations. After getting the identification numbers of the target firms in these deals, I use these numbers to get the performance metrics and balance sheet information of these target firms from Bureau van Dijk. However, this raises the concern that the data might not be fully representative as bigger firms have stronger liabilities to report their metrics. Also, we see that the observation count increases as the years progress, especially around 2017-2022. Guo et al. (2011) points that the results of the deals can not be understood well and leads to bias in the results if the companies do not have at least 3 years of observations after the deal. This seems to be a sufficient time frame for management to implement changes and the effects of those changes to be observable. Thus, I make sure that there are 4 years of observations for each company before and after the deal to minimize this bias.

I execute two firm-level regressions for the analysis. One to understand the effect of PE firms on all companies after the deal. The other one to understand how these effects differ for the companies in capital-heavy industries. In order to account for the differences across countries and industries I employ country, firm, industry, and year fixed effects.

The results show that indeed, there is a difference in the ways CAPEX intensive firms experience the PE deals. Namely, they have a 9% higher increase in total assets, 18% lower

returns on cash generated by sales and 11% lower sales rates than the general effects of PE firms on all companies. This suggests that PE firms account for the unique needs of distinct industries. These conclusions align with existing literature such as Bloom et al. (2015) which supports the positive changes implemented by PE firms.

However, there are limitations with the conducted research as all company performance metrics are linked to each other, possibly causing endogeneity issues. This is avoided by employing fixed effects and interaction term in the analysis. The reverse causality question also arises as it could be that the PE firms strategically choose firms which have promising futures. This concern is also mitigated since we see significant differences in company metrics after the deal which shows that the PE firms make notable changes. Furthermore, academic literature like Gompers et al. (2016) also support the view that PE firms bring valuable information to the table, helping companies improve their operations and valuations on a remarkable level.

This paper takes the discussion regarding the value-add methods of PE firms to the next level by assessing how they vary in companies with different natures. The rest of the paper is organized as follows: Section 2 presents the base of the theoretical framework, Section 3 explains how the data was gathered, Section 4 dives deep into the methodology used, results are presented in Section 5, Section 6 concludes the paper, and limitations are discussed in Section 7.

2 Theoretical Framework

Since the mid-1990s, the effects of private equity firms have been more pronounced and recognized by governments globally. Especially buyout deals experienced a rise in the mid-2000s as explained in Kaplan and Strömberg (2009) and continued to take an important spot across industries. One area of interest is if PE firms actually add value to companies they take over. Many studies favor PE takeovers because they are shown to improve the overall health and value of the firms. For example, Guo et al. (2011) show that after the buyout, companies show large increases in the total value. This improvement is not only limited to finances of the firm but extend to all levels. As highlighted in Bloom et al. (2015), PE owned firms have better management than other private firms. This shows that PE expertise helps companies identify their weaknesses and improve them by aligning management incentives with shareholder incentives. However, there is the concern that PE firms may choose companies that already have good finances and management. To address this possibility, Bernstein et al. (2017) utilizes a twice-lagged measure and obtains similar results, thereby mitigating the influence of PE firms choosing companies with higher potential growth. In my own research, I introduce a dummy variable to illustrate differences in the firms post-acquisition, thereby addressing this concern.

To further see the effects of the PE takeovers I look at academia where Robinson and Sensoy (2013) highlights that PE funds deliver high returns that beat public equity markets. This raises the question: How do PE firms achieve to increase value in the firms they buy? To this question, Guo et al. (2011) gives 3 potential answers. Firstly, they can increase the operating performance of companies. Second value creation method is utilizing market timing and valuation. Lastly, they can use larger tax shields to their advantage. In this paper, I focus on the operating performance and leverage of firms. Furthermore, Boucly et al. (2011) finds that firms that go through a buyout experiences growth in employment, sales, and capital employed. To test this, I look at the total assets, cash, and employment characteristics of the firms and compare them with the before deal values. Supporting this perspective, Kaplan (1989) states that target companies demonstrate higher cash flows and lower capital expenditures after the deal.

Taking these conclusions to a broader level, Bernstein et al. (2017) indicates that these improvements are not only on a firm level but affect the whole industry invested positively. This inspires the research to assess how PE firms adapt their value-add methods to accommodate for the industries' unique needs. Specifically, how do firms operating in capital intensive industries change after a buyout? To answer this question, I initially dive deeper into the characteristics of the capital-intensive industries. Then it becomes clearer what firms operating in capital-heavy industries require differently from the firm operating in labor-intensive industries.

2.1 Capital Intensive Industries

One interesting area to look at is how these value-add strategies of PE firms differ within various industries. More specifically, how do the firm characteristics change for companies that work in industries that have different natures? To investigate this further, I look at the

differences between capital intensive and labor intensive companies. The general problem with capital intensive industries is the low returns on investments since they have large investment and maintaining costs as stated in Komonen et al. (2006). Thus, the approach of the PE firm should accommodate for the issue and the consequences that root from the capital-heavy nature of these industries.

Capital intensive companies require large amounts of capital invested into their properties such as machinery or land. Such industries include retail trading, telecommunication, transportation, and mining. The high operating leverage changes the managing strategies of these firms since they are more vulnerable to external factors. Even though their sales drop, they are still liable to pay for their fixed assets which creates the need for unique management techniques and high-grade risk mitigation strategies. Some improvement methods are presented in Rousseau and Caruso (2015). These include cutting costs while maintaining the production capacity, choosing the manufacturing locations strategically, utilizing mergers and acquisitions to accommodate strategic growth, and founding a service angle within the industry. These strategies contrast with those in labor-intensive industries, where the focus is more on workforce development. In such firms, the priority is to improve the working conditions and employee productivity since their success is more dependent on these factors. Thus I expect to see a positive difference in the firms across various industries after the deal given the successful track records of PE firms meeting unique needs of companies. So my research question becomes: **How do PE firms create value in capital intensive companies?**.

To answer this, I first take a look at how the firms' balance sheet characteristics change after the take over to understand how the big picture changes. Afterwards, I move forward to analysing how this changes look like in capital dependent sectors. Looking at the researches, I expect overall health and total value of the firms to increase over time due to expertise of PE firms. With regards to CAPEX heavy industries, I expect to see a bigger change in total assets and sales compared to other sectors given the reducing cost strategy suggested for such industries in Rousseau and Caruso (2015). Therefore, in line with current research, the results should show higher sales and lower material costs, consequently leading to higher total assets.

This paper fills a gap in the academia as there are limited number of papers investigating the differences in strategies of PE firms across industries. I aim to shed some light into the results of these performance enhancement techniques employed by these firms and how they might vary between industries with different characteristics.

