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Publicly Listed Versus Privately Owned: The Cash Conversion Cycle Conundrum

A Comparison of Public and Private Companies in Norway

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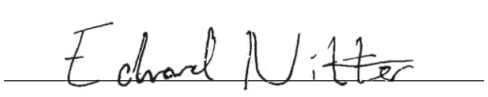

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Abstract

The objective of this thesis is bipartite. Firstly, we examine the effect of working capital management on return on invested capital for Norwegian companies. Secondly, we attempt to explain the differences in working capital management between publicly listed and privately owned companies from the perspective of agency theory. More concisely, we want to investigate whether the distinctive characteristics of these two ownership structures cause different exposure to agency costs, and subsequently different cash conversion cycles.

In our analysis, based on a panel of 1,129 Norwegian companies in the period from 2014 to 2018, we have found that there is a negative relationship between the cash conversion cycle and return on invested capital. These results were highly expected, considering the findings of the existing literature on this topic in other geographical markets. Moreover, we see that the drivers for this effect are mainly the management of receivables and inventory. Furthermore, we have identified significant differences in working capital practice between publicly listed and privately owned companies in Norway. In the last part of the analysis, we attempt to explain this discrepancy from an agency theory perspective. Based on our findings, there are some indications of an unexpected negative relationship between agency costs and the cash conversion cycle, but we cannot say anything conclusive the on extent to which this causes the inconsistencies in working capital policies. However, we are of the persuasion that there should be a theoretical link. Hence, we believe that this is an interesting path to follow for future research on working capital management.

Keywords – Working Capital Management, Agency Cost, Public, Private

Contents

1 Introduction

In June 2000, one of the largest listed corporations in the US learned the merciless lesson of the impact of working capital negligence. The respected bond broker, Ravi Sauri, dropped the bomb in the form of a pointed warning against the Amazon stock. The basis on which the warning was made was: "weak balance sheet, poor working capital management, and massive negative operating cash flow". In the following days, the shareholders responded by fleeing the company, leaving the stock at one-third of the value prior to the statement by Mr. Sauri. According to both the Washington Post and the Wall Street Journal, the main driver behind the stock-price crash was poor working capital management, leaving this as a strong example of how severe the consequences of neglecting the importance of working capital can be (Carlton, 2000; Schwartz, 2000).

Eight years later, another shock struck the world of finance, but this time on a totally different scale. The global financial crisis of 2008 is one of the most severe of its kind in modern time, as it drove numerous stock exchanges into the ground and drained liquidity (Moessner and Allen, 2010). As a consequence, working capital management received increasing attention from financial executives in companies all around the world (Nuhiu and Dërmaku, 2017). Companies of all sizes experienced severe financial distress during this period due to lack of liquidity, and turned to their balance sheets and found a solution in form of more efficient working capital management. This enabled companies to generate funds internally and remain solvent. In general, the apparent advantage of increased liquidity is that more significant cash balances make companies more reliable and robust in regard to debt obligations. In addition, companies with more cash on hand have the flexibility to pursue profitable investment opportunities. However, as the economic situation stabilised, working capital returned to its former state as a more subtle performance indicator.

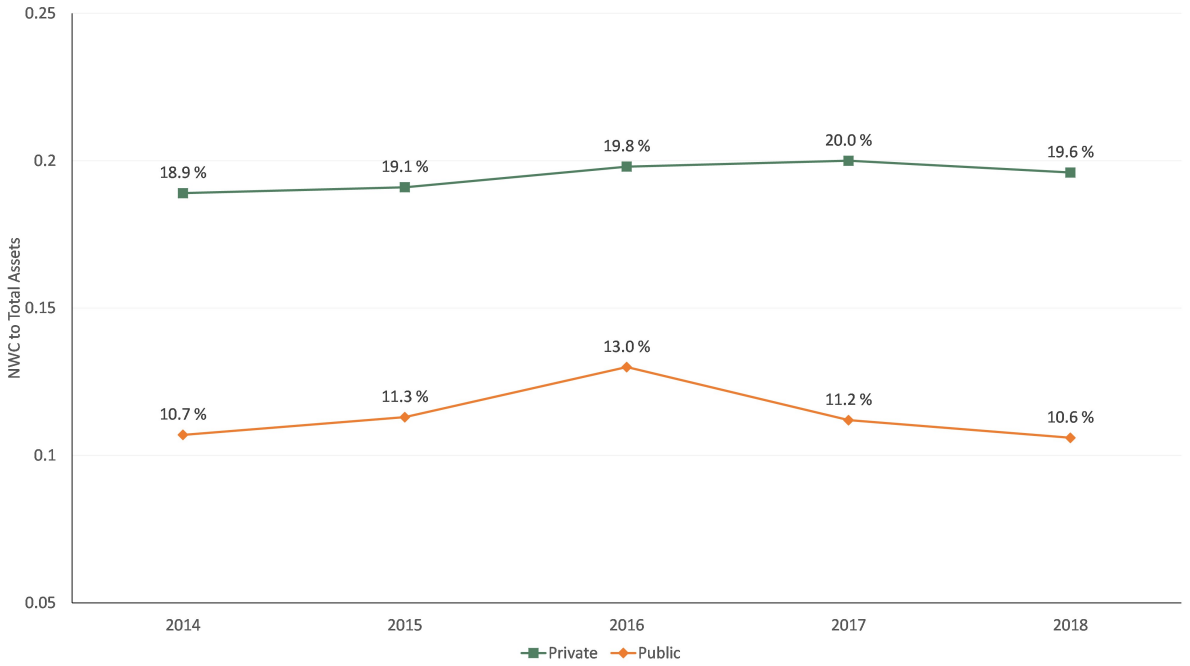
In a survey carried out by the Norwegian consulting firm Norsk Arbeidskapital, 80% of the CFOs asked acknowledged that working capital is an integral part of the company's financial performance. However, the same report unveils that 85% of those who recognise working capital as important say that they do not have proper monitoring

tools in place (NorskArbeidskapital, 2017). In later years, PWC has carried out multiple studies on working capital management globally, in the Nordic countries and in Norway (PriceWaterhouseCoopers, 2015, 2017, 2019). These reports suggest that there is still untapped potential regarding working capital management all around the world, and in the Nordics notably. What seems to be the main problem in Norway is not the awareness per se, but rather the lack of sufficient monitoring tools and the proper incentives. As of now, working capital seems to remain a neglected measurement of financial performance. Nevertheless, there are several examples showing that efficient management of working capital is critical for the survival of companies (Jafari et al., 2014).

The relationship between working capital management and corporate profitability has been subjected to thorough investigation in the field of financial research (Shin and Soenen, 1998; Deloof, 2003; Lazaridis and Tryfonidis, 2006; Hawawini et al., 1986). The findings imply that when net working capital decreases (increases), company profitability increases (decreases). However, opinions in the world of academia vary greatly. There are several examples of studies indicating that increasing investments in working capital could benefit the financial performance of companies (Paul and Wilson, 2007; Schwartz, 1974; Blazenko and Vandezande, 2003). In addition, the findings of PWC seem somewhat contradictory to the purposed negative relationship between working capital and profitability. As can be seen, Norwegian companies hold particularly high levels of working capital, relative to their international peers. There are potentially two explanations for this phenomenon. The first is that the financial incentives of Norwegian companies differ from the rest. Alternatively, Norwegian companies are exposed to excessive working capital due to a lack of rationality and proper incentives for managers.

There is a gap in the literature regarding how the working capital policies of public and private companies differ. The case of Amazon provides an example of how the shareholders severely punish management's mistakes. However, owners of private companies are not subject to the same external monitoring. Hence, they are not able to react in the same way as shareholders in listed companies. In the graph below, we display how the average net working capital to total assets differs between public and private companies in Norway:

Figure 1.1:
The Cash Conversion Cycle of Public and Private Companies



As is evident from the graph, there is a systematical difference in the net working capital levels between public and private companies. In the further analysis, we will attempt to explain this discrepancy from the perspective of agency theory, as we believe there are fundamental differences that facilitate unequal exposure to agency costs, which subsequently affects working capital management (Jensen, 1986; Opler et al., 1999; Ferreira and Vilela, 2004). Accordingly, the research question of this thesis is as follows:

Can the Agency Problem explain the difference in the cash conversion cycles of Norwegian public and private companies?

