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# Efficiency and Working Capital Improvement After Acquisition

*Do private equity firms focus on working capital management to improve static efficiency after buyout?*

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# Abstract

It is not easy to track increment in efficiency and its reasons for an organization, especially after acquisition. However, several techniques are used as proxies to evaluate them. Working Capital Management is one of the constructive techniques to gauge and improve a firm's performance. There is significant evidence about the negative relationship between working capital, presented in the form of cash conversion cycle and efficiency of an organization, measured as return on assets, indicating that a reduction in working capital can lead to increment in performance. Focusing on this relationship, private equity firms pay more attention on improving working capital in their target firms which results in improved operational efficiency. In this paper, I obtain significant results on the role of private equity firms in improving efficiency after acquisition. The results depict a decrease in cash conversion cycle for PE-backed firms after acquisition, paired simultaneously with an increase in return on assets. The sample being used consists of 30 PE-backed firms compared with 30 similar non-PE backed firms. Regression is used as the major tool for qualitative and quantitative analysis.

**Key-Words:** Private Equity, Efficiency, Working Capital, Operational Performance

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# Table of Abbreviations

| | |
|---|---|
| AR | Accounts Receivable |
| CCC | Cash Conversion Cycle |
| DiD | Difference in Difference |
| DIO | Days Inventory Outstanding |
| DPO | Days Payable Outstanding |
| DSO | Days Sales Outstanding |
| EAT | Earnings After Tax |
| EBIT | Earnings Before Interest and Tax |
| EBT | Earnings Before Tax |
| GMA | Gross Margins over Assets |
| LEV | Leverage |
| PE | Private Equity |
| ROA | Returns on Assets |
| ROE | Return on Equity |
| WC | Working Capital |
| WCM | Working Capital Management |

# 1. INTRODUCTION

Private Equity firms are usually lean, decentralized organizations with limited liability. Sometimes there are registered as partnerships. These organizations are small in number with employees coming from an investment background (Jensen, 1989). This trend is changing now since private equity firms are becoming larger in size and hiring individuals from diverse backgrounds. However, their size is still small than the companies they acquire or invest in (Kaplan & Stromberg, 2009). The number of private equity transactions has increased over the last decade. Jensen had predicted this form of organizations to outnumber public corporations in 1989, and the world experienced a growing trend in the number of these firms since the late 2000s (Wilson, Wright, Siegel, & Scholes, 2011). Private Equity transactions involve financing a significant portion through debt, making the transaction a 'Leverage Buyout'. This issue has faced criticism since having a lot of debt leads to short-termism in managers' decision making and intense insolvency for the organization (Wilson et al., 2011).

On the other hand, many scholars believe that due to high leverage, managers will be more efficient in operations so that the company can make timely payments. PE firms also improve governance by becoming actively involved in the board and having controls on management. This involves tying up their incentives with the company to minimize agency problems (Wilson et al., 2011). Additionally, as Smith (1990) mentions, PE transactions are also followed by financial returns. Operating profit and firm value have usually seen a positive trend after a leverage buyout. These results have also been observed in the form of total factor productivity by Chemmanur, Krishnan, and Nandy (2011). However, it is essential to mention here that these results will vary across industries and the sample being analyzed, considering the possibility of selection bias, i.e., acquiring well-performing companies with characteristics different than the population (Henderson & Page, 2007).

In this thesis, I will use research conducted in this area previously and look deeper into the role of Private Equity firms after the acquisition. For the scope of this thesis, this role will be focused on the improvement of efficiency. Organizations have observed improved performance (Wilsen et al., 2011) and an increase in total factor productivity (Chemmanur et al., 2011) after the buyout, however, I will be discussing more about the improvement in static efficiency. Static efficiency deals with current account-heads of the balance sheet. Any

effects on it would be measured through ratios that deal with similar account heads too. Private equity firms can improve this efficiency through various ways like strategic innovation (Chemmanur, Loutskina & Tian, 2014), corporate governance as mentioned above, but my focus would be on working capital management. Working capital deals with current assets and liabilities too, so I would be analyzing the change in efficiency through a change in working capital. The fundamental focus of this paper is:

***'Do Private Equity firms improve static efficiency after acquisition by focusing on working capital management?'***

In this paper, selection bias will be accounted and controlled for to make sure that pieces of evidence of improvement in static efficiency (if any) are incremental after the acquisition and resultant of working capital management. Similar research questions have been answered in the past for different markets, but so far, no research and analysis have been done on this question for Norwegian companies. Hence, the scope of this paper would be focused on Norwegian firms' data.

The significance of this research lies in its implications to the managerial decision making. With the growing trend in private equity transactions and buyouts, it is important to learn the reasons for these deals. Jensen (1989) called PE firms superior to other forms of organizations because of its structure. With positive sides of this structure, as mentioned above, there is one consideration to keep in mind. PE transaction brings high leverage for the acquired organization, and business firms are obliged to pay it. Inability to pay these dues affects the corporate environment and in general, macroeconomic environment (Atseye, Edim & Eke, 2014). With stakes this high, it is crucial for managers to make decisions that bring in operational efficiency and specifically target account heads, which are efficiency drivers. Identification of incremental value added by the acquirer is difficult, thus measuring change in efficiency after acquisition becomes problem-some (Calomiris, 1999). With the answers from this research question, managers can get direct insights about whether there is any incremental efficiency after the acquisition and if there is, should they focus on current accounts to bring this value in the firm immediately. Since the scope of my data is limited to the Norwegian market, Norwegian managers can have even more detailed insights about the role of industry, size of the firm, and leverage dynamics.

The thesis is organized in the following order. Section 2 presents a Literature Review where fundamental research on the topic and respective financial theories will be mentioned. Section 3 will then propose proxy variables for efficiency and working capital. These variables will be later used in the model for analysis. In Section 4, I will be shedding light on the sample used for the thesis. The number of companies been selected, and the criteria used for selection will be discussed in this section. Following to Section 5, I will be providing qualitative analysis on the selected sample in the form of description statistics. Quantitative analysis will be discussed in Section 6, which would cover the methodology by proposing a model in the form of base equation. This section will also mention the hypotheses being tested and equations for each hypothesis. In Section 7, I will present all regression outputs and discuss the results they depict in light of above-mentioned hypotheses. Section 8 will shed light on the limitations that were faced during research and analysis along with scope for future research. The thesis will be concluded in Section 9.

# 2. THEORETICAL FRAMEWORK

Harris, Siegel, and Wright (2005) have concluded productivity to improve significantly after acquisition in their research. However, it is of utter importance to confirm a similar trend for performance. Literature shows improvement in total factor productivity, which refers to incremental output after controlling for other production and technology factors (Chemmanur et al., 2011). This provides a piece of evidence for an improved performance after being acquired. This performance can also be observed in several financial ratios (Wilson et al., 2011). Nevertheless, this brings in the question if a similar trend can be observed for efficiency and what type of efficiency do acquirers focus on. Starting with the latter question first, there are two major types of efficiencies; static and dynamic, that an acquirer should consider to derive value out of this acquisition.

## 2.1 Static Efficiency

Distaso, Lupi and Manenti (2009) defines static efficiency as an indicator of performance, concerned with using the given resources present at the organization at one particular point of time in the most efficient way possible. It can be observed in two different forms:

### 2.1.1 Productive efficiency:

Productive efficiency can be achieved when a firm produces maximum output from given input factors with minimum costs. This is a short-term scenario for the firm to achieve through its operations (Distaso et al., 2009). It reflects that a firm cannot be more efficient than this point unless more inputs are added in the operations.

### 2.1.2 Allocative efficiency:

On the other hand, an organization is said to be allocative efficient if it has an optimal distribution of goods and services, considering consumers' preferences. According to economic terms, allocative efficiency can be achieved when marginal cost is equal to marginal utility (Ouattara, 2012).

To sum up, productive efficiency deals with producing the same output at low cost while allocative efficiency deals with efficient distribution of that output.

## 2.2 Dynamic Efficiency

Dynamic efficiency is another branch of efficiency that derives management's focus towards operations. However, the purpose and course of action for this is different than that of static efficiency. As Distaso, Lupi and Manenti (2009) mention, it does not focus on one particular time period; rather dynamic efficiency can be achieved over a period of time when an organization invests in new technology and production processes to cut costs. This is a long-term solution.