3 Data

For the analysis of the research question at hand, I assess a deal data covering the years 2009-2023. To obtain the institutional buy-out deal data, I utilize the Orbis M&A database. Subsequently, after exporting this data, the Bureau van Dijk (BvD) identification numbers of the target companies are used to get company metrics such as the total assets, cost of employees, sales and more. This enabled me to dive into the differences in the post-buyout period. Most importantly, the industry SIC codes of these firms are extracted to observe the effects of the PE firms in companies with different industries. It is crucial to note one shortcoming of this approach, which is the missing data values and the possible bias this might cause. Bigger firms have stronger reporting responsibilities which might lead to skewed results in a way that mainly bigger companies are represented and the results are not necessarily as inclusive as it would ideally be. The data consists of European and British companies. The sample consists of 7,516 firms. Majority of the companies are in the UK with 24%, this is followed by French companies which make up 12% of the companies. The distribution of the companies per countries is shown in Table 1. It includes data from a vast number of countries across Europe, presenting a valuable variety in the sample. While this variety is useful for the research, country fixed effects are employed to account for the heteroskedasticity across countries.

There is a total of 65,352 observations throughout the data sample of 14 years. However, in the regression analysis, the number of observations varies due to missing data problem. This probably leads to a selection bias in the data as firms with better finances or larger sizes may have bigger incentives to report their metrics. Nonetheless, the vast number of observations helps to partially lessen this effect.

The reason for choosing the year 2009 as the starting data roots from the financial crisis in 2008. In order to get a more clear view on how the companies evolve after buy-out, the crisis is avoided in the dataset since it may introduce irregularities. More details regarding the observation years can be seen in Table 2. It is shown that the observation count is more focused around 2016-2021. This is likely due to increasing incorporation of technology and changing reporting regulations. Also databases such as BvD are checked regularly to correct past entries that may be mistaken. Therefore, the data is expected to be high-quality.

The distribution of deals over the years is shown in Figure 1. There are a total of 7,516 deals. It is seen that the number of deals increase consistently until 2020 where a big drop is shown. This is likely due to the corona crisis where the private equity space took a break from the investments given everything was unstable. This drop is compensated by the large increase in deal numbers in 2021 when many regulations were introduced, followed by a drop in 2022 and 2023. The decrease can be explained by the recession concerns throughout the world and the long-lasting effects of the corona pandemic. The number values of the deals per year can be seen in Table 2. However, as the paper only takes deals that have at least 4 years of observations after, the effects of the pandemic are not strongly present in the analysis. The choice of 4 years roots from Valkama et al. (2013) where it is shown that the average holding period of PE firms is 43 months which corresponds to 3.6 years. I round this to 4 years with

Table 1: Panel A: Countries

	Count	Percentage
Albania	2	0.03
Austria	58	0.77
Belarus	1	0.01
Belgium	216	2.87
Bulgaria	10	0.13
Croatia	19	0.25
Cyprus	7	0.09
Czech Republic	112	1.49
Denmark	296	3.94
Estonia	31	0.41
Finland	243	3.23
France	938	12.48
Germany	685	9.11
Greece	11	0.15
Hungary	26	0.35
Iceland	6	0.08
Ireland	82	1.09
Italy	691	9.19
Latvia	14	0.19
Liechtenstein	1	0.01
Lithuania	21	0.28
Luxembourg	41	0.55
Malta	4	0.05
Monaco	3	0.04
Netherlands	460	6.12
North Macedonia	1	0.01
Norway	174	2.32
Poland	219	2.91
Portugal	116	1.54
Republic of Moldova	1	0.01
Romania	44	0.59
Russian Federation	53	0.71
Serbia	8	0.11
Slovakia	21	0.28
Slovenia	21	0.28
Spain	630	8.38
Sweden	417	5.55
Switzerland	2	0.03
Turkey	11	0.15
Ukraine	14	0.19
United Kingdom	1,806	24.03
Total	7,516	100.00

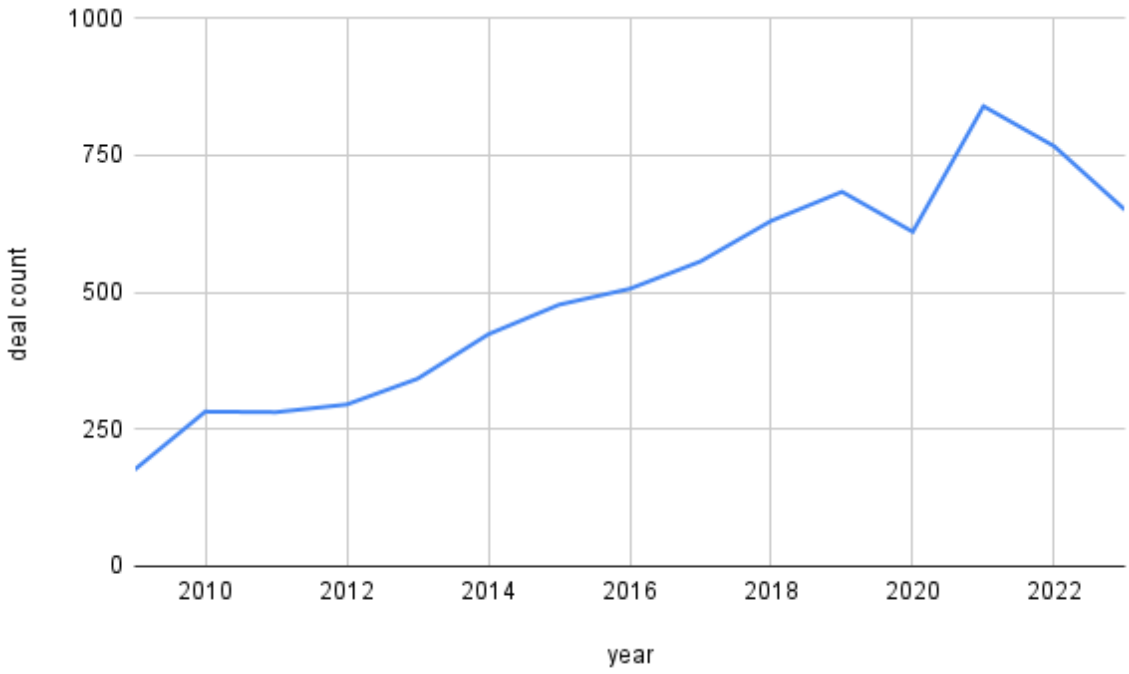

Figure 1: Number of deals in the data sample

the purpose of capturing the full impact of the holding period on the target company.