Our analysis in chapter 4 is divided into two parts. Firstly, we will apply panel data regression in order to investigate the economic impact of working capital management on profitability for Norwegian companies on an aggregated level. In the second part of the analysis, we attempt to explain the discrepancy in the cash conversion cycle between public and private firms. We believe the difference originates from unequal presence of agency costs and we use two different shocks to test this hypothesis: the deregulation of the accounting practice on the Oslo Stock Exchange, and the replacement of CFOs in

publicly listed companies. To estimate the effects, we adopt the Difference-in-Difference methodology.

The results of our analysis of the relationship between the cash conversion cycle and return on invested capital indicate that the negative relationship found by several other researchers also holds for Norwegian companies (Deloof, 2003; Shin and Soenen, 1998; Lazaridis and Tryfonidis, 2006). Furthermore, we observe that companies with longer cash conversion cycles have more substantial marginal effects on return on invested capital. These results are in accordance with our expectations, and consistent with the findings of existing literature (Juan García-Teruel and Martinez-Solano, 2007; Valipour et al., 2012). We find that there is a consistent discrepancy in the cash conversion cycles between public and private companies, and that the marginal effect of working capital management on return on invested capital differs between the two groups. Further, we investigate whether these differences can be explained by different exposure to agency costs. In our results, we are able to identify some links between agency cost and working capital. Moreover, further analyses reveal an unexpected negative relationship between the two. However, due to unclear results and absence of statistical significance, we cannot say anything conclusive about the whether there are differences in agency costs between public and private firms and if these explain the observed inconsistency in working capital management. Theoretically, we do believe a link exist, and we are of the opinion that this should be further investigated by future research.

Through this thesis, we believe we have made several contributions to the existing research. Firstly, we have added to the already extensive base of research on the effect of the cash conversion cycle on profitability by documenting a negative relationship for Norwegian companies. In addition, we have provided support to the notion that the marginal return of the cash conversion cycle on corporate profitability increases with the length of companies' cash conversion cycles. Secondly, and more importantly, we have discovered substantial differences in how public and private companies manage their working capital, and how their respective cash conversion cycles affect return on invested capital. Thirdly, we have addressed the agency cost as a potential explanation for the differences between public and private companies, and laid out extensive argumentation for why this should be the case. Although the results of our analysis are ambiguous in

that regard, we have provided some indications that agency costs do have an effect on the cash conversion cycle.

The thesis will be structured in the following way. In the next chapter, we will elaborate on the findings of existing literature on the matter of working capital and agency theory. Based on this review, we will further formulate our hypotheses. The third chapter focuses on the data used in this thesis, and elaborates on the methodology used in the analyses. It will contain a conceptual description of the various techniques applied, and also enlarge on our motivation for the chosen approach. In the fourth chapter, we present and discuss the results of our analyses, while the fifth and final chapter presents our conclusion and discusses the relevant limitations of this thesis. In addition, we will provide guidance for future research on this topic.

2 Literature Review

2.1 Corporate Profitability, CCC and Agency Costs

Our intention with this thesis is to explore the differences in working capital management policies between publicly listed and privately owned companies in Norway. The relationship between the cash conversion cycle and corporate profitability has been extensively investigated in the existing literature (Deloof, 2003; Shin and Soenen, 1998; Lazaridis and Tryfonidis, 2006; Nzioki et al., 2013). However, there is, to our knowledge, no research that makes an explicit distinction between public and private firms. In the analysis of the second objective, we will therefore apply an approach of a more theoretical nature.

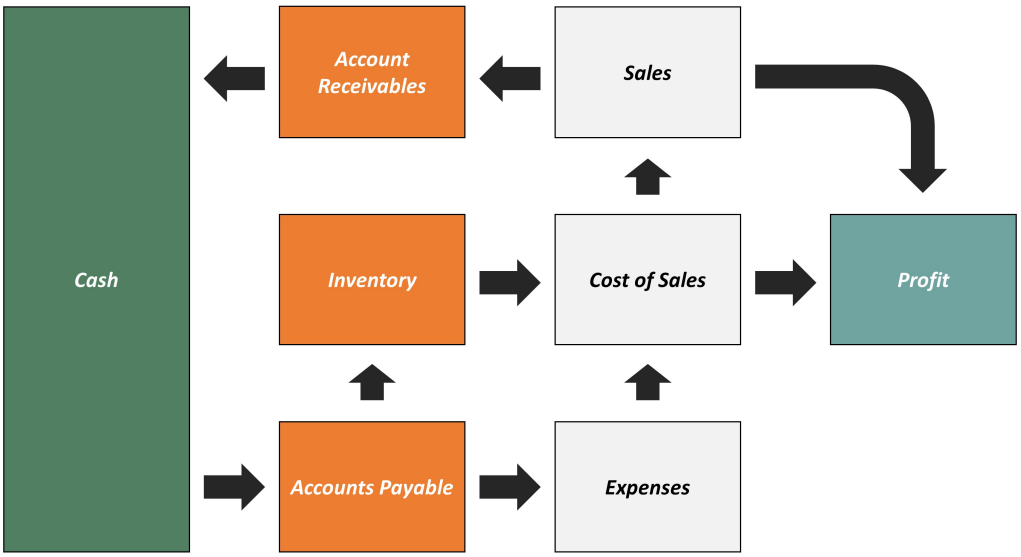
The cash conversion cycle is a measure of the number of days it takes for the company to convert a dollar of expenditure to a dollar of cash inflow (Richards and Laughlin, 1980). In our analysis, we will be using the cash conversion cycle as a proxy for the efficiency of companies' working capital management. The cash conversion cycle is acknowledged as a reliable metric in the literature (Deloof, 2003; Richards and Laughlin, 1980; Jose et al., 1996; Ebben and Johnson, 2011; Keown, 2004), and also has the advantage of isolating the specific sub-components of working capital management. By breaking the cash conversion cycle into days sales outstanding (DSO), days inventory outstanding (DIO) and days payables outstanding (DPO), we are able to carry out a more nuanced analysis on how efficiently different companies manage each specific component. The reason why we believe this is a valuable trait is the vast difference in the nature of each metric. Considering working capital on an aggregated level, it is difficult to say where potential inefficiencies are located. Subsequently, the decision on which actions to take remains a puzzle. In addition, the breakdown of the cash conversion cycle allows for analysis of how management of the different components affects the financial performance of the company. In a scenario where companies' resources are scarce, and priorities are necessary, such a decomposition is useful in order to make economically rational decisions.

Figure 2.1:
The Cash Conversion Cycle

To proceed with our initial research question, establishing a connection between the cash conversion cycle and financial performance is a necessary prerequisite. To put the issue of working capital management in a context where it is of relevance for companies' management, there needs to be a financial incentive attached. Otherwise, it would be rational to channel managements' time and resources elsewhere. In our assessment of the relationship between the cash conversion cycle and the financial performance, we have focused on return on invested capital as a measure of corporate profitability. The rationale behind the choice of return on invested capital is to isolate the effect of working capital management on the operational aspects of the business (Deloof, 2003; Petersen et al., 2017). Contrary to gross profit, used by Deloof (2003), the return on invested capital metric captures operational activities other than those directly related to sales. The use of return on invested capital also excludes the impact of the companies' capital structure (Modigliani and Miller, 1958). Intuitively, the link between investments in working capital and profitability is related to the costs of managing receivables and payables, as well as physical storage costs and management costs of inventories. Moreover, a reduction in the cash conversion cycle will lead to a reduction in these costs. On the other hand, there are other less pronounced ways in which working capital management could affect

profitability, and we will touch upon these in later sections. In figure 2.2, we illustrate how working capital and profitability are directly connected.