## 2.3 Trade-off

While a firm needs both types of efficiencies mentioned above, Ghemawat and Costa (1993) talk about the trade-off involved between choosing them for an organization, especially when it comes to firms post-acquisition. Static efficiency leads to fewer costs in the short run, while dynamic efficiency demands investment in new machinery and processes. These might lead to a significant increase in costs. However, dynamic efficiency brings in long term benefits (Quigley, 2003). Apart from that, static efficiency provides limited benefits related to cost-saving however, dynamic efficiency brushes up more competition and leads to improvement in operations. It results in better, cheaper products overall, thus benefiting consumers later. It leads to the development of new products and services through innovation and technological advances (Evans & Quigley & Zhang 2019).

Mostly, post-acquisition, the acquirer has a preference to work with static efficiency first because this results in evident value creation in the short run thus showing the value of acquisition quickly (Bacon, Wright, Meuleman & Scholes, 2012). Dynamic efficiency also demands a look into many sectors; external and internal. Hence, that is why I will be focusing more on static efficiency in this thesis. This static efficiency can be observed through certain indicators, one of which is 'Working Capital'. In this paper, I will shed more light on the role of working capital in the improvement of static efficiency.

## 2.4 Working Capital

Working capital is a measure to check the financial condition of a company. By definition, it refers to the difference between a company's current assets, i.e., including cash and cash

equivalents, accounts receivables and inventories, and its current liabilities, i.e., accounts payable. It is one of the significant factors that analysts consider while looking into the financial condition of a business. It depicts its short-term liquidity by revealing if the business can fulfill sudden, short term liabilities through its liquid assets (Boopathi & Leeson, 2016). That is why Pastena and Ruland (1986) considers it as one of the most reliable indicators to judge a company's operational efficiency. Inability to have higher working capital leads to non-payment to creditors. This high leverage can be one of the reasons for bankruptcy for a business.

### 2.4.1 Importance of Working Capital

Working Capital can tell if a company needs to go to banks and financial markets to raise funds to meet its short-term liabilities or it is stable enough to fulfill them internally. It saves companies from going bankrupt when their bills are due. In the absence of sufficient working capital, a company has to face immense financial pressure leading to late payments to creditors and vendors (Seidman, 2014). This leads to lower credit ratings in the market. Further, upon lending through banks or bonds, it has to pay higher interests to compensate for internal financial risk; thus, slowly draining out more money from the accounts (Strahan, 1999).

The position of working capital also depends on the inventory turn-over of a business. Companies that have high turn-overs enjoy instant access to liquid cash through their operations (Boopathi & Leeson, 2016). They do not need extra working capital to pay up their dues. On the other hand, credit policies also play a role in determining the level of working capital, i.e., if credit is readily available from suppliers then the need for working capital is less or vice versa. Similarly, Boopathi and Leeson (2016) also talk about working capital being dependent on how fast the clients pay back. In addition to these factors, it is advisable to look into the nature of business (product or service) or market factors (boom or recession) to determine the requirement of working capital.

Overall, it depicts how working capital can directly affect the revenues of a company and why is it an essential indicator for analysts to judge the financial position of a business.

## 2.5 Accounts Involved in Working Capital

As mentioned above, working capital is concerned with current account-heads (Boopathi & Leeson, 2016). Hence before moving further, it is necessary to shed light on the accounts, it affects and discusses how it does it. Following are the account heads that are directly linked with working capital management:

**Working Capital = Current Assets – Current Liabilities**

**= Cash + Accounts Receivable + Inventory – Accounts Payable**

### 2.5.1 Accounts Receivable

ARs is a current-asset account in the balance sheet, representing outstanding invoices from customers. Usually, accounts receivable and working capital has a direct relationship between them. This means that an increase in AR leads to a linear increase in WC too. It is a normal procedure in businesses to not pay in cash but rather credit the transaction. This amount goes to accounts receivable. As the customers delay payments, accounts receivable keeps on stacking, and that leads to inefficiency in the system. Tucker and Moore (2000) link high accounts receivable with insolvency in the company since it shows that the company is still dependent on customers to pay their credits and has less cash on hand to pay its bills. This does not have a positive effect on working capital either.

Hence to improve WCM, it is to be ensured that customers do not get too much credit and payments are made on time. This task is also known as ‘credit control’. A company can also use other strategic alternatives for their customers to pay early. This includes having strong terms of credit. Another alternative is giving early-bird discounts to customers. Both of these options give an incentive to customers to pay their credits early. It can also be started by having low credit limit so that every customer is able to pay on time. However, it has to be noted that there will always be some payments that would go as ‘bad debts’ (Inigo & Kumar, n.d.).

### 2.5.2 Accounts Payable

Accounts payable is another important account-head that has a significant impact on working capital. Statistically, it has an indirect effect on working capital; an increase in accounts payable decreases working capital. Normally, as a company allows its customers to pay later, it also has outstanding dues to be paid. This contributes to accounts payable. Sometimes, it is

favorable to delay payments of accounts payable to keep cash inflows on a certain level. However, by this method, this results in high trade credit. Padachi (2006) adds poor managements of trade credits as a reason for firms to fail or perform ineffectively. For the sustainability of a business, having high payables is not a good performance indicator. And since it also reflects a major part of working capital, it may decrease company's valuation in the market for prospective shareholders and buyers since it shows the capital to be paid in future.

These payables, if are smooth, actually make the system efficient. Inigo and Kumar (n.d.) proposed that the management can ensure that the accounts receivables and cash flows from the operations are aligned to its own account payable transactions. However if they are not aligned properly, there will not be cash available to pay the payables. This would decrease the working capital and hence, would result in financial instability in the short run and insolvency, in the long term (Zakari & Saidu, 2016).

### 2.5.3 Inventory

Inventory is another current-asset account. It has the same effect on working capital as accounts receivable. Statistically, an increase in inventory has a direct linear effect on working capital too. Typically, companies maintain an equilibrium level with their inventories, respective to their sales. Replenishing them on time, smoothens the sales procedure, and increases revenues by preventing delivery lags. This can prove to be a competitive advantage in several industries (Naliaka & Namusonge, 2015). However, there is a downside to having a lot of inventory stock too that leads to a decreasing working capital and diminishing liquidity. Improperly managed inventory leads to high costs. Buying more inventory and over-stocking them requires cash, and that reflects a lesser chance to pay one's debts. Similarly, this extra inventory would also increase storage costs and administration costs. Hence, this management will adversely affect working capital, leading it to decrease in the long run and weaken revenues (Inigo & Kumar, n.d.).

On the other hand, this concern can be catered through working capital management too. A company can adopt new policies to avoid over-stocking of inventory before-hand and thus, still managing to fulfill consumers' needs. For instance, 'Just-In-Time' policy gives margin to the company to work on an order once it is in the system and confirmed by the customer. It also gives leverage to the customer to have customization as compensation to the waiting period. But for this to succeed, a company must have easy access to raw materials and

production units. The production system should involve less irregular noises. A company should also have thorough knowledge about its business cycles and its customers' purchasing history (Inigo & Kumar, n.d.). If they manage to smoothen their inventory system, it can improve their working capital significantly.

## 2.6 Link of Working Capital with Static Efficiency

Static efficiency, as we discussed earlier, is concerned with efficiency gained through operations and production procedures at a particular point of time in an organization. These could include activities in manufacturing, supply chain, accounts, or administration. Similarly, working capital management is a significant metric to analyze a company's efficiency and stability. It directly deals with their revenue generation, receivables and payables management, inventory management, and payment procedures. Working capital looks at the policies affecting all these account-heads in the short-run (Seidman, 2014).

Since both of these look into the same account-heads and imply the same results, it would be plausible to study static efficiency through the effective management of working capital in the company. We would see if there is a possibility to develop a cause-effect relationship between the two through this thesis. It is reasonable to believe that managing working capital efficiently in an organization and filling up the leaks can lead to a significant increase in static efficiency. This optimization can be a result of the direct relationship between them.

## 2.7 Post Acquisition Role of WCM

Alongside establishing the link between WCM and static efficiency, it is important to consider if this link should extend after the acquisition. Sometimes, cash is locked up in the operational processes of a company, and that makes them insolvent. To release this cash and become liquid, working capital is a major factor (Inigo & Kumar, n.d.). Acquirers focus on the optimized handling of working capital to create a value of their transaction. This leads to a focus on suppliers' distribution systems, payment procedures, warehouse management, and several other operational issues. A firm can save a substantial amount of money by having optimization in these processes and gain a competitive edge. In the current era of high competition, it is challenging to retain a competitive edge over a new investment or innovation. Hence, Dey (2009) discusses that cost-saving can play a key role in generating

profits and staying ahead in the market. For this purpose, acquirers concentrate on operational efficiency after merger/acquisition. This not only helps them in integrating their businesses but also protects them from the market's hostile actions that lead to their failure (Inigo & Kumar, n.d.).