3.1 Industry Characteristics

The industries of the companies are identified by the SIC codes. The research is done under the primary industries so the one-digit SIC code is sufficient. These range from 1 to 9 and are defined in the Standard Industrial Classification Manual as below:

1. Agriculture, Forestry, and Fishing
2. Mining
3. Construction
4. Manufacturing
5. Transportation, Communications, Electric, Gas, and Sanitary Services
6. Wholesale Trade
7. Retail Trade
8. Finance, Insurance, and Real Estate
9. Services

Table 2: Panel B: Years

	Count	Percentage
2009	176	2.34
2010	282	3.75
2011	281	3.74
2012	295	3.92
2013	342	4.55
2014	423	5.56
2015	477	6.35
2016	506	6.73
2017	556	7.40
2018	630	8.38
2019	683	9.09
2020	610	8.12
2021	839	11.16
2022	766	10.19
2023	650	8.65
Total	7,516	100.00

Majority of the companies in the dataset belong to 8th industry, Finance, Insurance and Real Estate by 20%. This is followed by 7th industry which is Retail Trade. The details of the number of companies in each industry is shown in Table 3. Less than 1% of the total database belongs to the Agriculture sector indicating that it does not highly effect the analysis. The reason why 1st industry is not highly represented in the data could be due to limitations in the profit margins, challenges with law, dependence on natural and weather conditions, and high ratio of family owned businesses. Due to these reasons, the companies may not have the incentive to provide consistent statements about their balance sheets.

Table 3: Panel C: 1-digit SIC codes

	Count	Percentage
1	35	0.47
2	270	3.62
3	813	10.90
4	1,048	14.05
5	551	7.39
6	991	13.29
7	1,420	19.04
8	1,530	20.52
9	799	10.71
Total	7,457	100.00

The expectation of this paper is that companies in different industries have different dynamics that respond to various value add methods of private equity companies uniquely. To understand these industries further, I perform some analyses. For these analyses, I group firms according to the industry they belong in to visualize the patterns in each industry. For example,

throughout the years it is seen that the firms operating in Manufacturing industry showed the highest average sales growth amongst other industries.

To understand their metrics further a performance measure calculated as $PerformanceMeasure = EBIT/TotalAssets$ is used. This measure shows that Retail Trade has lower returns on assets. There could be many underlying reasons for this while some that come to mind relies on the fact that it is a capital expenditures (CAPEX) heavy sector. Being CAPEX heavy indicates that there are possibly large depreciation costs associated with the storage spaces used as well as high operating costs, consequently leading to a lower total asset and EBIT values. The results are presented in the Appendix. After calculating the capital-intensiveness of the firms, I see that 49.94% of the observations belong to this classification. Graph 4 shows how capital intensive an industry is by dividing the fixed assets of the firms by the operational returns. This definition stems from Maxim (2021) where capital intensity is defined as total assets required to generate a unit turnover. Instead of total assets, I use fixed assets because it provides a more on point definition since it includes long-term investments in PP&E that directly contributes to production. Total assets may introduce some noise and irrelevant assets that provides a more cloudy definition. I calculate the industry average and then take the natural logarithm of this ratio for easier interpretation of the graph. Consistent with the common knowledge, transportation & telecommunication and mining stand out as capital intensive industries. Retail trade is the most capital-dependent industry amongst all. Even though there are mixed opinions on this as the industry is also dependent on the employees, capital-heaviness of the industry is supported in the academia by Bhalla (1970) where it is shown that retail trade is more capital-intensive than commonly believed. There are many big costs involved in inventories, transportation, and commercial spaces making retail trade a suitable candidate for capital-heavy sectors.

On the other hand, construction and agriculture are seen as labor-intensive as further supported by the Graph 4. Even though there are costs involved with the production, the majority of the work is carried by manual labor. Manufacturing strikes the eye by being the most labor-intensive sector. This is likely because it involves many different subsections within that are not capital-intensive. It is further argued that manufacturing is indeed a labor-intensive sector that requires improvements within the working environment, skills of the employees, and R&D developments to further improve productivity in Islam and Syed Shazali (2011).

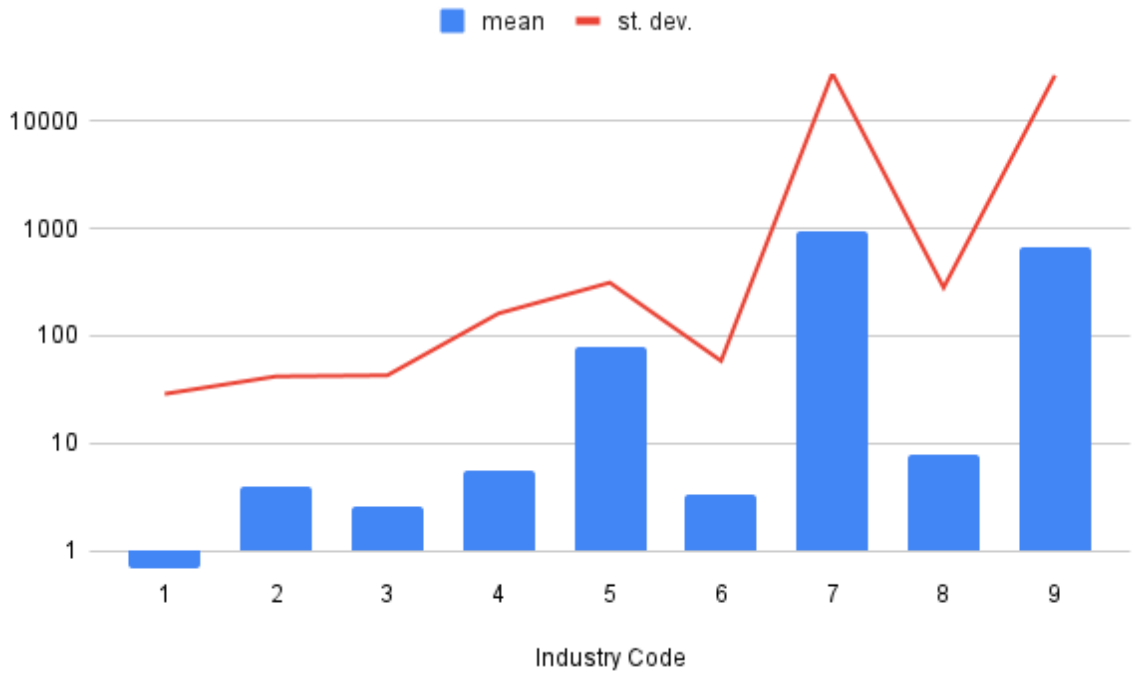

Figure 2: Leverage of Industries

The graph is displayed at a log level for easier interpretation.