Figure 2.2:
The Relationship between Working Capital and Profitability



In the relationship between agency cost and working capital, the focus has been on using agency theory to explain inefficiencies in companies' working capital management. Up until now, the literature has focused on the relationship between agency costs and cash retention, and how this affects the cash conversion cycle (Jensen, 1986; Opler et al., 1999; Ferreira and Vilela, 2004). The misalignment of incentives between managers and shareholders has been emphasised as one of the core reasons why these costs occur (Brealey et al., 2012; Harris and Raviv, 1996). Another explanation for the observed agency costs is asymmetric information between the management and the headquarters (Hubbard, 1997). In addition, several researchers have directed their attention towards control mechanisms to restrain the extent of agency costs. Firstly, budget constraints are used as a way of controlling the management in the case of diverging interests (Jensen and Meckling, 1976). Secondly, increasing corporate debt can be argued as having a disciplining effect as it limits the free cash flow which the management has at its disposal (Ang et al., 2000).

In subsequent sections of this chapter, we aim to further elaborate on the relationship between the cash conversion cycle and corporate profitability, and how the agency theory plays a role in the determination of both this relationship and the length of the cash conversion cycle. In the first part, we will present arguments for why a shortening of the cash conversion cycle has a positive effect on the profitability of companies. Secondly, we look at explanations for the opposite. Thirdly, there will be a section on structural differences between public and private companies, and how the agency problem can be connected to these differences. Finally, we state the hypotheses which make up the foundation for our thesis.

2.2 Shorter Cash Conversion Cycle and Improved Profitability

In the literature, two factors stand out as the explanations for the relationship between working capital management and corporate profitability. Firstly, more efficient working capital management implies better liquidity (Shin and Soenen, 1998; Mathuva, 2015). Secondly, companies with shorter cash conversion cycles are assumed to have more market power, primarily as a consequence of company size. The two perspectives will be discussed individually in the following.

2.2.1 Effects of Liquidity on Cash Conversion Cycle and Profitability

Liquidity concerns are mentioned as an essential reason for the relationship between profitability and net working capital (Johnson and Soenen, 2003). By minimising the amount of capital invested in working capital, the company has more funds to invest in profit enhancing activities. For example, it may look for inorganic growth opportunities through M&A activity, or it may turn its focus to improving fixed assets already in place (Papadakis, 2007). Other advantages associated with increasing liquidity are the decrease of default risk. By releasing cash through more efficient working capital management, companies are more resilient to external shocks in their business environment. For instance, they are better prepared to meet their financial obligation in the event of rate hikes.

Furthermore, the funds can be used to repay debt, and thus strengthen the balance sheets through reduction in leverage. The notion that companies' leverage has a significant adverse effect on the corporate profitability has extensive support in the existing literature (Raheman and Nasr, 2007; Arditti, 1967; Hall and Weiss, 1967). An effect of decreasing total debt is lower financing costs, which can be explained in two ways. Intuitively, financial expenses increase with total debt since interest expenses are a product of interest rate and total debt. A more subtle way in which leverage affects corporate profitability is through the relationship between capital structure and credit score. According to previous research, the amount of debt and companies' credit scores are negatively related. With increasing debt, the default risk rises, and thus the credit score worsens (Ohlson, 1980; Petersen et al., 2017). Subsequently, this is likely to result in exponentially higher marginal cost of financial debt and increase the overall cost of capital. This in turn weakens the profitability of the companies, and also increases the alternative cost of the capital invested in working capital.

In addition to the profitability concerns, increased liquidity could have a self-enhancing effect on the cash conversion cycle (Saleem and Rehman, 2011). Better liquidity reduces the counter party risk from a supplier perspective since the probability of receiving payment for goods delivered increases. Hence, the risk of the company is negatively related with days payables outstanding, as suppliers are more restrictive towards low-liquidity firms due to default-risk. However, this is a trade-off between the rate of return at which the excessive capital can be employed and the marginal return of the improvements in supplier conditions (Saleem and Rehman, 2011).

2.2.2 How Company Size and Market Power Affect Cash Conversion Cycle and Profitability

One of the reasons why the ideal amount of working capital varies with size can be explained by alternative costs. In general, larger companies have an advantage relative to small companies in obtaining external financing at lower costs (Moss and Stine, 1993). From an alternative cost perspective, it is less costly for larger companies to finance inventories and account receivables with debt from credit institutions (Stiglitz and Weiss, 1981; Rajan and Zingales, 1995; Berger and Udell, 1995; Shane and Cable, 2002; Cassar,

2004). The reasoning behind this argument is that larger companies experience a positive spread between the cost of capital in the debt market, and the marginal return on increased inventory and account receivables (Schwartz, 1974; Deloof, 2003). Thus, an increase in these working capital metrics up until the point where cost of capital equals the marginal return can be argued to be economically rational. In addition, larger companies are able to finance more of their working capital with credit as their debt capacity exceeds that of smaller firms, and thus have a higher optimal level of working capital than smaller firms (Stiglitz and Weiss, 1981). Consequently, we see that the positive effect of decreasing cash conversion cycle on profitability intensifies with decreasing size (Dalci et al., 2019; Juan García-Teruel and Martinez-Solano, 2007).

Consistently with the argumentation above, decreasing size is associated with decreasing debt capacity and higher financing costs (Stiglitz and Weiss, 1981). Thus, smaller companies are forced to use expensive capital to finance their working capital, and will necessarily benefit more from reducing their cash conversion cycle (Faulkender and Wang, 2006). Based on these relationships, we should expect that the length of the cash conversion cycle increases with the size of the company, all else being equal.

However, there are significant findings of the opposite, that the cash conversion cycle is negatively correlated with company size (Valipour et al., 2012; Nilsson, 2010; Chiou et al., 2006). This relationship of shorter cash conversion cycles and large company size has also been found for Norwegian companies (PWC, 2015). In fact, it is observed that Norwegian companies in the revenue range of 100-500 mill NOK have 25% longer cash conversion cycles, compared to companies with revenues >1000 mill NOK. The literature argues that these differences partly rely on the market power associated with increasing company size (Shin and Soenen, 1998). Increasing market power improves the bargaining position of the company towards both customers and suppliers (Porter et al., 1979). Larger companies have more leverage towards suppliers, relative to small firms, which enable them to dictate more flexible credit terms. The more reliant a supplier is on a specific company, the less restrictive it will be. This argument can also be extended to the customer side of the supply chain. If a customer is reliant on a single company in order to be supplied with vital goods, it will have to accept the tight terms and conditions of that supplier. Consequently, more flexible credit terms increase the days payable outstanding and tighter

customer credit policies reduce days sales outstanding, which in turn decreases the length of the cash conversion cycle (Richards and Laughlin, 1980; Porter et al., 1979).

2.3 Longer Cash Conversion Cycle and Improved Profitability

Although the working capital management literature for the most part supports the conjecture that shorter cash conversion cycles increase corporate profitability, there are still some mitigating factors that argue for the opposite. In particular, a further examination of the individual components reveals circumstances where it could be profitable to have longer cash conversion cycles. We will elaborate on each component separately and discuss the instances where these contradictions may arise.

2.3.1 Days Sales Outstanding and the Motivation for Extending Credit to Customers

There is no dispute that shortening the time it takes to collect sales outstanding increases liquidity. On the other hand, it could also be beneficial for firms to increase the portion of credit sales. To understand why, one has to consider the motivation for extending credit to customers in the first place. There are costs associated with matching the time pattern of payment of goods to the pattern of delivery of goods (Schwartz, 1974). Moreover, customers benefit from trade credit since it enables them to plan future expenditures with greater precision and provide time to plan outlays for unexpected purchases. Thus, companies can generate additional sales so long as the customers have an appetite for trade credit. In addition, the literature consensus does, to a certain extent, consider growth strategies in conjuncture with days sales outstanding. As pointed out by Richards and Laughlin (1980), increasing account receivables deteriorate liquidity only if the portion of credit sales to total sales increases. Therefore the effect of increasing days sales outstanding is dependent on the costs associated with lower liquidity and the return from strategic growth, and there could be instances where both days sales outstanding and profitability increase together. On the other hand, there is little benefit in extending trade credit to customers above levels dictated by the growth strategy (Nuhiu and Dërmaku,

2017).