Realizing the significance of operational efficiency and its possible relationship with working capital, private equity firms focus more on WCM than listed companies. Research has been conducted by PWC showing that PE-owned companies outperform listed companies by approximately 30% in working capital efficiency (Siemes & Schouten, 2017). This research was conducted on different companies in Europe belonging to a diverse range of sectors, i.e., Healthcare, Materials, Industries, and Consumer Goods. A significant reason behind this preference is that they believe that by having control over working capital, they would not only be increasing share-holders value but also be saving money for new investments rather than taking over huge debts for funding. This, in turn, will assist them in having a substantial market value and big exit in case of going public in the future (Siemes & Schouten, 2017). Thus, working capital management is not just a one-time tool; it provides a complete strategic course of action to operate a company. And that is why I will look at this side of efficiency creation in this paper.

# 3. PROPOSED MODEL

## 3.1 WCM Proxy Variable

The purpose of WCM is not only improving liquidity but also making sure that a company can seek profitable investments in the future. For this purpose, Braga (2016) recommends in his research that companies should minimize their length of the payment period from their customers and maximize their length of payment period to creditors. At the same time, they also have to make sure that their inventory is also maintained at the minimal level so that it does not accumulate various costs and adversely affects the purpose of working capital management.

To analyze improvement in working capital, there are specific major performance indicators that point out changes in the account heads. We will see how these indicators have a positive effect on working capital that consequently has a positive impact on the efficiency of a business.

### 3.1.1 Cash Conversion Cycle

Cash Conversion Cycle is a significant performance indicator that can be used to learn about how a company is using its capital. Richards and Laughlin (1980) defined CCC as a tool that indicates the number of days, taken by a company, to convert its capital ouflows to cash inflows. In general, it shows the amount of time for which a dollar is tied up in the manufacturing and sales process before it is converted into cash revenues from consumers (Upadhyay, Sen & Smith, 2015).

Cash Conversion Cycle consists of three major components; day sales outstanding (DSO), days inventory outstanding (DIO), and days payable outstanding (DPO). Effect on working capital can be observed from these components individually, but it is preferable to look into their combined effect through CCC. A major reason behind this is that CCC can influence and control all these account-heads (Braga, 2016). From these components, it can be observed that CCC majorly deals with current account-heads in the balance sheet and that is why, it can be employed as an indicator for WCM (Lazaridis & Tryfonidis, 2006).

$$\mathbf{CCC = DSO + DIO - DPO}$$

- Day Sales Outstanding can be defined as the number of days, a company takes to collect its pending receivables from credit sales. The smaller the DSO, the more efficient their collection procedure is.

$$DSO = \frac{Average\ Accounts\ Receivable}{Sales} * 365$$

- Days Inventory Outstanding, similar to DSO, depicts the number of days it takes for the inventory to be turned into sales.

$$DIO = \frac{Average\ Inventory}{Cost\ of\ Goods\ Sold} * 365$$

- Days Payable Outstanding shows the number of days; a company takes to pay it, creditors. The longer the DPO, the better it is for the company since it has access to cash for longer.

$$DPO = \frac{Average\ Accounts\ Payable}{Cost\ of\ Goods\ Sold} * 365$$

Unlike quick ratio and current ratio, Cash Conversion Cycle not only tells us about the liquidity position of a business but also sheds light on the overall financial health of the organization. Zakari & Saidu (2016) consider it a metric that explains the capability of the company to handle their cash. When a company has a large amount of cash stuck in the production process, it means they have less control over their receivables and inventory levels. Due to excessive inventory and a large number of unpaid receivables, their CCC would be large, and hence, it would face high uncertainty and insolvency risk. Under such circumstances, it is difficult for it to pay its due obligations. This situation is more serious if the firm is smaller because large firms still have access to external funds to finance their working capital requirements while small firms need internal funds from WC to meet their day-to-day operational needs. Thus, shorter CCCs are preferred (Zakari & Saidu, 2016).

To decrease this period, companies have to bring in certain changes in their current accounts. For instance, having strict terms of credit or early-bird discounts, they can encourage their customers to pay receivables early. Similarly, high warehouse costs can work as an incentive to maintain optimal inventory level during the production process. At the same time, a company can delay its payables by having strong relationships with their suppliers and distributors (Tsuruta, 2013).

## 3.2 Efficiency Performance Indicators

Like WC, it is also important to consider efficiency indicators. Change in working capital affects the overall financial position of a business. It depicts (increasing or decreasing) efficiency in the company's operations. However, there is no direct method to calculate the efficiency of a business' operations. As mentioned before, both factors look into the same account heads in a balance sheet. Hence, efficiency can be quantified using these account heads. Like working capital, this static (operational) efficiency can be measured with the help of certain measures. Two of the major measures include Return on Assets and Gross Margin over Asset (Hiltunen, 2017).

### 3.2.1 Return on Assets

$$\textbf{ROA} = \frac{EBIT}{Total\ Assets}$$

Return on Assets is a significant ratio to measure operational efficiency. It gives an idea of how efficiently a company's assets are being used to generate earnings. An increase in earnings can be translated into the fact that the firm is able to generate more income from capital invested. This leads to higher ROA. Hence, the higher the ROA, the better it is. Any change in working capital affects several account heads from both; balance sheet and income statement (Hagel & Brown & Davison, 2010). ROA is able to capture that effect by combining balance sheet measure; Total Assets with a measure from income statement; EBIT (Gitman, 1974).

It is a better proxy to measure efficiency and performance than sales since it is not possible to track the effect of change in working capital through increasing (or decreasing) sales (Vries, n.d.).

### 3.2.2 Gross Margin over Assets

Like ROA, gross margin over total asset ratio plays a proxy role in the measurement of operational efficiency. It takes out the effect of fixed costs and directly measures how a company's performance is being affected on a marginal basis with every increasing sale.

Any effect of working capital management can be observed in this account too.

### 3.2.3 Du Pont

Hiltunen (2017) brings up Du Pont as another metric that deals with working capital accounts and are used to analyze efficiency in an organization. It has three components; profit margin, assets turnover, and leverage multiplier. These three components give a detailed analysis of the financial wealth of the company in the form of Return on Equity. Through this equation, analysts can identify if the company is improving ROE by improving working capital and consequently, asset turnover or just increasing ROE by increasing leverage thus exposing the investors to more risk in their investment.

**ROE = Profit Margin * Asset Turnover * Leverage Multiplier**

$$= \frac{Net\ Income}{Sales} * \frac{Sales}{Average\ Assets} * \frac{Average\ Assets}{Average\ Equity}$$

Here, profit margins give a broad picture of the profitability of the business and how much it is earning after deducting all expenses. Asset Turnover uses sales, both fixed and current, so this ratio is considered to study working capital performance. Similarly, leverage multiplier depicts the dependence of the company on debt for its operations (Hiltunen, 2017). Even though this equation gives a detailed knowledge of how much have the shareholders earned on their investment, it has a weak link with working capital. For that purpose, a modified form of Du Pont analysis is used.

This equation was introduced by Hawawini and Viallet (1999) and consisted of five components. They recommended a change of ‘Total Assets' to ‘Capital Invested,' Total Liabilities and Equity were replaced by ‘Capital Employed.' All these changes point out to one factor that they are considering working capital accounts more for short-term analysis. These changes not only measure profitability and efficiency of the company but also gives a deeper insight to factors that can be employed to directly impact working capital and improve it gradually, increasing share holders' wealth consequently. This equation separates the effect of interest and taxes from the old components, hence giving a better picture of the company's operations and their impact.

$$\mathbf{ROE} = \frac{EBIT}{Sales} * \frac{Sales}{Invested\ Capital} * \frac{EBT}{EBIT} * \frac{Invested\ Capital}{Equity} * \frac{EAT}{EBT}$$

*Note: Invested Capital = Cash & Cash Equivalents + WC Requirements + Net Fixed Assets

Hence, the modified Du Pont Analysis provides a strong link between a firm's efficiency measurement and working capital requirements. WCM has a direct impact on it. For small firms, this linkage is extremely important since it gives them control over their day-to-day operations and hence, its effect on static efficiency (Anake & Ugwu & Takon, 2015).