Tobin's Q values are calculated for every firm in each industry then averaged and displayed in Table 4. It is seen that all values are very close to one, indicating accurate pricing throughout the dataset. This suggests that the market is fair in valuing these companies. To understand the nature of the industries further, I look at profit margin and leverage of the industries. They are portrayed in Figure 3 and 2 respectively. The industries that have high profit margins and leverage are consistent with industries that have high capital intensity. Especially industry 7 stands out in all three figures, followed by industry 5. Services industry is another capital intensive industry that also has high leverage. It may feel contradictory that firms in the Retail Trade space (Industry 7) has the highest profit margins and the lowest returns on assets. This roots from the capital-intensive nature of their industry as even though they show high and stable revenues, large asset bases are required to maintain this performance which consequently reduces the return on assets.

It follows that capital intensive companies have higher leverage since they require higher financial support to maintain their PP&E. Furthermore, they can utilize the debt to benefit from tax shields as stated in Stickney and McGee (1982). They can put the borrowed money into their firms to increase their operational effectiveness thus it is of more importance for capital-intensive industries compared to labor-intensive ones. They have a higher amount of machinery that depreciates thus requiring costly capital investments to maintain. Hence, the higher debt amount is required to sustain the business model for companies in such industries.

Table 4: Tobin's Q Values

Ind	Mean	Std. Dev.
1	0.99	0.03
2	0.99	0.00
3	0.99	0.01
4	1.00	0.07
5	1.00	0.00
6	1.00	0.02
7	0.99	0.08
8	0.99	0.04
9	0.99	0.02

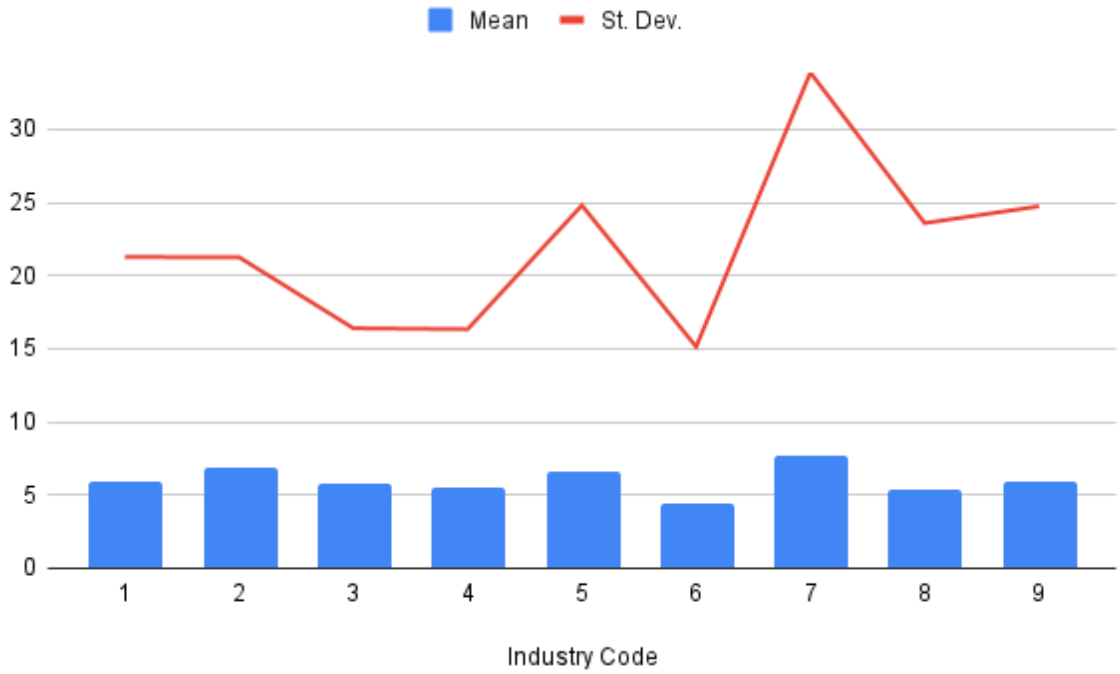

Figure 3: Profit Margin of Industries

The graph is displayed at a log level for easier interpretation.

Additionally, Figure 3 reveals that there is no major difference in profit margins between industries. However, industries 7, 5, 9, and 2 show higher profit margins compared to other industries. This is aligned with the capital-heavy sectors shown in Figure 4. Therefore, it is seen that firms working in the CAPEX-heavy sectors show higher profits compared to firms operating in other industries. Forslid and Okubo (2011) incorporates scale economies into his research to show that large capital intensive companies benefit from reduced costs in their operations such as transportation. This view can contribute to explaining the higher profits margins achieved by such firms.

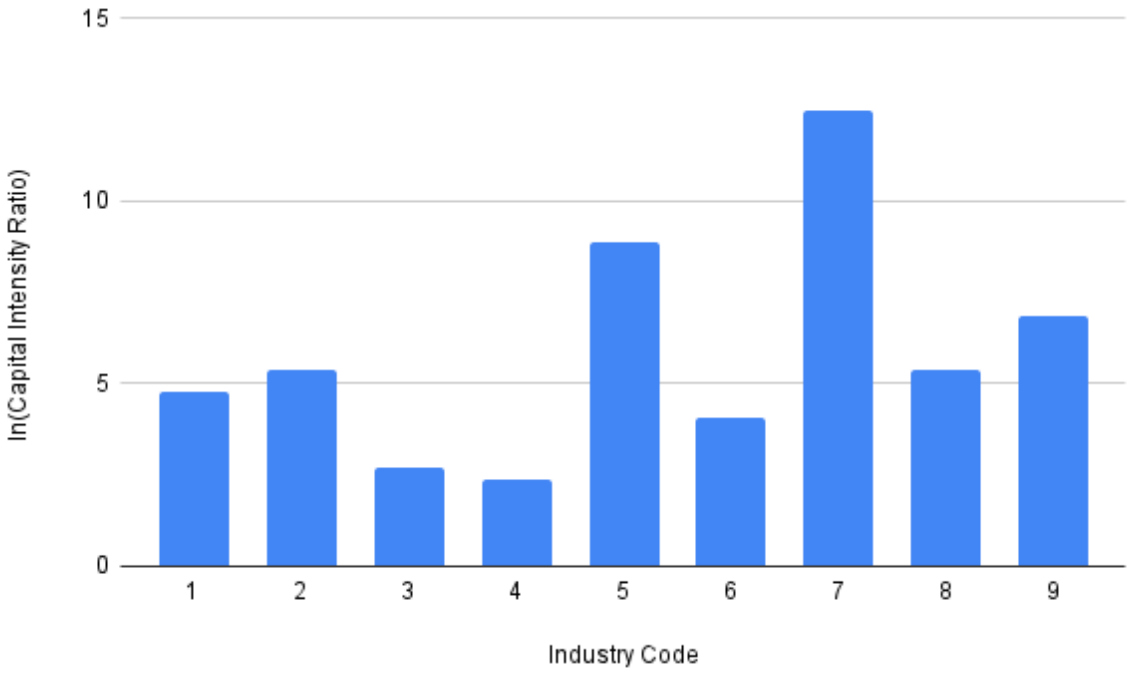

Figure 4: Capital Intensity of Industries

Thus, it is seen from the Graph 4 and literature that there are fundamental differences between capital and labor intensive industries, making it suitable for alternative improvement methods within. While for labor-intensive industries the focus is more on employee skills and effectiveness, the capital-intensive industries mainly look for ways to minimize costs. I will further examine these expectations to see if PE firms also notice these variations and cater to such deviations.