There are additional propositions regarding why companies actively extend customers credit and how it can affect profitability positively. Firstly, since growth in general is restricted to the limits of the markets, companies can increase their own profits by financing profitable growth of their customers (Schwartz, 1974). Moreover, suppliers of trade credit have a cost advantage over financial institutions in providing short-term credit since they have information from transactions and can seize the goods delivered as collateral. Hence, they can function as a financial intermediate to customers when banks are less inclined to supply short-term financing (Petersen and Rajan, 1997; Deloof and Jegers, 1999). An additional implication is that if companies become an essential part of their customers' short-term financing policies by repeated transactions, they are granted more control of their supply chain and a better bargaining position to dictate terms and prices. Secondly, credit sales can be regarded a form of price discrimination. High margin companies have strong willingness to make additional sales to higher costs if they can evade cutting prices on sales to established customers. By extending trade credit with discounts for early payments, customers with high creditworthiness will find the implied interest rate expensive, while the low-quality lenders will find it a cheap alternative to other short-term financing. Thus, in elastic markets the two segments effectively face different prices, and the suppliers of trade credit achieve better market penetration and increased profitability (Petersen and Rajan, 1997). Finally, companies offer trade credit to customers in order to signalise the quality of the goods supplied. Trade credit allows the customers to assess the products after the purchase but before the payment, and therefore they have the ability to withhold cash. This gives an assurance to the customers and facilitates a process of relationship and reputation building for the suppliers, where companies offering high-grade goods are willing to loosen their credit policies, while firms producing low-quality goods prefer cash transactions. Moreover, small companies and companies without other means to communicate quality are shown to have longer days sales outstanding. However, for firms with well-established reputations for quality or operating in homogeneous markets, the signal effect of extending trade credit only has a confirmation effect and is therefore more limited (Long et al., 1993; Deloof and Jegers, 1996; Paul and Wilson, 2006).

2.3.2 Days Inventory Outstanding, Stock-Outs and Barriers to Entry

There are also some arguments to be made in direction of a longer cash conversion cycle with regard to days inventory and profitability. An argument for why companies could benefit from holding more inventory is based on the risk of stock-outs and its associated consequences (Blazenko and Vandezande, 2003; Deloof, 2003). The outcome of this trade-off depends on companies' exposure towards stock-out risk and the preferences of their customers. More specifically, the gains from excessive inventory are more considerable for more concentrated industries (Rotemberg and Saloner, 1986). In more crowded industries, the consequences of stock-outs are more severe as many competitors are ready to take the market position.

Investments in inventories can also be strategically motivated. Companies with high market power can invest in excess production capacity in order to deter entries from other players by threatening to lower prices. In the short run, this could imply higher inventory levels and additional costs, but in the long run, the superior market position is sustained (Pashigian, 1968). As these companies often have high margins, there could be instances where inventory levels are high in conjuncture with high profits. However, empirical research has shown that the use of excess capacity is uncommon in practice. Instead, excess capacity seems to be present in markets where there is variability in demand and lumpiness in investments (Lieberman, 1987).

2.3.3 Days Payables Outstanding and Early Payment discounts

Holding off invoices from suppliers can be an effective short-term source of liquidity for firms, but it is not without risk. Firstly the suppliers will be affected by the increased costs and over time incorporate this into their credit terms and pricing (Nuhiu and Dërmaku, 2017). Moreover, companies facing a high concentration of suppliers have to assess the business risks and the effects on profitability of potential relationship deterioration and weigh this against the gains of higher liquidity.

Another obscuring factor is the presence of early payment discounts. Suppliers often

offer discounts on their goods if their customers pay by a predetermined date within the credit period. The customers then have to balance the price reduction with the cost of deferred payment (Paul and Wilson, 2007). The cost is the implicit interest rate incurred when the cash discount is not taken, and this rate tends to be significantly higher than the rate charged on working capital financing offered by financial institutions (Elliehausen and Wolken, 1993). Moreover, companies choose to take on expensive trade credit because of credit rationing, i.e. the unwillingness of financial institutions to provide credit because of the borrowers' implied risk profile. Hence, there is excess demand for short-term financing in the markets. As mentioned previously, this demand is in turn met by suppliers of trade credit with lower lending costs (Schwartz, 1974). Therefore, it would be likely that companies with cheap and easy access to capital markets will take the discount, while companies affected by credit rationing wait to the end of the term (Petersen and Rajan, 1997). Consequently, it could be that profitable companies with better creditworthiness will seek to reduce days payables outstanding. A further point is that struggling companies could be using liquidity from delayed payments as a life line in order to survive (Sharma and Kumar, 2011). This relationship was also hinted at by Deloof (2003), who proposes that less profitable Belgian firms tend to postpone payments, and additionally the same relationship was found among Greek companies (Lazaridis and Tryfonidis, 2006).

2.4 Inherent Differences Between Public and Private Companies and Agency Costs

The primary purpose of our thesis is to explore the differences in working capital management between publicly listed and privately owned companies. Furthermore, we will investigate whether agency costs originating from the structural differences between the two ownership structures can explain these disparities. Multiple studies have focused on how agency costs are related to different company structures. In addition, the existing literature offers some discussions about the effect of agency costs on companies' working capital management. We will first discuss fundamental differences between public and private companies. Next, we elaborate on what the literature states about the relationship between agency costs and working capital.

2.4.1 Inherent Differences Between Public and Private Firms

Ownership Structure

A fundamental difference between public and private companies is the ownership structure. Firstly, the number of owners in public companies is usually substantially higher when compared to private firms (Mueller, 2008). Secondly, individual investors of private companies usually hold larger ownership shares in comparison with the shareholders of public companies. A third distinction to be made between public and private companies is that management on average has larger ownership interests in private companies (Regjeringen, 2012). On the one hand, increasing the concentration of managerial ownership can multiply the agency costs as the risk undertaken by the managers increases with their ownership and influence in the company (Saunders et al., 1990; Amihud and Lev, 1981; May, 1995). The rationale for this relationship relies on the challenges for external stakeholders associated with monitoring more risky markets, due to less transparency and more sophisticated investment objects (Demsetz, 1983). Therefore, they have to rely on the judgment of managers operating with a contrary risk profile.

On the other hand, we also observe the contrary, that more concentrated ownership can have a mitigating effect on the agency problem (Jensen, 1993; Singh and Davidson III, 2003; Jensen and Meckling, 1976). By moving towards managerial ownership, the misalignment between owners and managements diminishes, and the agency costs decreases. A third perspective found in the literature is that the relationship between managerial ownership and agency costs is of a non-linear nature (Short and Keasey, 1999; McConnell and Servaes, 1995, 1990; Morck et al., 1988). However, there is disagreement on how the effect of managerial ownership on agency costs behaves for different ownership stakes.

Corporate Standing

Another difference between the two groups is the ability to attract and retain top tier talent (Erdogan et al., 2016). As companies go public, they become increasingly attractive to high level professionals. By elevating the credibility and general standing of the company in the corporate world, it gets access to a more skilled pool of professionals

to fill managerial positions. The quality of financial management is paramount in the context of working capital for two reasons. Firstly, it is the executive team, led by the CFO, which dictates and monitors the working capital policy of the company (Nuhiu and Dërmaku, 2017). Secondly, one of their core responsibilities is to undertake investment decisions on behalf of the company. Thus, the effect of freeing up capital through more efficient working capital management mainly relies on the return rate at which the financial management is able to reemploy the funds.

Reporting Practice

A third diametrical difference between Norwegian public and private firms is the reporting practice to which these companies are obliged to adhere. While private companies are obliged to report their financial statements on an annual basis, the public companies must report semi-annually (Sulen, 2004; Børs, 2016). In addition to reporting on a more frequent basis, there are particular demands for publicly listed companies regarding the information to be included in the financial reports, as they are legally bound by the IFRS accounting standards (Bernhoft et al., 2011). With the implementation of the IFRS standards, publicly listed companies have become more transparent to the public, investors and creditors (Ding et al., 2007).

In turn, the increased transparency as a result of the IFRS accounting standards is expected to have a negative effect on the agency costs (Pae et al., 2006; Levitt, 1998). By providing shareholders with more information on the financial state of the company on a more frequent basis, the task of monitoring performance is made more effortless. Thus, the management runs a higher risk by not meeting the shareholders' expectations, as the increased transparency enhances the reactivity of the shareholders (Bushman and Smith, 2001; Black, 2000; Huang and Zhang, 2011). A related explanation for the negative effect of increased disclosure on agency costs is the reduction of the information asymmetry problem through more efficient liquidity management and changed incentives (Bushee and Leuz, 2005).