However, for the scope of this paper, only the first two indicators; Return on Assets and Gross Margin over Assets will be used for regressions.

# 4. SAMPLE DESCRIPTION

Our sample would consist of two sets of companies. All of these companies are Norwegian. One set would include companies that were acquired recently. It would target acquisitions by private equity firms. The time horizon for this sample is eight years from 2009 to 2016. The companies that were selected belong to 2012-14 so that we have enough years before and after the acquisition. In the end, a sample of thirty PE-backed firms is obtained. The other set would consist of companies, with comparable financials and dynamics, but are operating on a stand-alone basis, i.e., not acquired. The reason for choosing two sets is to show how PE firms are more focused on value addition through working capital management. This result would be shown by analyzing their financial statements. Access to the information about the firms' financials is taken from the working paper compiled by Berner, Mjøs & Olving (2013). This working paper is the source of data for industry information, organizational forms, and financial statements in the form of stata files. This compilation is funded by SNF and Finans| Bergen.

For the selection of private equity firms, it is made sure that companies have a complete data for all eight years. On the other hand, random sampling is not used for the selection of the comparable set of non-PE firms. Random sampling removes biases from the selection (Taherdoost, 2016); however, for the current paper, non-random or quota sampling is used. In this form of sampling, the sample is not picked on randomly but rather selected on pre-determined characteristics (Taherdoost, 2016).

For our sample of Non-PE firms, it is ensured that these firms have similar characters as the PE firms except for being operating on a stand-alone basis. To cater to this point, certain steps are taken while making the sample. Every firm in the non-PE set has the same industry code to the corresponding firm in the PE sample so that the effect of industry is controlled during analysis. For this purpose, the first two digits of the SIC code of all PE firms are collected. These digits represent the industry the firm belongs to (Berner, Mjøs & Olving, 2013). These firms come from various industries, including manufacturing, telecommunication, business services, or oil. Based on these SIC codes, corresponding non-PE firms with exact first two digits are selected. After collecting all firms with the same industry code, the effect of the form of organization is controlled. It has to be made sure that PE firms registered as partnerships are paired with the same form of non-PE organizations.

This control will lead to discarding non-matching firms from the sample. Later, the effect of leverage and size is controlled by taking out the firms that have abnormal values on these attributes. In the end, the firms that are left are similar to PE sample based on industry, organizational form, leverage, and size. One major differentiating factor between these samples is PE-backed or not, and our analysis will be based on this characteristic. Now, it is plausible to attribute the change in our analysis' results to this characteristic.

Data files are available in Stata-friendly format. Hence, Stata software can be used to identify the causal relationship, and Difference-in-Difference method will be our medium of analysis and interpretation. This method is beneficial to learn the effect of a change with regards to causal estimation. Since data is available for pre-PE acquisition and post-acquisition period, DiD method can provide valuable insights about the changes that occurred in these time frames due to buyouts. (Lechner, 2011).

# 5. QUALITATIVE ANALYSIS

Before looking into regressions, it is important to have a descriptive analysis of our variables. This analysis would help us in pointing out the presence of outliers and the role they play in our data. Normally, these outliers can have strong implications on the estimates of a fitted model (Caroni, Larioto, Economou & Pierrakau, 2012). The descriptive analysis depicts dispersion in the data, especially in a large set of data (Müller-Rommel & Baha, 2016). The outliers can also be spotted using graphs, with dependent variable on the y-axis, i.e., ROA in our case and independent variable on x-axis, i.e., Cash Conversion Cycle. However, we can use descriptive analysis using different commands in Stata. This would be more detailed than graphical representation since it would also provide information on percentiles, maximum, and minimum values. Additionally, we could also learn more about skewness through stata output.

A summary of PE-backed firms and non-PE backed firms is shown in the table. This table provides us with an overview of the mean, standard deviation, and coverage of the data for both sets. Return on assets has a higher value for PE-backed firms by 7% while cash conversion cycle for these firms is 0.11 years or 40 days lower than non-PE backed firms. The dispersion of leverage and size of the firms have already been controlled during sample selection. From the maximum and minimum data points of ROA and CCC, it can be observed that these data points are widely dispersed from the mean, and this could lead to the presence of outliers in the data. However, the presence of these outliers will be identified and controlled after detailed analysis.

**Table 1**
**Descriptive Statistics of Non-PE backed firms**
This table reports descriptive statistics of 30 non-PE backed firms for the sample from 2009-2016. All variables are defined in Appendix A and winsorized at the $10^{th}$ and $90^{th}$ percentile.

| | | Non PE-backed firms | | | | |
|---|---|---|---|---|---|---|
| Variable | Obs. | Mean | Std. Dev. | 25th Pctl. | Median | 75th Pctl. |
| roa | 231 | 0.021 | 0.337 | -0.03 | 0.045 | 0.163 |
| ccc | 231 | 0.345 | 1.115 | 0.076 | 0.165 | 0.306 |
| lev | 231 | 0.669 | 0.511 | 0.415 | 0.648 | 0.818 |
| size | 231 | 7.679 | 2.212 | 6.475 | 7.493 | 8.707 |
| growth | 231 | -2797.87 | 70013.48 | -163 | 0 | 199 |

**Table 2**
**Descriptive Statistics of PE backed firms**
This table reports descriptive statistics of 30 PE backed firms for the sample from 2009-2016. All variables are defined in Appendix A and winsorized at the 10th and 90th percentile.

| PE-backed firms | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Obs. | Mean | Std. Dev. | 25th Pctl. | Median | 75th Pctl. |
| roa | 231 | 0.095 | 0.253 | -0.001 | 0.065 | 0.184 |
| ccc | 231 | 0.232 | 0.144 | 0.136 | 0.245 | 0.4 |
| lev | 231 | 0.626 | 0.275 | 0.455 | 0.626 | 0.814 |
| size | 231 | 9.556 | 4.825 | 8.987 | 11.311 | 12.304 |
| growth | 231 | 35387.31 | 252317.6 | -3827 | 1115 | 17583 |

As part of the descriptive analysis, the dependent and independent variables of the equation are also run through detailed summary command. This command provides an overview of percentiles along with skewness and kurtosis. The results are presented in Appendix B. The table shows the results of the descriptive analysis on return on assets and cash conversion cycle for the companies that are not backed by private equity and the companies that are acquired by private equity firms.

Skewness measures the asymmetry in the data. The knowledge of asymmetry is crucial due to its implications on statistical inferences which assume normality in data variables. The more it is away from 0, the more non-normal or skewed the distribution is (Hippel, 2011). Similarly, kurtosis also discusses the distribution of data. A higher value for kurtosis indicates the presence of more extreme values. It should be 3 for a normal distribution (Liang, Wei, Zhao, Liu, Li, Shen & Zheng, 2008).

Through the analyses, it can be observed that the distribution of return on assets for PE-backed firm is more symmetrical than the other set. However, from the median and average of the data, it depicts that both sets have outliers. Skewness and Kurtosis for PE-backed firms are less than those of non-PE backed firms.

Similar descriptive analysis can be done on our independent variable. The reason for picking ROA and CCC is that both of them are the major variables in our regression. Additionally, since both of them are derived from different account heads, similar useful interpretation can also be made about those accounts through these variables.

The results for cash conversion cycle are also presented in Appendix B. They also show that the PE-backed firms have lower cash conversion cycle than non-PE backed firms, and the dispersion is less skewed.

Taking into consideration that inferences are more accurate with minimum skewness or kurtosis (Hippel, 2011), I will control the effect of outliers in the data through 'winsorizing'. Winsorizing is a technique that assigns a lower weight to outliers or extreme values instead of taking them out altogether like in trimming. The purpose of winsorizing is to control the effect of outliers by assigning them a value which is still high but not extreme to be considered as an outlier (Reifman & Keyton, 2010). For our descriptive analysis, the values for return on assets are winsorized at 90%, which means that the outliers about 90% are given a controlled value, equal to the value at $90^{th}$ percentile. This technique is also repeated for the cash conversion cycle. After assigning a value to the outliers, the variables are summarized again to ensure the results. Further analysis and regressions are conducted on this winsorized sample.

# 6. QUANTITATIVE ANALYSIS

## 6.1 Methodology

In this section, I will proceed to the quantitative analysis of the created sample to derive useful information from it. To analyze the effect of WCM on a company's efficiency after the acquisition, linear regression will be used on the selected sample.

As a proxy for working capital management, CCC is used in this paper. This variable will work as our independent variable, thus showing us change in efficiency with any change in CCC.