Table 5: 1-digit SIC codes observation count

	Count	Percentage
1	294	0.45
2	2,466	3.77
3	7,577	11.59
4	9,614	14.71
5	4,962	7.59
6	8,884	13.59
7	11,089	16.97
8	13,455	20.59
9	7,011	10.73
Total	65,352	100.00

One worry is capital-heavy industries having higher observation count than other industries, skewing the results. This situation likely disrupts the accuracy of the result by underestimating

the changes the industries go through separate from the general effects. Fortunately, it is not the case as seen in Table 5. Except for the industry 1 which also has low number of companies belonging to this industry in the dataset, there seems to be no concerning differences in the observation count amongst different sectors. This allows the results to be driven by different features of the industries rather than unbalanced reporting behaviors across companies.

3.2 Value-Add Methods

While they are linked, there are many ways to enhance performance within a firm. Biesinger et al. (2020) highlights that the success of the PE firm lies on the customized value creation strategy followed by correct execution. I dive deeper into what the possible value add methods could be in this section.

1. **Profitability**: Arguably, the most fundamental motivation underlying a buyout deal is to increase profits within the target firm. Many papers such as Boucly et al. (2011) indicate that PE firms achieve to create higher profit margins in the firms they take over during the holding period. To assess this variable, I look at total returns and returns on total assets in the regressions.

2. **Managerial Improvements**: One of the most crucial ways of boosting a firm lies in governance engineering. By ensuring that the management team has the required qualifications and incentives, PE firms can enrich the target company. One tool of such engineering is leverage. As explained in Kaplan and Strömberg (2009), it imposes a financial constraint on managers which prevents them from making redundant spending as they have payments to meet. Additionally, leverage can help a company in the shape of a tax deductible.

3. **Increased sales**: Acharya et al. (2013) exhibit that the sales and operating margins improve after the PE firms step in. Sales and cash values are displayed in the data which help me identify if this holds and differs between industries with distinct aspects.

4. **Add-on investments**: One way to pursue growth is through inorganic methods e.g. mergers&acquisitions after the deal. Hammer et al. (2017) shows this as a valid and successful performance enhancement method. However, the data is limited and does not allow to examine if there are any further deals executed by the target firms after the buyout. Alternatively, I can assess the cash amount as it is the crucial element in executing deals. If the cash levels are lower after the deal, it can be a possible explanation that an add-on investment took place.

5. **Employment**: Goergen et al. (2014) displays that after the deal, the employee count drops and wages decrease as a way to reduce costs. Labor force is not as crucial for capital-intensive industries so it is of interest to see if this is still the case for CAPEX heavy firms. The BvD data provides with the employee number and cost of employees, allowing me to assess this further.

4 Methodology

The analysis to see the effects of PE firms after a deal is executed in two steps. To begin with, I look how the firm balance sheet variables change after the buyout. This is crucial to understand the translation of the strategies executed by the PE firms. Keeping in mind papers like Guo et al. (2011) and Gompers et al. (2016) the expectation is to see positive growth and revenue whilst reducing costs. Once the overall effect of the deal is established, I move the analysis to the next level by incorporating the capital heaviness of an industry. This is to observe how these changes are pronounced in CAPEX focused sectors. I employ OLS regressions with fixed effects to analyze the effects of the deal on the companies similarly to Rajan and Zingales (1996). It is a commonly used linear regression method to show the relationship between the dependent variable i.e. company characteristics and the takeover by minimizing the square of the residuals. Thus the result of the regressions show the strength of the relationship between the take-over and the firm characteristics.

4.1 Overall effect of PE firms

To assess the differences in the firms after the deal, I create a POST dummy that takes the value 1 once the deal is executed and is 0 otherwise. For the initial analysis, I look at the effect of the deal on the firms. To control for the variation across countries and industries, I add industry-year, and country fixed effects to the regressions. All standard errors throughout the paper are clustered on a firm level. In both steps, I ensure that the observations included are 4 years before and after the deal to see the effect of the deal. Since the data covers years 2009-2023, there are deals executed in 2020-2023 which are not included in the regressions as the companies need at least 3 years to realize the effects of the deals. This is to avoid noises in the data that could lead to biased results.

Initially, I execute the following regression to understand the relationship between the firm characteristics and the deal:

$$Y_{ct} = \alpha + \beta_1 POST_{ct} + \eta_i + \eta_t + \eta_c + \epsilon_{ct} \tag{1}$$

Where Y_{ct} is the variable of interest e.g. total assets. α is the coefficient; η_i, η_t, and η_c are the industry, year, and firm fixed effects respectively.

4.2 Effects of PE firms on Capital Intensive Industries

For the second part, I take inspiration from Rajan and Zingales (1996) where they create a external dependence of an industry. Similarly I calculate the capital dependence of an industry.

To understand the differences in the deal effect in capital intensive industries, I create a Capital_Heavy_Dummy. For this variable, I initially calculated how capital heavy an industry is. To calculate capital-intensity ratio, I use the following commonly accepted formula:

$$Capital\ Intensity\ Ratio = \frac{TotalFixedAssets}{OperatingRevenue} \tag{2}$$

Afterwards, I calculate the median value of the Capital Intensity Ratio. Using this median, I create dummy variable Capital_Heavy_Dummy that takes the value 1 if the Capital Intensity Ratio of the industry is higher than the median value. This indicates if a firm belongs to an capital-intensive industry or not. I further interact this variable with the $POST_{ct}$ similarly to the difference-in-difference analysis employed in Antoni et al. (2019). Thus, I expect the interaction term to help minimize the endogeneity concerns.