2.4.2 Working Capital and Agency Costs

General Relationship

One link between agency costs and working capital that has substantial support in the existing literature is that management prefers keeping capital in-house in order to exercise control (Jensen, 1986). Management also tend to see the withholding of cash as a safety mechanism, as keeping liquid assets in the company lowers the risk of bankruptcy (Opler et al., 1999). Moreover, by retaining cash or investing it in working capital, management is not exposed to the risk associated with investing these funds externally (Ferreira and Vilela, 2004). Another consequence of this risk aversion amongst managers is a more restrictive dividend policy (Drobetz et al., 2010). In addition to the adverse effect for the shareholders, it is difficult for the capital markets to expose this practice as these investments are funded internally (Pinkowitz, 2000). Thus, we see that excess cash causes the management to prioritise its own interests over the interests of the company and its respective shareholders. A mechanism for controlling the agency costs is to increase the corporate debt in order to limit the amount of excess cash available to the management, and subsequently the agency problem (Ang et al., 2000). However, it seems that this relationship only holds for certain levels of debt (Jensen and Meckling, 1976). When companies' leverage exceed these levels, the relationship between debt and agency costs turns positive. Such a mechanism only changes who carries the agency problem, as increasing corporate debt opens up for direct wealth transfers from debtholders to shareholders (Smith Jr and Warner, 1979).

Another argument for a negative relationship between the cash conversion cycle and agency costs is the negligence of working capital as an essential measure on financial performance. Managers and CFOs have traditionally focused on long-term perspectives, and thus put more effort and resources into investments with longer duration (Nuhiu and Dërmaku, 2017). Subsequently, the management of short-term investments and working capital has received less attention. Additionally, improvements in the cash conversion cycle have been associated with extensive effort relative to other profit enhancing activities (Darun, 2011). Thus, it is easy for management to prioritise less important operating initiatives, even though the working capital issues might be more urgent.

Chief Financial Officer

Regarding financial management, the principal executive is the CFO (Nuhiu and Dërmaku, 2017). In addition to their monitoring function, the CFO has a direct impact on the establishment and execution of company strategies. Moreover, the CFO has the ultimate responsibility for investments and management of working capital. It is natural to consider the CFO of a company, over the CEO, when investigating financial reporting practices, as they have more influence over the companies' financial reporting behavior (Jiang et al., 2010). Accordingly, CFOs with skewed incentives could represent an agency problem. One argument in favour of this notion is the effect of changing CFO. Existing literature has found that companies appointing a new CFO experience a significant decrease in discretionary accruals (Geiger and North, 2006). These findings imply that new CFOs tend to take on the losses of their predecessor. Additional support is provided by the findings of significantly higher accruals for companies hiring CFOs directly from their auditor, as these have incentives to stay true to "their own" practice (Menon and Williams, 2004; Dowdell and Krishnan, 2004). Current CFOs have incentives to increase discretionary accruals as this reflects favourably on financial performance, and subsequently on bonuses and compensation (Healy and Wahlen, 1999; Burgstahler and Dichev, 1997; Cheng, 2004). Conversely, newly appointed CFOs are incentivised to do the exact opposite. By reducing discretionary accruals, they set a lower bar, and thus create larger room for improvement in the future (Geiger and North, 2006). A change of CFO is therefore expected to lower the agency costs of the company in the short run.

2.5 Hypothesis Development

Based on the findings of existing literature in the field of working capital management, we believe that there is a negative relationship between the cash conversion cycle of a firm, and its profitability. The question is, however, not quite as straightforward. On the one hand, it is possible to argue that improving the working capital management of a company will result in increasing liquidity through freed-up funds. Increased liquidity provides the company with financial flexibility and might have an effect on both access to external capital and the opportunity to pursue growth strategies. On the other hand, pushing the working capital too low will increase the company's exposure towards other risk factors,

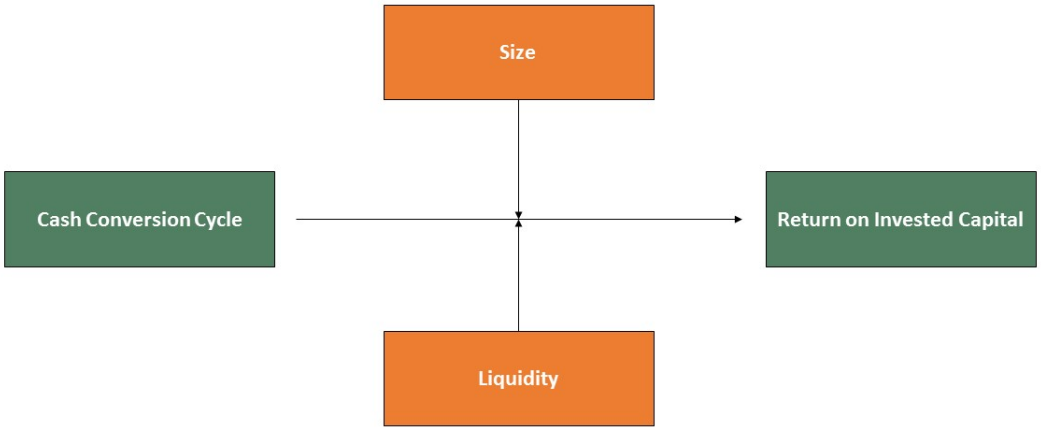
which subsequently might have a negative impact on the financial performance overall. For example, stock outs and strict credit sale policies may degrade the customer experience, which subsequently materialises in decreasing sales. Also, by stretching the payables, the company risks ruining relationships with its suppliers.

However, our expectation is that shortening the cash conversion cycle has a positive effect on the return on invested capital due to liquidity and market power aspects. Even though a more restrictive working capital policy is associated with higher risk, we are of the perception that in the current state, Norwegian companies have positive marginal return on shortening the cash conversion cycle. We also expect that companies with relatively longer cash conversion cycles have higher marginal return on cash conversion cycle improvements. Our first hypothesis can therefore be formulated as follows:

Hypothesis 1 (H_1): Decreasing the cash conversion cycle leads to an increase in return on invested capital for Norwegian firms, with diminishing returns.

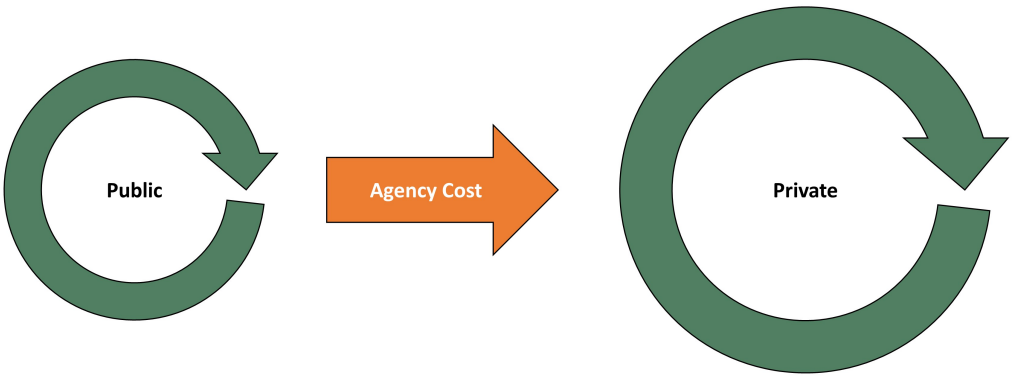
The logic behind this hypothesis is illustrated in figure 2.3 below:

Figure 2.3:
An Illustration of the Relationship between the Cash Conversion Cycle and Return on Invested Capital



Based on figure 1.1 in the introduction, we believe that there are consistent differences in the cash conversion cycles of public and private companies in Norway. Subsequently, we argue that these differences are related to the skewed exposure to agency costs. Our perception is illustrated in the conceptual framework presented through figure 2.4.