For dependent variables, I will use ROA and Gross Margin to Assets ratio. These variables will work as performance indicators for operational (or static) efficiency in a company.

The variables can be put into the following simple equation:

$$ROA = B_0 + B_1 * CCC + error$$

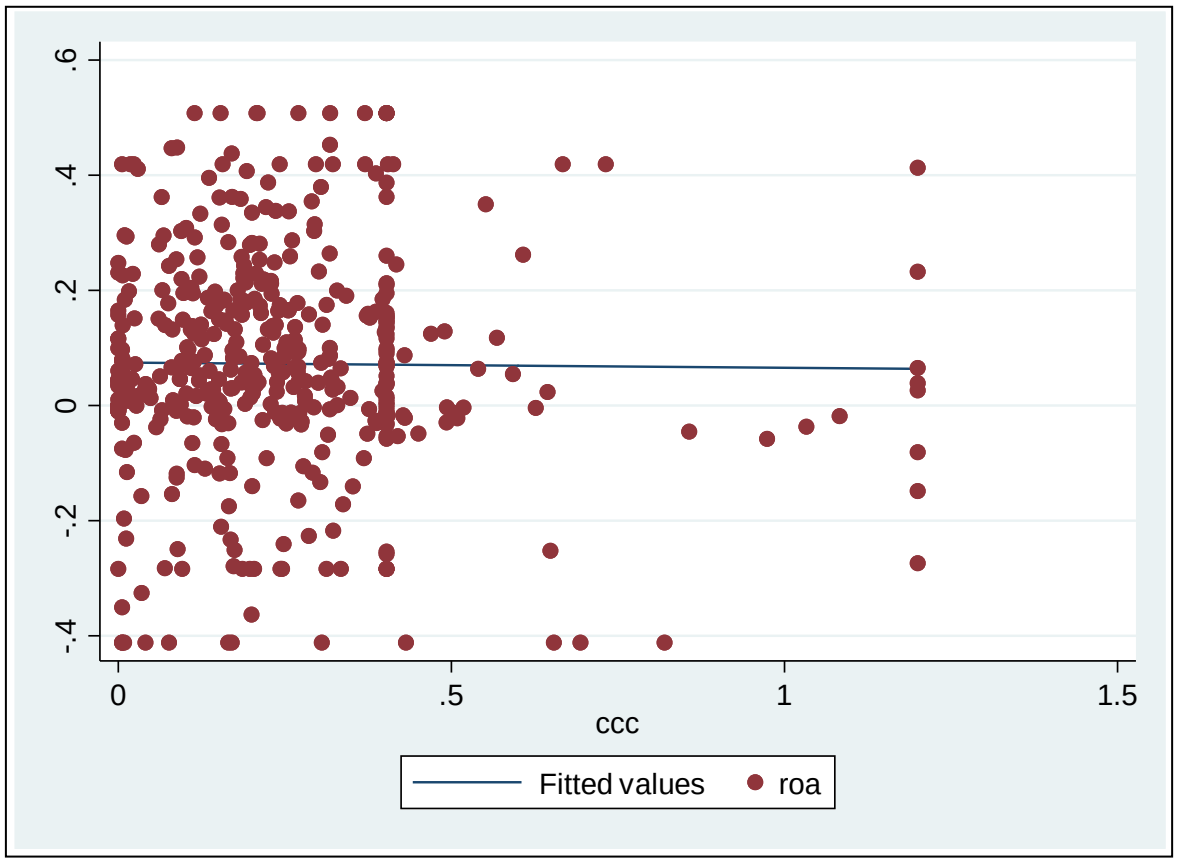
$$Gross\ Margin/TA = B_0 + B_1 * CCC + error$$

In this section, I will try to capture the relationship between both sides of the equation; direct or indirect. We will look into the significance of coefficients and comprehend their relationship through certain statistical tests. In order to capture the relationship accurately, the effects of other factors on the dependent variable will be controlled. For this purpose, certain control variables will be used throughout our regressions. These variables include leverage given by total debt to total assets ratio, asset growth given by taking a difference between assets of the current and previous period and size of the company given by log of total assets. Apart from these, the effect of industry, leverage and size is controlled while making the sample. Furthermore, $_{Yi}$ (aar) is used as a dummy variable to represent respective years in the sample. Results will be provided in tables with three types of regressions: first, with only dependent and independent variables, second with only control variables and third with all control and dummy variables.

## 6.2 Model Specification

Scatter graph is plotted between Return on Assets and Cash Conversion Cycle to capture the relationship between the variables accurately. Depending on these results, we will be able to specify our regression equation.

**Figure 1**
**Model Specification Graph**
This graph provides a visual presentation of the relationship between cash conversion cycle (x-axis) and return on assets (y-axis) in the form of a scattered plot with a trend line fitted through the values.




Above exhibit shows that it is plausible to say that a linear relationship exists between our specified variables. Hence, for this sample, a level-level model is used (Wooldridge, 2015). With model specification and inclusion of control variables, the final equation will be:

**$ROA = B_0 + B_1*CCC + B_2*Controls + B_3DYears + error$**

This shows that with every unit increase in CCC, the ROA will increase by $B_1$ units, keeping leverage of the company and size as controlling variables. Similar logic will apply in case of negative sign. Additionally, these dummy variables will have a value equal to 1 for every respective year.

## 6.3 Hypothesis I

In the first part, it will be shown if working capital management has any effect on static efficiency. Keeping the literature in mind, it is plausible to say that by decreasing the cash conversion cycle, i.e., making sure that we receive the money earlier in the system than paying the creditors, we will be able to achieve operational efficiency (Kasozi, 2017). Since CCC is our proxy for WC, this sign of coefficient will indicate the effect of working capital management. For instance, a positive sign will indicate that increasing CCC has an incremental effect on ROA, and thus, we should focus on increasing WC. Similarly, a negative sign would depict that increase in ROA can be achieved by decreasing WC.

*Ho: CCC has a positive effect on operational efficiency, measured in terms of ROA, i.e., as CCC increases, ROA will also show an incremental impact.*

An alternative hypothesis, $H_1$, will be accepted in case of negative sign between ROA and CCC. To test this hypothesis, I used the data from the Norwegian market, covering Norwegian enterprises and groups. It covers the time horizon of eight years from 2009-2016 with organizations acquired from 2012 to 2014.

## 6.4 Hypothesis II

Once the relationship between CCC and ROA is established, the impact of PE firms is to be observed. For that purpose, we introduce a new dummy variable PE, which is equal to 1 when the firm is acquired by a private equity firm and is 0 when it is on a stand-alone basis. With this equation, it is easier to observe the effect of the partial effect of private equity buyouts. This equation shows the impact of working capital management on performance for PE firms specifically.

$$\mathbf{ROA = B_0 + B_1*CCC + B_2*(CCC*PE) + B_3*Controls + B_4*(Controls*PE) + B_5DYears + error}$$

In the next step, it is important to identify if PE-backed firms have better performance in terms of return on assets and lower cash conversion cycle, which can serve as a competitive advantage. To test this hypothesis, PE is regressed on CCC along with control variables and year dummies. The sample set for this regression covers the period after the buyout.

**$CCC = B_0 + B_1*PE + B_2*Controls + B_3DYears + error$**

*Ho: Private Equity firms have no significantly different or higher Cash Conversion Cycle than non-PE backed firms, which leads to a decrease in return on assets.*

The null hypothesis will be rejected in case of negative and significant sign for PE variable when regressed. This sign will depict that PE firms have low CCC than non-PE firms after controlling for their size and growth. These results depict the competitive advantage of private equity buyouts.

# 7. REGRESSION RESULTS

To observe the effects of all mentioned variables and relations, regression is run in Stata, and the coefficients have been observed along with their signs. There is a possibility that outliers in the data might affect the results of our regressions. That is why, before executing the commands, a detailed qualitative analysis of the data is conducted, and outliers are winsorized.

## 7.1 The link between WCM and Efficiency

To determine if performance or efficiency can be improved with working capital management, ROA is regressed on CCC along with control variables and dummy variables. In the case of a positive sign of the coefficient, we will conclude that efficiency increases with high working capital management. Similarly, a negative sign shows that working capital needs to be reduced to bring incremental effect on efficiency (Kasozi, 2017).