The Capital_Heavy_Dummy becomes the interaction variable I use to assess the effect of the PE firms on the different industry types. Again, firm and industry-year fixed are incorporated to account for the unobserved heteroskedasticity among these variables. Following regression is used to see the contribution of PE firms in capital-intensive industries:

$$Y_{ct} = \alpha + \beta_1 POST_{ct} + \beta_2 POST_{ct} \times Capital\_Heavy\_Dummy_{ct} + \eta_i + \eta_t + \eta_c + \epsilon_{ct} \quad (3)$$

Similarly, Y_{ct} is the firm characteristic we are interested in, η_i, η_t, and η_c are the industry, year, and firm fixed effects. β_2 is the coefficient of interest that explains how the firm characteristic changes after a deal for a capital intensive industry.

The firm performance variables are used after taking the natural logarithm of the values to achieve a linear-relationship that is easier to interpret. The results of the regressions are further discussed in the next chapter.

5 Results

5.1 General Effect of PE Takeover

I start by observing the overall effect of PE firms on the operating performance on companies. Table presents the results of these regressions. Results that are significant on the 5% and 10% levels are indicated by *** and ** respectively. To have a clearer picture on the influence of PE firms, I collect the value add methods under 3 different categories: leverage, operating performance, and employment.

1. **Leverage** : As the name suggests, leverage looks at the debt taken to invest in the firm. As suggested in Kaplan and Strömberg (2009), this can have implications for the management of the firm. Since it effects the interest and tax levels of a company, I look into them as well.

2. **Operating Performance** : For the operating performance, I look at the changes in the sales and assets of the firm. A firm with successful operations should yield increasing sales and valuation, reflected in these variables.

3. **Employment** : Employment covers variables regarding the topic. Since the literature suggests job and wage cuts after the deal to minimize the costs, I look if this is the case for the dataset.

The definitions of the variables used can be found in the Appendix.

5.1.1 Leverage

Leverage of a firm looks at the amount of debt obtained to make investments to improve the efficiency or profitability of the company. Since it reduces the cash available, managers tend to make more conscious spending. Rooting from the view of Jensen (1986), leverage is expected to reduce the free cash flow available for inefficient investments by managers, thereby improving the firm's overall financial health. Also, the paper finds that leverage-increasing deals usually lead to financially positive outcomes. Moreover, debt is known for its tax-reducing properties so lower tax levels is also expected. Given the higher leverage ratio, the interest payments should also increase.

Nasimi (2016) reveals that the capital structure of the firms, especially interest cover and debt to equity ratio, have significant effects on the companies' performance and profitability. Interest cover is shown to have a positive relationship with return on assets and return on equity thus motivates the choice of the variable in the regressions.

Table 6 gives supporting results with the literature. Leverage indeed increases by 7.82% however not significant at 5% level. This suggests that the deal does not have strong effects on the leverage levels.

On the other hand, we see significant changes in the interest front of the company. Interest cover, used to measure a firm's capability to pay off its outstanding debt, decreases significantly

after the deal. Its calculation involves dividing the company's EBIT (earnings before interest and taxes) value by its interest expenses so a higher value is preferred. The negative change in this coefficient suggests increasing interest payments which is supported by the positive, significant coefficient of the interest payments in Table 6. These findings suggest that the debt levels of the companies increase significantly after the deal. This may feel contradictory since the change in leverage is not significant. However, it is not necessarily the case because leverage is calculated as $\frac{Total\ Debt}{Total\ Equity}$ so it may be that the levels of equity and debt vary throughout the dataset such that the overall effect is not significant. Moreover, it is worthy of taking a look at the observation counts of Table 6. Leverage and interest paid have the highest number of observations which may effect the results through selection bias.

Even though the coefficient of the taxation variable is not significant, it is negative which helps me draw a general picture of the debt-taking behavior of companies after the deal. The firms take on more debt after the deal which imposes financial liabilities on the management, nudging them to make more responsible investments. This supports the views of Gul (2001) where interest payment requirements help mitigate agency problems and align incentives of management and shareholders. High debt levels also have the benefit of reducing tax through tax shields. Table 6 is consistent with this by showing a decrease in tax levels although this is hard to interpret as it is not significant and tax levels may have many underlying reasons. Similar to leverage, it is linked to both equity and debt levels which may vary in each industry.

Overall, we see results aligned with the literature such as Jensen (1986) and Gul (2001) where it is shown that increased levels of debt helps firms monitor governance better. Kaplan and Strömberg (2009) indicated that this was a method employed by PE firms to increase value which I confirm looking at the results of the analysis.

Table 6: Effects on Leverage

	Leverage %	ln_IC	ln_INTE	ln_TAXA
POST	7.82	-0.26***	0.18***	-0.09
t-statistics	1.54	-3.83	3.14	-1.38
N	12,356	7,174	11,572	8,673
R^2	0.63	0.73	0.82	0.77
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

5.1.2 Operating Performance

Operating performance of the firm arguably is the most important element of a company. It involves the production, valuation, and sales of the firm. Table 7 presents the findings of the analysis. To start from the first column, a positive coefficient for total assets strikes the eye.

It indicates that overall, the total assets of the firms increase by 24% after the deal. This is a big increase that is significant at the 5% level following the findings of Guo et al. (2011). The investment firms helps the firms enhance their asset base as a part of their after-buyout strategy. There could be many underlying reasons to this increase, the first two that comes to mind is investments in assets that leads to a larger asset base and strategic add-on investments as suggested in Hammer et al. (2017). Either way, it can be concluded that the deal provides the target firms with strategies leading to a higher holdings.

This result is endorsed by the 39% increase in cash holdings observed after the deal. This is again significant at a 5% level, suggesting successful implementation of financial enhancement methods by the PE firms. There may be different implications of the cash holdings as Kaplan and Strömberg (2009) propose that the buyouts may improve short term cash flows while damaging future cash flows since the surplus cash should be put into use to further increase the firm value. One example of the ways the cash could be put into use is through R%D as displayed in Lerner et al. (2011). However, the number of observations that involve R&D is limited with 795 so the analysis could not be conducted for this paper to confirm or reject this view.

Overall, as this analysis looks at the short term effects, it is consistent with literature that the cash flows increased. Thus, the PE firms execute efficient cost saving and improving productivity strategies that result in increased assets and cash.

I am inspired by Kaplan and Strömberg (2009) to look at cash flow to sales ratio since the authors state that it increases by 40% after the deal. Looking at Table 7, it is seen that the results are similar: the ratio increases by 33% after the PE takeover. This is supporting of the success of the PE firms in operational performance of the firms. They indeed engage strategic approaches that convert sales into cash, boosting the value of the company.