Figure 2.4:
The Purposed Effect of Agency Costs on the Cash Conversion Cycle



As implied by existing literature, agency costs and the cash conversion cycle are positively related. One of the causes for this relationship is the risk aversion of company management, as they tend to invest excessive cash in liquid assets like working capital. In section 2.4.1 we discussed the inherent differences of public and private companies, and how these differences can determine the amount of agency costs faced by the two groups. On the one hand, we see a consistent negative relationship between transparent financial reporting and agency costs. As public companies face more restrictive legislation regarding reporting practice, we argue that public companies will have lower agency costs. On the other hand, companies with managerial ownership seem to have lower agency costs as the alignment of management and owner expectations is less complicated. Thus, private companies should have an advantage relative to public companies in regard to controlling agency problems. Nevertheless, we are of the perception that public companies face lower agency costs due to extensive and frequent financial reporting, in addition to

more exposure to public perception through trading at stock exchanges. Furthermore, there are some notions that the relationship between managerial ownership and agency costs is of a non-linear nature. Thus, our second hypothesis is:

Hypothesis 2 (H_2): Public companies have shorter cash conversion cycles due to lower agency costs

3 Methodology and Data

In this chapter, we will present the data and methodology used to analyse the research question. First, we will elaborate on the data sources, sample selection and other obstacles that we have addressed to prepare the data for further analysis. Next, we will present our model and all the associated variables used, followed by descriptive statistics. Thirdly, we will go more in detail on the methodology used to test our hypotheses. The last section will explore potential issues and we will further discuss limitations to our approach.

3.1 Data Sources and Sample Selection

There are two primary sources of data. The international databank, Orbis, has been the main source for extensive financial information on publicly listed companies in Norway, while data on Norwegian private firms has been extracted from the Scandinavian database Soliditet by bisnode. Where needed, we collected data from external sources in order to construct the necessary variables for our analyses. These sources will be addressed under the discussion of the relevant variables in section 3.2.

For both the Orbis and the Soliditet databases, we ran several queries to filter the data. Firstly, we limited our search to fully consolidated active companies with reported total 2018 revenue equal to or above 100 million NOK. Our motivation for the revenue limit is to exclude smaller growth companies. Purely mathematically, these types of companies obscure the working capital metrics we use in our models. Moreover, from an intuitive point of view, we also regard these companies as unfit due to the uncertainty of their future sales and thus their ability to manage working capital with stability. Next, we sorted the companies by industries, determined by their NACE rev. 2 codes (NACE, 1990). Because of their working capital characteristics and the nature of their business models, we have excluded companies from the following sectors: financial and insurance activities (code 64-66), public administration and defence (code 84), education (code 85), other service activities (code 94-96), activities with households as employers (code 97-98) and activities of extraterritorial organisations and bodies (code 99). The complete list of the industry classifications is given in the table A.01 in the appendix. Lastly, we ensured that the companies had available financial statements for each year in the period

from 2013 to 2018. Initially, the entire process generated 1,129 eligible firms. Firm data from 2013 was used to calculate variables of which financial items from the previous year were required. Hence, we obtained a balanced panel data set with five years of financial statements and 5,645 firm-years in total.

We then matched the financial statements of the two databases to ensure that the items were comparable, removed duplicated rows and validated the data for missing and erroneous entries. After constructing our variables (see section 3.2) the data was organised into two subsets: Norwegian private firms and Norwegian public firms. Furthermore, the Norwegian private data was truncated between the 5th and 95th percentiles to remove outliers from the cash conversion cycle. Considering the relatively small size of the Norwegian public subsample, we found it reasonable to remove outliers manually. In order to balance the panel data, companies missing one year or more of observations after our adjustments were completely removed from the dataset (Deloof, 2003). Finally, the private subsample held 5375 firm years and the public subsample ended up with 270 firm years.

3.2 Discussion of Model and Variables

In line with our first hypothesis, our models aim to explain how working capital management affects profitability. Hence, return on invested capital is our dependent variable, and variations of working capital management metrics are used as our explanatory variables. Naturally, return on invested capital is influenced by factors other than working capital management, which is reflected in our choice of control variables. The base model for our study can therefore be presented as variations of the following regression equation:

$$ROIC = \alpha + \beta[NWC\,metric] + \theta[Controls] + \epsilon \tag{3.1}$$

3.2.1 Dependent Variables: Return on Invested Capital

In later years, the emerging themes in the working capital literature have been the effectiveness of working capital management and a deeper understanding of working capital

practices (Darun et al., 2015). Effective working capital management can be summarised by the two elements of profitability and liquidity. Our thesis revolves heavily around the first of the two, and our dependent variable of choice is the profitability measure return on invested capital, represented by ROIC in our models. Return on invested capital is in effect a measure of the return yielded from all operating assets on a company´s balance sheet (Damodaran, 2007). Therefore, it encompasses the operational and investment sides of the business, both of which are channels that the literature believes are affected by the working capital management. Petersen et al. (2017) argue that return on invested capital is a better measure of operating profitability compared to nominal operating profits, such as EBIT and NOPAT, since it takes invested capital into account and can be compared to investors' cost of capital. Additionally, an advantage of using return on invested capital is that we can utilise the DuPont identity and decompose the ratio into NOPAT margin and net operating asset turnover. This breakdown lets us study additional explanatory variables and gives our research greater insight into how working capital management affects the profitability of firms, and where stakeholders should direct their focus. Formally, we follow the framework of Petersen et al. (2017), and define return on invested capital:

$$ROIC_{it} = \frac{NOPAT_{it}}{Invested\,Capital_{i,t-1}} \tag{3.2}$$

$$NOPAT\,margin_{it} = \frac{NOPAT_{it}}{Revenues_{it}} \tag{3.3}$$

$$Asset\,turnover_{it} = \frac{Revenues_{it}}{Invested\,Capital_{i,t-1}} \tag{3.4}$$

Net operating profit after tax, or NOPAT, is the profit earned on a firm's operations and is therefore independent of the form of financing (Petersen et al., 2017). It is derived from earnings before interest and taxes, but adjusted for taxes paid on operating profit solely. Since financial expenses are tax-deductible and dividends and capital gains on qualifying shares are tax-exempt in Norway, taxes paid in the period are not applicable. Instead, we use the corporate tax-rate in Norway times operating profit as a proxy for taxes

paid on the operations. The proxy has its limitations due to the neglect of the effects of deferred tax-assets, tax-liabilities and other large non-recurring tax-items. Another option would be to use the effective tax-rate and add back the tax-shield effects from net financial income. However, this approach would imply examination of each firm individually and is not compatible with the time restrictions we face for this thesis. Additionally, we argue that the effect of the various tax items excluded has a marginal implication on average.

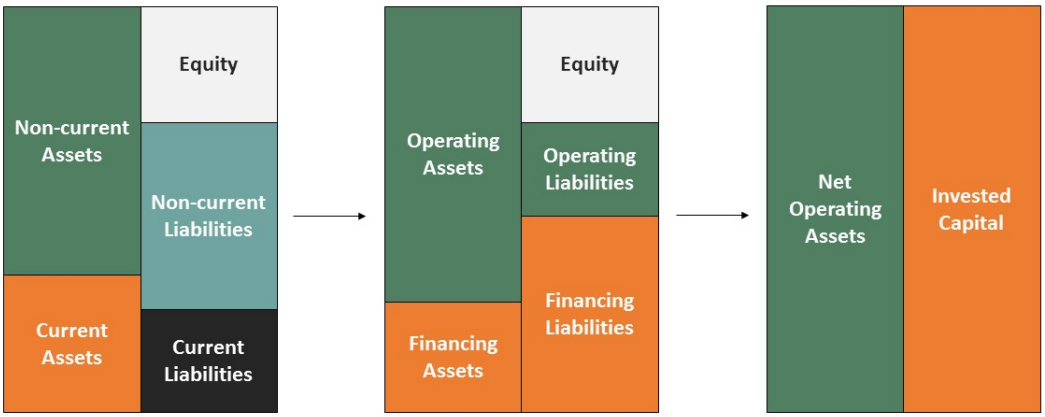
$$NOPAT_{it} = EBIT_{it}(1 - t_t) \tag{3.5}$$

In the calculation of invested capital, Petersen et al. (2017) make the distinction between operating and financial activities, as can be seen in figure 3.1. From the liability side of the balance sheet, invested capital is defined as the sum of net interest-bearing debt and equity. From the asset side, invested capital equates to net operating assets, which is equal to the sum of operating assets, less operating liabilities. The correct calculation of invested capital requires in-depth classification of balance sheet items for each firm. Again, this is unattainable due to our time constraints. Instead, we have followed the methodology using a more general framework for operating assets and liabilities proposed by Petersen et al. (2017). In this thesis, invested capital is defined as the following:

$$\begin{aligned} &Invested\,Capital_{it} = \\ &(Fixed\,Assets_{i,t-1} + Current\,Assets_{i,t-1} - Cash\,and\,Equivalents_{i,t-1}) \\ &-(Current\,Liabilities_{i.t-1} - Short\,Term\,Interestbearing\,Debt_{i,t-1}) \end{aligned} \tag{3.6}$$

In the calculations of invested capital, we use the beginning of period book value. This simplification follows the rationale of Damodaran (2007), that investments generally do not produce earnings within the course of the same year. Furthermore, book values are considered closer to the nominal values invested, compared to market values that reflect both growth and future earnings power in assets.