**Table 3**
**The effect of cash conversion cycle on return on assets**
This table reports regression of the effect of working capital management on efficiency. Return on assets (roa) represents dependent variable while cash conversion cycle (ccc) represents independent variable for the time period of 2009-2016. Years are used as dummy variables which take the value of 1 in a particular year. Regression (1) shows a simple model without control variable and fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | roa | roa | roa |
| ccc | -0.00902 | -0.0517 | -0.0473 |
| | (-0.22) | (-1.27) | (-1.16) |
| size | | 0.0117*** | 0.0116*** |
| | | (5.15) | (5.16) |
| Y2009 | | | 0.0288 |
| | | | (0.84) |
| Y2010 | | | 0.0756*** |
| | | | (2.21) |
| Y2011 | | | 0.0389 |
| | | | (1.14) |

**Table 3**
*(Continued)*

| Variable | (1) roa | (2) roa | (3) roa |
|---|---|---|---|
| Y2012 | | | 0.0647** |
| | | | (1.89) |
| Y2013 | | | 0.0930*** |
| | | | (2.72) |
| Y2014 | | | 0.0700*** |
| | | | (2.05) |
| Y2015 | | | 0.0229 |
| | | | (0.67) |
| Constant | 0.0746*** | -0.0159 | -0.0661*** |
| | (5.66) | (-0.73) | (-2.09) |
| Observations | 462 | 462 | 462 |
| $R^2$ | 0.000 | 0.055 | 0.079 |

***t statistics in parentheses***
*** p < 0.15, ** p < 0.10, *** p < 0.05***

It can be observed that CCC has a negative sign in all three models. Furthermore, with 1 unit increase in CCC, i.e., if the cash conversion cycle is delayed by one year, decrease in ROA ranges from 0.9% to 5.2% in that particular year. The negative sign indicates that working capital in a company needs to be decreased in order to increase its operational efficiency. The coefficient cannot be found statistically significant at the given p-values; however t-values are large, ranging from -0.22 to -1.27.

A stronger relationship can be observed between similar variables when regressed on just PE firms. The results are statistically significant at 10% with t-values ranging from -0.83 to -1.89. With a decrease in the cash conversion cycle by one year, PE-backed firms experience an increase in return on assets too.

**Table 4**
**The effect of cash conversion cycle on return on assets for PE-backed firms**
This table reports regression of the effect of working capital management on efficiency for a smaller sample using interaction terms; ccc_pe (ccc*PE) and size_pe (size*PE). The results represent firms backed by private equity firms. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | roa | Roa | roa |
| ccc_pe | -0.00451 | -0.0110** | -0.0122** |
| | (-0.83) | (-1.71) | (-1.89) |
| size_pe | | -0.00308 | -0.00424 |
| | | (-0.39) | (-0.54) |
| PE | | 0.111 | 0.126 |
| | | (1.14) | (1.30) |
| Y2009 | | | 0.0285 |
| | | | (0.77) |
| Y2010 | | | 0.0819*** |
| | | | (2.16) |
| Y2011 | | | 0.0498 |
| | | | (1.32) |
| Y2012 | | | 0.0759*** |
| | | | (2.03) |
| Y2013 | | | 0.105*** |
| | | | (2.78) |
| Y2014 | | | 0.0839*** |
| | | | (2.24) |
| Y2015 | | | 0.0223 |
| | | | (0.59) |
| Constant | 0.0791*** | 0.0477*** | -0.00835 |
| | (8.05) | (3.74) | (-0.30) |
| Observations | 420 | 420 | 420 |
| $R^2$ | 0.002 | 0.035 | 0.065 |

***t* statistics in parentheses**
** $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$**

Overall, the results confirm that by managing working capital management, the efficiency of a firm can be improved.

We can use a similar regression with another proxy variable for efficiency. In Equation 1, we can replace ROA with Gross Margin over Assets. Considering literature, we expect the same relationship between dependent and independent variable.

$$\mathbf{GMA = B_0 + B_1{*}CCC + B_2{*}LEV + B_3{*}SIZE + B_4{*}GROWTH + B_5Y_{2012} + B_6Y_{2013} + B_7Y_{2014} + B_8Y_{2015} + error}$$

Upon running the regression, a negative sign throughout the models is observed for gross margin over assets too with change in GMA ranging from 0.3% to 6.2% however, the t-values for these regressions are smaller as compared to previous regressions.

**Table 5**
**The effect of cash conversion cycle on gross margin over assets**
This table reports regression of the effect of working capital management on efficiency. Gross margin over assets (gma) represents dependent variable while cash conversion cycle (ccc) represents independent variable for the time period of 2009-2016. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | gma | gma | Gma |
| ccc | -0.00306 | -0.0619 | -0.0564 |
| | (-0.05) | (-0.95) | (-0.87) |
| size | | 0.0161*** | 0.0160*** |
| | | (4.46) | (4.46) |
| Y2009 | | | 0.0392 |
| | | | (0.72) |
| Y2010 | | | 0.116*** |
| | | | (2.12) |
| Y2011 | | | 0.0239 |
| | | | (0.44) |
| Y2012 | | | 0.0998** |
| | | | (1.83) |
| Y2013 | | | 0.135*** |
| | | | (2.47) |
| Y2014 | | | 0.113*** |
| | | | (2.08) |

**Table 5**
*(Continued)*

| Variable | (1) gma | (2) gma | (3) Gma |
|---|---|---|---|
| Y2015 | | | 0.0486 |
| | | | (0.89) |
| Constant | 0.0608*** | -0.0639** | -0.137*** |
| | (2.92) | (-1.85) | (-2.71) |
| Observations | 462 | 462 | 462 |
| $R^2$ | 0.000 | 0.041 | 0.066 |

***t* statistics in parentheses**
* ***p* < 0.15, ** *p* < 0.10, *** *p* < 0.05**

## 7.2 Impact of Private Equity Buyout on WCM

In the next step, the second hypothesis is tested using two equations. These equations are more focussed on the impact of private equity buyout over working capital management. To compare their effect, CCC for PE firms and non-PE backed firms are used in the regression together. It can be observed through the coefficients of the independent variables that the impact on efficiency by per year change in working capital of PE-backed is higher and statistically significant than that for non-PE backed firms when the effects of control variables and years are controlled.

**Table 6**
**The difference in cash conversion cycle for PE and non-PE backed firms**
This table reports regression of the effect on return on assets by differentiating cash conversion cycle of private equity firms and non-private equity firms, with return on assets (roa) as dependent variable while cash conversion cycle (ccc & ccc_pe) as independent variables for the time period of 2009-2016. In the regression, ccc_pe (ccc*PE), lev_pe (lev*PE), size_pe (size*PE) and growth_pe (growth*PE) are interaction term where PE takes the value of 1 if the firm is acquired by private equity firm. These interaction terms assist in observing the effect of PE ownership accurately. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| Variable | (1) roa | (2) roa | (3) Roa |
|---|---|---|---|
| ccc | -0.0452 | -0.0176 | -0.0163 |
| | (-1.00) | (-0.35) | (-0.33) |
| ccc_pe | -0.00917* | -0.0149** | -0.0170*** |
| | (-1.64) | (-1.90) | (-2.17) |

**Table 6**
*(Continued)*

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| PE | 0.0752*** | 0.347*** | 0.374*** |
| | (3.84) | (2.47) | (2.67) |
| lev_pe | | 0.0830 | 0.0642 |
| | | (1.06) | (0.82) |
| size_pe | | -0.0358*** | -0.0367*** |
| | | (-3.19) | (-3.27) |
| growth_pe | | -1.56e-08 | -6.57e-09 |
| | | (-0.08) | (-0.03) |
| lev | | -0.0298 | -0.0299 |
| | | (-1.15) | (-1.16) |
| size | | 0.0260*** | 0.0251*** |
| | | (3.95) | (3.82) |
| growth | | 2.19e-08 | 2.20e-08 |
| | | (0.12) | (0.12) |
| Y2009 | | | 0 (Omitted) |
| Y2010 | | | 0.0715** |
| | | | (1.90) |
| Y2011 | | | 0.0414 |
| | | | (1.10) |
| Y2012 | | | 0.0690** |
| | | | (1.85) |
| Y2013 | | | 0.0986*** |
| | | | (2.64) |
| Y2014 | | | 0.0769*** |
| | | | (2.07) |
| Y2015 | | | 0.0184 |
| | | | (0.49) |
| Constant | 0.0587*** | -0.128*** | -0.175*** |
| | (3.48) | (-2.07) | (-2.65) |
| Observations | 420 | 364 | 364 |
| $R^2$ | 0.037 | 0.101 | 0.128 |

***t* statistics in parentheses (* $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$)**

To further establish the impact of PE buyout and explain if PE firms manage this working capital more efficiently, another regression is conducted. In the previous sections, it was discussed that private equity firms focus specifically on operational efficiency through working capital management in the short run. To verify this relationship, PE dummy variable is regressed on CCC after the acquisition of the firms, i.e., the regression will only include post-acquisition years as dummy variables.