Table 7: Effects on Operating Performance

	ln_TOAS	ln_TURN	ln_CASH	ln_CashToSales
POST	0.24***	0.01	0.39***	0.33***
t-statistics	7.03	0.24	6.55	4.64
N	15,771	9,365	14,664	9,070
R^2	0.90	0.90	0.74	0.64
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

5.1.3 Employment

The general consensus on the impact of takeovers on employment suggests job and wage cuts for cost reducing reasons as stated in Goergen et al. (2014). On the other hand, Lichtenberg and Siegel (1990) finds that the wages increase after the buyout and even though there are

reductions in the labor, it is at a slower pace than before the deal. So to understand which side my results coincides with, I look at Table 8 where it is seen that all the coefficients are positive suggesting increases in employment and wages.

To take a deeper look into the regression, it appears that although the number of employees increases, the change is very small and not significant, indicating it doesn't have a substantial impact on the overall data sample. However, the cost of employees increase significantly suggesting a wage increase per employee. This is consistent with the coefficient of ln_ACE where the cost of employees per year is shown. This confirms that the the employees receive more payments in however form it may be such as wages, compensation or benefits after the PE takeover.

This view is potentially further supported by the total assets per employee ratio that shows a significant 6% increase after the deal. The firm increases in value which reflects positively on the employees, supporting productivity since the labor is compensated well. This conclusion is supported by Spencer et al. (2016) where it is shown that higher compensation leads to higher productivity of the employees. As a part of their efficiency enhancing strategies, PE firms pay attention to the employees ensuring that they operate smoothly, contributing to the overall success of the company. Kaplan and Strömberg (2009) backs this up by stating that the empirical evidence shows that PE firms boost economic value by optimizing the employment status of the target companies.

Generally, it can be concluded that the buyouts have significant impact on the employees of the target company. While the result on the employee count is not very clear, it is seen at the Table 8 that the employees receive better compensation after the deal likely due to the better financial status of the company. This shows that PE firms utilize the labor of the firm to increase operational efficiency.

Table 8: Effects on Employment

	ln_EMPL	ln_STAF	ln_ACE	ln_TAPE
POST	0.03	0.06***	0.09***	0.06***
t-statistics	1.49	2.30	8.14	2.37
N	12,247	11,451	10,223	12,038
R^2	0.91	0.90	0.95	0.93
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

5.2 Effect of PE Takeover on Capital-Heavy Sectors

There is no denying that PE firms utilize their expertise to enhance firm value and efficiency. It is shown above that these changes are significant and positive in the general level. In this

section, I look at how these value-add strategies differ for companies in capital-intensive industries. Namely, it is seen that firms working in capital-heavy industries have higher leverages which would probably translate to differences in the incentives of the management. Additionally, from the employees' perspective, labor-intensive sectors, being more reliant on their workforce, are expected to offer better compensation than capital-intensive sectors. Below are the detailed results of these sections.

5.2.1 Leverage

The results of the leverage analysis with the capital-intensive industries is given in Table 9. First thing to notice is that the coefficients of the interaction term are not significant indicating that the effects are not strongly driven in capital-heavy sectors after the deal. On the other hand, the coefficients of the interest cover and interest payments are larger and significant at 5% level meaning that the effects are more pronounced in labor-intensive companies. In Table 6 the interest payments increase by 18% while in Table 9 this increase is seen as 23%. The same pattern goes for the interest cover in the opposite direction. The decrease drops from 26% to 29% in Table 9. This suggests that the effect is more pronounced in labor-dependent companies rather than the capital-heavy ones. Companies that are not as dependent on capital takes on more debt, consequently having higher interest payments to meet and having a more difficult time in covering them.

This result could be justified looking at Figure 2. It is seen that the capital-intensive industries already have high leverage regardless of the takeover since they have high fixed costs to maintain the equipment used. This limits the space available for firms to take on more debt as it increases the riskiness of the company. Thus, given the expertise of the PE firms, they would not put the company in an unstable position.

To summarize, Table 9 reveals that the increase in interest payments after the deal is mainly driven by labor-heavy firms as capital-intensive companies use high leverage regardless of the PE takeover.

Table 9: Leverage vs Capital Intensive Industries

	Leverage %	ln_IC	ln_INTE	ln_TAXA
POST	0.06	-0.29***	0.23***	-0.09
t-statistics	0.92	-3.70	3.23	-1.42
$POST \times Capital\_Heavy\_Dummy$	-0.11	0.08	-0.11	0.03
t-statistics	-1.38	0.82	-1.20	0.34
N	11,226	7,174	11,572	8,673
R^2	0.70	0.73	0.82	0.77
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

5.2.2 Operating Performance

Secondly, I look at how sales and cash generated change in CAPEX-heavy companies, the results are displayed in Table 10. It is seen that the interaction term has significant coefficients at 10% level, suggesting that the deal has notable impact on such companies.

To start with the first column, total assets of capital-dependent companies increase by 9% more compared to companies in other industries. This could suggest higher investment into equipment and plants or efficient cost reducing strategies which yield to successful enhancement of the asset base. Considering the nature of such companies, there is more room for cost saving methods as there are large fixed costs that could be optimized under the PE guidance. This supports the findings of Guo et al. (2011) where the companies' assets increase after a buyout deal.

The sales of the firms of interest decreases by 11% significantly after the deal. This brings the warnings of Rousseau and Caruso (2015) to mind where they state capital heavy companies trying to optimize their efficiency and costs can overlook sales performance. It is possible that while the PE firms try to minimize the costs and increase efficiency they neglect sales. Furthermore, the cash to sales ratio decreases by 18% which follows since both sales and cash coefficients of CAPEX heavy companies are negative. This could suggest that operational efficiency does not reflect into financial gain in the form of cash or sales as Table 10 and 7 points to improvements in these areas are mainly lead by companies operating in other industries.

The CAPEX-intensive companies, as the name suggests require high fixed costs to maintain the machinery and plants. Hence, the negative cash flows and sales observed in capital-intensive firms can be justified by the nature of these firms. They demand significant investments, causing cash to be reinvested into the company to further enhance operations. This differs from other industries since the cash levels increase significantly by 45% after the deal for other companies.

To conclude, Table 10 reveals that sales and cash to sales ratio decreases significantly post-deal for capital-intensive industries which contradicts with the results obtained in Table 7. It shows that capital-intensive companies does not show higher cash reserves after the deal. However, this does not necessarily indicate bad leadership since the cash may be used to invest into the company which can yield higher returns in the coming years. This supports the idea that different industries require different value-add strategies to accommodate for their unique needs as the results seem to be positive for other companies.