Figure 3.1:
Analytical Balance Sheet



3.2.2 Independent Variables: CCC, DSO, DIO and DPO

The cycle of working capital can be managed by monitoring account receivables, inventory, account payables and the cash balance. However, as pointed out by Nuhiu and Dërmaku (2017), financial managers face a twofold challenge in optimising both the monetary investment volume and the duration of these investments. This is usually accomplished by minimising the investments in working capital and shortening the working capital cycle. The temporal nature of the optimisation problem shows the advantage of using flow-based liquidity metrics for working capital management, as opposed to the absolute monetary value of working capital or working capital ratios such as the current ratio. Richards and Laughlin (1980) raise the concern that these static indicators fail to recognise the discrepancies between the operating cash inflows and outflows, and give misleading views of firms' need for short-term liquidity. Moreover, they argue that by including income statement items to measure the turnover rates of working capital components, managers get a better grasp on the average number of days it takes for working capital to be converted into cash. Conversely, the view is that firms can increase liquidity by squeezing the average turnover days. We share this conjecture of Richards and Laughlin (1980), and in line with working capital management literature written in

the late globalisation era, we adopt the view that the working capital effect on liquidity and profitability is best measured by flow-based metrics (Darun et al., 2015).

3.2.2.1 Cash Conversion Cycle (CCC)

The cash conversion cycle is a measure of the net time between cash expenditures on a firm's productive resources and cash ultimately received from product sales (Richards and Laughlin, 1980). It is defined as the sum of days sales outstanding and days inventory outstanding, less days payables outstanding. Thus, it encompasses all the cash cycle components of working capital and is effectively a comprehensive measurement of working capital management in a firm. Gentry et al. (1990) propose a weighted cash conversion cycle, which also takes into account the volume of funds at each step in the working capital cycle. Although this measure fits better with the optimisation problem laid out by Nuhiu and Dërmaku (2017), the weighted cash conversion cycle requires information about the working capital cycle only available to internal management of the firms, and is therefore unadoptable by external researchers. Consequently, in this thesis, we apply the traditional cash conversion cycle.

In our models, the cash conversion cycle is represented by the variable CCC and, contrary to similar research done on working capital and profitability, we use lagged components when this relationship is analysed. Our main motivation for this approach is that we believe effects from releasing net working capital generally facilitate return on investments the following year. For instance, large companies often need to plan their investment decisions a year ahead, and therefore assess available capital at that point in time. Moreover, increased liquidity reduces the cost of capital for the firm due to lower borrowing costs (Ortiz-Molina and Phillips, 2010), which in turn enable the management to pursue new profitable investments in the future. On the other hand, we do recognise that reductions in working capital may have income statement effects affecting return on investments within the same year. Examples could be lower inventory management costs or lower shrinkage costs. However, it is natural to assume that working capital initiatives are likely to be persistent over time; hence, after adjusting for growth, the income statement impact is also likely to be persistent in the following period. A last point in favour of using lagged variables is that there may be issues with reversed causality. Deloof (2003) observe

a negative relationship between days account payables and profitability in Belgian firms, and suggest that low profitability may affect solvency and the ability to pay suppliers. By using lagged terms, we circumvent this issue. Throughout the first part of our analysis, we will use models with the cash conversion cycle and its components as explanatory variables. With regard to the interpretation of the following results, we have scaled all independent variables by 10 in the first part of our analysis. Thus, the coefficients of the independent variables represent the effect on return on invested capital of a 10-day change in the cash conversion cycle metrics. The scaling of the variables is applied with the intention of improving the readability of the results presented in chapter 4.

$$CCC_{it} = DSO_{it} + DIO_{it} - DPO_{it} \tag{3.7}$$

3.2.2.2 Days Sales Outstanding (*DSO*)

The first term on the right-hand side of equation (3.7) is days sales outstanding. Days sales outstanding is a measure of the time it takes in days to convert credit sales into cash (Richards and Laughlin, 1980). Account receivables originate from the time gap between sales and cash-inflow, and extension of trade credit to customers will therefore have a direct impact on investment in working capital and days sales outstanding. Firms' credit policies are tightly connected to strategic choices and are inherently different across industries. Richards and Laughlin (1980) add that unless sales increase in proportion to the increase in receivables, growth strategies will deteriorate liquidity. The effect of increasing days sales outstanding on return on invested capital ultimately depends on the trade-off between increased cost related to working capital and the return on strategic growth. However, there is no benefit from extending customers' credit above the level dictated by the growth strategy, and management should therefore seek to minimise the payment period to the extent that is strictly necessary (Nuhiu and Dërmaku, 2017).

Days sales outstanding is defined as net account receivables over sales in the same period, times the number of days in a year. Net account receivables is gross accounts receivable, less doubtful accounts, and represents the amount of credit sales the firm estimates it can convert into cash. Dependent on the stability in doubtful accounts,

expected credit losses will affect operating margins negatively proportionally to net account receivables. By comparing net accounts receivables to sales in the same period, we can estimate the degree of customer credit per unit of sales, which is the inverse of the turnover-metric initially proposed by Richards and Laughlin (1980). The inclusion of time makes the metric flow-based, under the assumption that receivables are converted into cash within a year.

$$DSO_{it} = \frac{Net\ Account\ Receivables_{it}}{Sales_{it}} * 365 \tag{3.8}$$

3.2.2.3 Days Inventory Outstanding (*DIO*)

The second component in the cash conversion cycle is days inventory outstanding. It measures the average time firms hold inventory before it is sold. Moreover, increasing the stock of inventory also tie up more funds in investments waiting to generate returns and prolonging the time it takes to generate cash. As with firms' customer credit policies, the inventory stock is also strongly connected to strategic perspectives. For instance, firms with aggressive growth strategies may need to build the inventory stock to support future product demand. For firms competing on quality, longer maturity periods for goods may lift the customer experience and increase market share. Likewise, stock-outs and narrow product ranges can affect profitability negatively (Nuhiu and Dërmaku, 2017). Although there are situations that support higher inventory levels, large stocks are often associated with higher storage costs and elevated management costs. The direct inventory costs and liquidity effects must therefore be balanced against the strategic benefits in order to maximise return on invested capital.