**Table 7**
**The effect of PE ownership on cash conversion cycle**
This table reports regression of the effect on cash conversion cycle after leverage buyout. Cash conversion cycle (ccc) represents dependent variable while private equity (PE) represents independent variable. PE takes the value of 1 if the firm is acquired by private equity firm. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

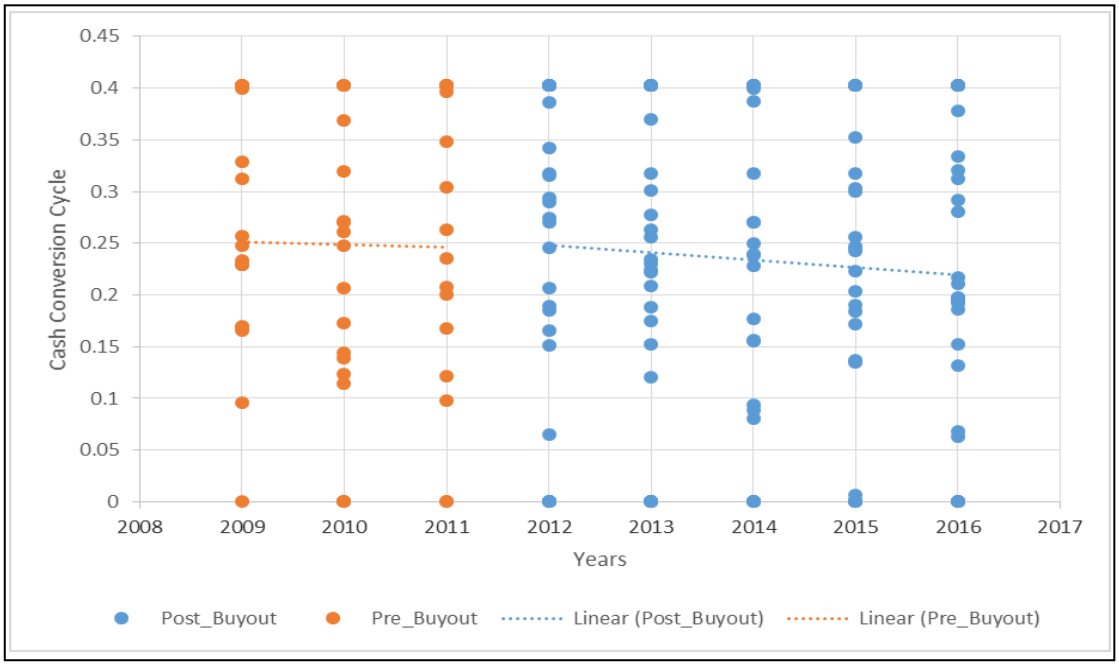
| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | ccc | ccc | ccc |
| PE | -0.0113 | -0.0345** | -0.0346** |
| | (-0.57) | (-1.71) | (-1.71) |
| size | | 0.0123*** | 0.0123*** |
| | | (4.74) | (4.72) |
| Y2012 | | | -0.00676 |
| | | | (-0.22) |
| Y2013 | | | -0.00858 |
| | | | (-0.28) |
| Y2014 | | | 0.00302 |
| | | | (0.10) |
| Y2015 | | | -0.0264 |
| | | | (-0.85) |
| Constant | 0.244*** | 0.149*** | 0.154*** |
| | (17.25) | (6.12) | (5.87) |
| Observations | 462 | 462 | 462 |
| $R^2$ | 0.001 | 0.047 | 0.049 |

***t* statistics in parentheses**
** $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$**

The results depict a strong relationship between PE-backed firms and working capital management. The coefficients show that PE ownership decreases the cash conversion cycle by 0.01 to 0.03 years or 4.0 to 12.8 days. The results are significant at 10% with t-values going to minimum -1.71. These results provide evidence in favour of the competitive advantage of private equity firms.

This relationship can also be observed through the treatment effect graph that compares the cash conversion cycle of the PE-backed firms from two tenures. The first period refers to pre-buyout tenure while the second period depicts the cash conversion cycle after the buyout. It can be observed from the trend lines that CCC improves after 2012 (post-acquisition).

**Figure 2**
**Treatment Effect Graph**
This scatter plot graph provides a visual presentation of the effect of PE ownership on working capital management over years. Years are shown on x-axis while Cash conversion cycle on y-axis. 2009-2011 is the period before private equity buyout while 2012-2016 represents the year of private equity ownership.




## 7.3 Impact of Private Equity Buyout on Efficiency

So far, we have observed how operational efficiency can be improved by focusing on working capital in the form of the cash conversion cycle. Later, we established that PE buyouts improve working capital of their target firms by reducing cash conversion. This section will look into if operational efficiency improves after the efforts of PE firms. For this

purpose, return on assets, and gross margin over assets is regressed upon PE dummy variable for the post-acquisition period.

**Table 8**
**The effect of PE ownership on return on assets**
This table reports regression of the effect on efficiency measured as return on assets after leverage buyout. Return on assets (roa) represents dependent variable while private equity (PE) represents independent variable for the time period of 2009-2016. PE takes the value of 1 if the firm is acquired by private equity firm. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | roa | roa | roa |
| PE | 0.0503*** | 0.0313** | 0.0314** |
| | (2.88) | (1.77) | (1.79) |
| size | | 0.0101*** | 0.0101*** |
| | | (4.43) | (4.46) |
| Y2009 | | | 0.0291 |
| | | | (0.85) |
| Y2010 | | | 0.0776*** |
| | | | (2.27) |
| Y2011 | | | 0.0414 |
| | | | (1.21) |
| Y2012 | | | 0.0665** |
| | | | (1.95) |
| Y2013 | | | 0.0947*** |
| | | | (2.78) |
| Y2014 | | | 0.0713*** |
| | | | (2.09) |
| Y2015 | | | 0.0257 |
| | | | (0.75) |
| Constant | 0.0473*** | -0.0304 | -0.0815*** |
| | (3.83) | (-1.42) | (-2.62) |
| Observations | 462 | 462 | 462 |
| $R^2$ | 0.018 | 0.058 | 0.083 |

***t* statistics in parentheses**
** $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$**

The results are statistically significant, up to 10% with an increase in ROA ranging from 3 to 5% per year. This proves that PE buyouts lead to high efficiency in the short run. And since CCC also reduces in these years, it is plausible to link the increase in ROA to the reduction in CCC.

Running this regression with a gross margin over assets provides similar results in terms of statistical significance; however, the impact on GMA is larger than ROA with the value ranging from 5 to 7.5% per year.

**Table 9**
**The effect of PE ownership on gross margin on assets**
This table reports regression of the effect on efficiency measured as gross margin over assets after leverage buyout. Gross margin over assets (gma) represents dependent variable while private equity (PE) represents independent variable for the time period of 2009-2016. PE takes the value of 1 if the firm is acquired by private equity firm. Years are used as dummy variable which take the value of 1 in a particular year. Regression (1) shows a simple model without fixed years effect, (2) includes the effects of control variables and (3) represents complete model, including the effects of years and control variables. Coefficients, Number of observations and R-squared are reported. T-statistics are reported in parentheses while *, ** and *** are used to denote significance at 15%, 10% and 5%. All variables are defined in Appendix A.

| | **(1)** | **(2)** | **(3)** |
|---|---|---|---|
| Variable | gma | gma | gma |
| PE | 0.0754*** | 0.0495** | 0.0498** |
| | (2.73) | (1.76) | (1.78) |
| size | | 0.0138*** | 0.0137*** |
| | | (3.80) | (3.78) |
| Y2012 | | | 0.0556 |
| | | | (1.30) |
| Y2013 | | | 0.0903*** |
| | | | (2.11) |
| Y2014 | | | 0.0688* |
| | | | (1.60) |
| Y2015 | | | 0.00568 |
| | | | (0.13) |
| Constant | 0.0223 | -0.0840*** | -0.111*** |
| | (1.14) | (-2.47) | (-3.04) |
| Observations | 462 | 462 | 462 |
| $R^2$ | 0.016 | 0.046 | 0.060 |

***t* statistics in parentheses**
*** *p* < 0.15, ** *p* < 0.10, *** *p* < 0.05**

## 7.4 Robustness

For the analysis, two performance measures are used: Return on Assets and Gross Margin over Total assets. These different measures are used to allow for any accounting bias (Deloof, 2003). Apart from that, dummy variables for years are used to control possible effects of a trend over the years. During sample selection and regressions, effects of leverage, industry, organizational form and size are also controlled to minimize their effect and counter for emitted variable bias. Winsorizing is employed to minimize the impact of outliers during analysis.