Table 10: Operating Performance vs Capital Intensive Industries

	ln_TOAS	ln_TURN	ln_CASH	ln_CashToSales
POST	0.19***	0.06	0.45***	0.41***
t-statistics	5.61	1.47	6.24	4.64
$POST \times Capital\_Heavy\_Dummy$	0.09**	-0.11**	-0.13	-0.18**
t-statistics	1.89	-1.92	-1.50	-1.76
N	15,771	9,365	14,664	9,070
R^2	0.90	0.90	0.74	0.64
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

5.2.3 Employment

Lastly, I look at employment to observe if there is a difference between labor and capital heavy companies. Table 11 displays the results of the analysis. It is seen that while all coefficients of POST variable are significant, none of them are for the interaction term indicating that changes in employment are mostly driven by labor-intensive firms which follows intuitively. Since labor is their main source of power, it makes sense that the PE firms would prioritize the labor force by increasing the number of employees and their wages to increase efficiency and production.

While insignificant, the employment count and cost of employees are negative for the interaction variable which is consistent with Goergen et al. (2014). On the other hand, for other industries both the employee count and costs per employee increases similarly to the general results in Table 8.

I conclude that the deal does not have a notable impact on the employment nature of capital-intensive companies since the results are insignificant. Alternatively, companies in other industries show increases in both employee counts and wages post-deal to increase their labor and consequently, their production. This result proves that PE firms do not follow a single strategy to enhance value in every company. As every company and every industry have different natures, the methods differ accordingly. The core of CAPEX-heavy companies lie in their PP&E thus the investments go to those areas rather than their employees.

Table 11: Effects on Employment vs Capital Heavy Industries

	ln_EMPL	ln_STAF	ln_ACE	ln_TAPE
POST	0.05***	0.08***	0.03***	0.17***
t-statistics	2.10	2.88	2.08	7.09
$POST \times Capital\_Heavy\_Dummy$	-0.03	-0.04	-0.02	0.04
t-statistics	-0.94	-1.08	-1.07	1.19
N	12,247	11,451	10,223	12,038
R^2	0.91	0.90	0.95	0.93
Company FE	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

6 Conclusion

This study investigates the differential impact of PE takeovers in capital-intensive companies, shedding light on the customized strategies employed by PE firms to create value. The analysis spans European and UK firms acquired between 2009-2023 and observations 4 years before and after the deal are taken to fully capture the effect of the takeover.

The findings of the paper shows that investment firms contribute to the acquired companies by expanding their asset base and increasing cash holdings. These results builds on the researches of Kaplan (1989) and more whom finds that PE companies contribute the firms they take-over by increasing their operations and minimizing their costs.

Furthermore, it is seen that these value-add strategies differ for companies in CAPEX-heavy sectors. Capital-heavy companies have different dynamics that allow for larger improvements within their PP&E. The results show that PE firms utilize this gap by further increasing the total assets of such firms by 9% compared to the overall level. Interestingly, a significant drop in the sales levels is shown in the capital-intensive companies compared to the insignificant positive change in other industries. As the priority is to minimize costs and increase optimization, sales seems to be neglected in the post-deal period. Moreover, cash levels increase significantly for companies in other sectors whereas this effect is not significant for capital-dependent firms. This result raises the possibility that CAPEX-heavy target firms invests excess cash into the PP&E improvements although further research is required to conclude this. Finally, notable increases in the compensation of employees is seen in the overall level while this is not pronounced in capital-heavy companies. This suggests that the effect is mainly driven by labor-intensive companies as they are more reliant on the productivity of their human force.

These results suggest that PE firms indeed contribute to the company they take over positively aligning with the academia. Moreover, this contribution differs per the characteristic of the company. The investment firms tailor their value-add approach depending on the industry the company belongs in such that the firms working in capital-intensive industries undergo different changes than those in labor-intensive sectors.

The findings of this study are valuable for both academic scholars and financial analysts. For scholars, the paper opens up numerous research avenues to further investigate the impacts of PE buyouts across various industries, geographies, and firm sizes. For financial analysts, especially those working within target or PE firms, the paper highlights the importance of understanding industry-specific dynamics to tailor value-creation strategies effectively. Reports such as Rousseau and Caruso (2015) proposes ways of improving performance in diverse industries which adapt to needs of the specific industry.

Overall, this research contributes to the broader understanding of PE investments, emphasizing the need for a specialized approach tailored to the unique requirements of different industry sectors.

7 Further Discussion and Limitations

The paper yields interesting results with regards to improvement strategies of PE firms. However, as with many papers this one also comes with potential shortcomings. One challenge of the paper is the missing data problem. As all firms are not liable with reporting their performance metrics, the data lacks observations and carries the concern of not being high quality. We see that the observation count increases substantially over the years which suggests the presence of higher quality data compared to older years but fails to mitigate the concern fully. Furthermore, it is likely that majority of the data present belongs to larger firms since they have bigger responsibilities to report their balance sheet items. This could lead to a selection bias where the results mainly represent bigger companies.

There is also the confirmation bias where the companies may be more liable to report positive earnings rather than unsuccessful years. This can yield to results being more overestimated since more positive than negative metrics are reported. One way to lessen this is by implementing more laws and rules in reporting methods of the companies. While the publicly available data is likely exposed to this bias, investors and shareholders have high incentives to ensure all the reports are thorough and correct. In future research, it would be valuable to access these double checked reports to conduct the analysis, therefore mitigating this bias.

Moreover, I carry the endogeneity concern as the operation metrics are all related to each other. The calculation of capital intensity of an industry involves total fixed assets and operating revenue which could cause inaccuracy in the results. I aimed to avoid this problem by using a dummy variable and not using the calculation variables as the dependent variable in the regressions.

Another issue commonly present in private equity analysis is that of the reverse causality e.g. PE companies selecting well operating companies. While it is impossible to fully reject this concern, the structure of the regression is chosen to minimize this effect. Furthermore, Bernstein et al. (2017) argues that the issue is not largely effecting the results. Additionally, many papers show that PE firms successfully add value to the target firm thus I conclude that the results are not significantly effected by this problem.

The area for further research is very wide. To begin with, it could be intriguing to see if these results hold in a different geography such as the US or Southeast Asia. If the missing data problem can be overcame, another interesting area is to see how the effects differ for smaller firms.

A Appendix A: Variable Information

Table 12: Definitions of Variables Used

Variable	Definition
Leverage	Using debt to enhance the returns from an investment or project.
IC	Interest Cover
INTE	Interest Paid
TAXA	Taxation
TOAS	Total Assets
TURN	Sales
CASH	Cash & Cash Equivalent
CashToSales	CASH / TURN
EMPL	Number of Employees
STAF	Cost of Employees
ACE	Average Cost of Employee per Year
TAPE	Total Assets per Employee

B Appendix B: Performance Measure of Industries

Table 13: Performance Measure Values

	Mean	St. Dev.
1	6.72	14.93
2	7.62	18.97
3	7.07	17.27
4	7.36	16.80
5	4.12	16.09
6	8.13	18.97
7	3.89	18.69
8	6.77	21.98
9	6.08	22.65

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