Furthermore, heteroscedasticity can also be an issue when dealing with pooled data. Hence, it is checked and corrected by using *robust* command. Controlling for heteroscedasticity leads to the possibility of less statistical power (Rosopa, Schaffer, & Schroeder, 2013).

Independent pool data is used as an empirical method during regressions due to limited data; however, panel data can also provide plausible results in case of extensive PE data or large sample.

# 8. Limitations and Future Research

This analysis encountered certain limitations leaving ample scope for future research. One major limitation came up during sample selection. With having controls on industry and size along with the organizational form, the sample of PE-backed firms along with comparable non-PE backed firms, becomes very small, i.e., 30 firms. Due to the limited data available, it was difficult to control the effect of outliers and reach accurate conclusions. Another limitation in this regard came with the role of year dummy variables. Even though the effect of trend has been controlled, it needs to be considered that certain years will have more PE transactions than other years. Such a wave of PE acquisitions in a particular year tends to affect the results of regressions. However, for the scope of this paper, this effect has not been controlled, and an equivalent wave of PE transactions is assumed throughout the years.

For future research, these limitations can be given more attention along with other dimensions to improve the horizon of this analysis. For instance, Du Pont is not used in regressions as an efficiency indicator. However, considering the research mentioned in the previous sections, it provides a strong relationship between efficiency and working capital management. Therefore, including it in regressions and analysis can also provide useful insights. Another factor that can be focused on in future is the individual role of accounts receivable, payables, and inventory in the form of DSO, DPO, and DIO. This would give a more concentrated outlook on working and the impacts of each account-head in its management. Managers can use this research to find the core area for value addition after the acquisition. Additionally, this paper does not look into the qualitative factors that could play a role after the acquisition transaction. For instance, human capital expertise or agency problems after acquisition can also prove to be significant drivers in efficiency increment.

Hence, there is a significant scope of further research and improvement. This paper will not only add value to existing literature and analysis but also open paths for future literature.

# 9. Conclusion

An established conclusion that can be drawn from existing literature and the analysis is that working capital management can play a significant role in evaluating firms' operational efficiency and creating value after acquisition. In the first half of the paper, the link between working capital and efficiency is considered. Working capital, when measured as cash conversion cycle, has a negative relationship with efficiency which is measured as return on assets. This indicates that by decreasing working capital, a company can improve its operational performance or efficiency. In the second half, this paper further concludes that the above mentioned technique of value creation is primarily used by private equity firms after buyout, enabling them to quantify value of the transaction in the short run. Through the regression results, the impact of PE buyout on the reduction of cash conversion cycle is mostly found to be statistically significant at ten percent. Furthermore, the results also show that return on assets for the PE-backed firms increases after buyout, thereby confirming the relationship established in the first half and the role of PE firms discussed in the second half. These results can further be improved by overcoming certain limitations in the sample as mentioned in the precious section. Overall, it is plausible to mention that working capital and operational efficiency are inter-linked and PE ownership has significant role in improving efficiency in the target firms through working capital management.

# Appendix A. Variable Definitions

| Variable | Description |
|---|---|
| roa | Ratio of net income (operating income after depreciation) to total book assets (TA) at the end of fiscal year. |
| gma | Ratio of gross profits (revenues minus cost of goods sold) to total book assets (TA) at the end of fiscal year. |
| ccc | Refers to the number of days it takes for a company to convert its sales into cash |
| size | Size is given by log of total assets (TA). |
| lev | Ratio of total debt (or liabilities) over total assets (TA) |
| growth | The change in total assets over the year; calculated by difference between assets of two consecutive years. |
| Year(i) | Dummy variables equal to one in each respective year from 2009-2016. |
| PE | Dummy variable equal to one if the firm is acquired by private equity firm. |
| ccc_pe | Interaction term calculated by multiplying ccc with PE and considers the specific impact of private equity ownership on cash conversion cycle. |
| lev_pe | Interaction term calculated by multiplying leverage with PE and considers the specific impact of private equity ownership on leverage. |
| size_pe | Interaction term calculated by multiplying ccc with PE and considers the specific impact of private equity ownership on assets. |
| growth_pe | Interaction term calculated by multiplying growth ratio with PE and considers the specific impact of private equity ownership on asset growth. |

# Appendix B. Detailed Summary of Variables

**Table A**
**Detailed Summary of ROA (Non PE-backed firms)**
This table reports descriptive statistics of return on assets for 30 non-PE backed firms for the sample from 2009-2016. Results include nine percentiles, skewness and kurtosis.

roal

| Percentiles | | Smallest | | |
|---|---|---|---|---|
| 1% | -1.611765 | -2.659884 | | |
| 5% | -.4117647 | -2.035336 | | |
| 10% | -.2265446 | -1.611765 | Obs | 231 |
| 25% | -.0301205 | -.9767442 | Sum of Wgt. | 231 |
| 50% | .0454981 | | Mean | .0214406 |
| | | Largest | Std. Dev. | .3374778 |
| 75% | .1637464 | .5161881 | | |
| 90% | .2919227 | .5223577 | Variance | .1138913 |
| 95% | .4191023 | .6107595 | Skewness | -3.819068 |
| 99% | .5223577 | .8835701 | Kurtosis | 27.25978 |

**Table B**
**Detailed Summary of ROA (PE-backed firms)**
This table reports descriptive statistics of return on assets for 30 PE backed firms for the sample from 2009-2016. Results include nine percentiles, skewness and kurtosis.

roal

| Percentiles | | Smallest | | |
|---|---|---|---|---|
| 1% | -.6226054 | -1.153145 | | |
| 5% | -.2837111 | -.8019259 | | |
| 10% | -.0914437 | -.6226054 | Obs | 231 |
| 25% | -.0017671 | -.6003857 | Sum of Wgt. | 231 |
| 50% | .0657387 | | Mean | .0953879 |
| | | Largest | Std. Dev. | .253596 |
| 75% | .1848611 | .7637953 | | |
| 90% | .362069 | .776069 | Variance | .0643109 |
| 95% | .5078732 | .8298076 | Skewness | .1221933 |
| 99% | .776069 | 1.461186 | Kurtosis | 9.747817 |

**Table C**

**Detailed Summary of CCC (Non PE-backed firms)**

This table reports descriptive statistics of cash conversion cycle for 30 non-PE backed firms for the sample from 2009-2016. Results include nine percentiles, skewness and kurtosis.

cccl

| | Percentiles | Smallest | | |
|---|---|---|---|---|
| 1% | 0 | 0 | | |
| 5% | .005618 | 0 | | |
| 10% | .0129151 | 0 | Obs | 231 |
| 25% | .0760918 | 0 | Sum of Wgt. | 231 |
| 50% | .1650485 | | Mean | .3452071 |
| | | Largest | Std. Dev. | 1.115479 |
| 75% | .3061225 | 1.901112 | | |
| 90% | .5516014 | 1.908245 | Variance | 1.244293 |
| 95% | .8569813 | 10.09091 | Skewness | 9.790101 |
| 99% | 1.908245 | 13.3125 | Kurtosis | 105.2475 |

**Table D**

**Detailed Summary of CCC (PE-backed firms)**

This table reports descriptive statistics of cash conversion cycle for 30 PE backed firms for the sample from 2009-2016. Results include nine percentiles, skewness and kurtosis.

cccl

| | Percentiles | Smallest | | |
|---|---|---|---|---|
| 1% | 0 | 0 | | |
| 5% | 0 | 0 | | |
| 10% | 0 | 0 | Obs | 231 |
| 25% | .1362371 | 0 | Sum of Wgt. | 231 |
| 50% | .2458198 | | Mean | .2324492 |
| | | Largest | Std. Dev. | .1440109 |
| 75% | .4 | .4026772 | | |
| 90% | .4026772 | .4026772 | Variance | .0207391 |
| 95% | .4026772 | .4026772 | Skewness | -.3495585 |
| 99% | .4026772 | .4026772 | Kurtosis | 1.864165 |

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