We define days inventory outstanding as inventory over cost of goods sold, times the number of days in a year. Inventory is the cumulative stock of raw material, work-in-progress and finished goods. The literature mainly scales inventories against either sales or cost of goods sold in calculations of days inventory outstanding (Lazaridis and Tryfonidis, 2006; Deloof, 2003). Richards and Laughlin (1980) use sales to measure the frequency at which inventory is turned into product sales. The advantage of this view is that changes in the turnover rate clearly depict changes in liquidity: if inventory build-up

is higher than revenue growth, the turnover decrease and investments in working capital increase. In turn, this leads to deterioration in liquidity. We argue, on the other hand, that cost of goods sold is the better scale. Firstly, it is directly linked to the inventory level on the balance sheet and therefore, by comparing the two, we obtain a more precise estimate of the goods that are held in stock. Additionally, since cost of goods sold grows proportionally with sales volume, the inverse of inventory divided by cost of goods sold can be interpreted the same way as the turnover ratio laid out by Richards and Laughlin.

$$DIO_{it} = \frac{Inventory_{it}}{Cost\ of\ Goods\ Sold_{it}} * 365 \tag{3.9}$$

3.2.2.4 Days Payable Outstanding (*DPO*)

The first two components of the cash conversion cycle are normally referred to as the operating cycle of a business. The operating cycle alone is, however, deficient as a cash flow measure because it neglects the timing of cash outflows imposed on firms by their suppliers (Richards and Laughlin, 1980). The cash conversion cycle addresses this issue by subtracting days payables outstanding, the average number of days it takes the firm to pay its suppliers. When firms defer payments to suppliers, they effectively obtain short-term financing, which increases liquidity and can be used to invest in profitable projects (Petersen and Rajan, 1997). In practice, increasing days payables is easily achieved by holding off invoices until they are overdue. Although this may be effective in the short run, the long-term effect of such practice may be that suppliers will consider the additional costs in their terms and pricing (Nuhiu and Dërmaku, 2017). Moreover, increasing days payables outstanding may not be the optimal strategy in the presence of payment discounts. For firms with easy access to liquidity, the cost of capital must be compared to the implicit borrowing cost from not taking the discount (Deloof, 2003; Paul and Wilson, 2007). In order to optimise days payables outstanding, companies must weigh the return on payables against the alternative cost of product discounts and supplier relationship degradation. Since we are analysing this operational point of view, as opposed to the financing perspective, we find days payables outstanding superior to net account payables over total assets (Deloof and Jegers, 1996). Days payables outstanding is calculated by dividing account payables by cost of goods sold, before multiplying the

ratio with the number of days in a year to make the measure flow-based and comparable to the other components of the cash conversion cycle.

$$DPO_{it} = \frac{Account\ Payables_{it}}{Cost\ of\ Goods\ Sold_{it}} * 365 \tag{3.10}$$

3.2.2.5 *Asset Turnover* and *Cost Ratio* as Proxies for Agency Costs

We have applied two proxies for agency costs in the last part of our analysis, namely *Asset Turnover* and *Cost Ratio*. According to Ebben and Johnson (2011), asset turnover works as a proxy for quality of the management in regard to its ability to employ freed-up capital. Moreover, since asset turnover describes the utilisation of assets, it effectively becomes an inverse measure of agency costs, where low turnover may indicate inadequate investment decisions (Florackis and Ozkan, 2004). In our analysis, we have applied the following calculation for asset turnover:

$$Asset\,Turnover_{it} = \frac{Total\ Revenues_{it}}{Total\ Assets_{i,t-1}} \tag{3.11}$$

The Operating Expense Ratio, represented by *Cost Ratio*, describes the degree to which management spends on itself relative to revenues. For instance, excessive numbers of managers, unnecessary perks for the management group, excessive numbers of offices etc. raise the SGA cost and the operating expense ratio. All else being equal, higher ratios yield lower returns on invested capital, and are therefore a proper measure of agency costs (Ang et al., 2000). In the next sections, we have adopted this definition of the operating expense ratio:

$$Cost\ Ratio_{it} = \frac{[Total\ Revenue - EBIT - COGS]_{it}}{Total\ Revenue_{it}} \tag{3.12}$$

3.2.3 Control Variables

This section will elaborate on all the control variables in our models. We have focused on well-established effects found in previous work, and we expand upon the literature where improvements have been suggested.

3.2.3.1 Year-over-year growth (*Growth*)

The first company characteristic we control for is the year-over-year growth. We believe that growth is a determinant of profitability, and is also an important factor to consider for management when making working capital decisions (Schwartz, 1974). It is therefore reasonable to control for this variable in order to better isolate the effect of working capital management. The inclusion of a growth control does also have support in the literature (Deloof, 2003). The variable is calculated as the annual sales in period t divided by the annual sales in period *t-1*, less 1.

3.2.3.2 Size (*Size*)

This variable is used to control for the size of the companies. In the Literature Review, we have emphasised the effect of company size on corporate profitability. Studies conducted on the relationship have consistently proven that this relationship is of a positive nature (John and Adebayo, 2013; Papadogonas, 2006; Halil and Hasan, 2012). Thus, we will control for size, computed as the natural logarithm of the annual revenues of firm i in year t. The motivation for log transforming the *Size* variable is to adjust for the skewed distribution of this variable. Through a logarithmic transformation, we make the data more normalised. Furthermore, as all of our dependent variables are on level-form, the coefficient of the *Size* variable can be interpreted as follows: When increasing size by 1%, the independent variable will increase by $\theta_{Size}/100$ units.

3.2.3.3 Probability of Default (*Prb. Def.*)

In addition to *Size* and *Growth*, we have controlled for the financial health with the companies' credit score denominated as the probability of default. We are of the perception that the financial health of a company will have an impact on the profitability, and thus see it necessary to control for this effect. This view is supported by several

studies which have found that the financial position of a company is a strong determinant of the ability to generate profits (Shin and Soenen, 1998; Mathuva, 2015). The calculation of the variable is based on the Olson O-score, which ultimately decides the probability of a company defaulting on their debt obligations within a 12-month period with a logit regression (Ohlson, 1980).

The formula used to calculate the O-score is displayed below:

$$y_i = -1.32 - 0.47[SIZE] + 6.03[TLTA] - 1.43[WCTA] + 0.0757[CLCA] - 2.37[NITA] \\ -1.83[FUTL] + 0.285[INTWO] - 1.72[OENEG] - 0.521[CHIN] \tag{3.13}$$

Where the probability of default is calculated as:

$$P = 1 + exp(-y_i)^{-1} \tag{3.14}$$

Ohlson (1980) defines the variables as follows: SIZE is the logarithm of the company's total assets divided by Norwegian CPI, and TLTA is total liabilities over total assets. WCTA is working capital divided by total assets, and current liabilities over current assets is expressed by CLCA. Furthermore, NITA is net income scaled by total assets, while FUTL portray funds provided by operations divided by total liabilities. INTWO is a binary variable, which takes the value one if net income has been negative for the last two years, and 0 otherwise. The last two variables are OENEG and CHIN. OENEG is another binary variable, where one implies that total liabilities exceeds total assets, and zero implies the opposite. Finally, CHIN is the year-over-year change in net income.

3.2.3.4 Leverage (*Leverage*)

Based on standard corporate finance theory, there is also reason to believe that the capital structure of companies will have an impact on the corporate profitability. Even

though the results of Modigliani and Miller (1958) imply the opposite, more recent research has proven that the presence of financial frictions causes a negative effect of corporate debt on profitability. Increasing amounts of debt elevate the debt handling cost, and thus draw focus and resources away from profit generating activities (Krugman, 1988). In our models, we have used the debt ratio as a proxy on company leverage. The proxy is calculated as the long-term financial debt in year t divided by total assets in the same period. This is similar to the approach of Deloof (2003), who also include the *Leverage* control in his analyses.

3.2.3.5 Financial Asset Ratio (*FA Ratio*)

According to Petersen et al. (2017), the financial asset ratio can be considered as a measure of long-term liquidity position of companies. The ratio indicates the relative amount of assets which over time can be liquidated without affecting the operations. Furthermore it is viewed as a liquidity buffer in the case of sustained period of losses. The financial asset ratio can thus be seen as a proxy for long-term solvency of companies, and is hence used to control for the effect of operational stability on profitability. The ratio is calculated as the sum of fixed financial assets divided by total assets.

3.2.3.6 Cash Ratio (*Cash*)

Companies with a positive return on invested capital benefit more from reemploying the cash than keeping it idle, and it is therefore necessary to control for companies' ability to re-invest funds. Results of studies conducted by Faulkender and Wang (2006) indicate that the market value of withheld cash diminishes with the level of cash. The view is that investors reward companies for increased liquidity up to a given point until they no longer believe management can reinvest capital to an acceptable rate of return. With regard to working capital management, this implies that initiatives to free up capital are likely to have a decreasing marginal effect with the size of the existing cash balance. To obtain a clear picture of the effects of working capital management on profitability, this effect is accounted for in our models with the variable *Cash* and is defined as cash and cash equivalent scaled by total assets.

3.3 Methodology

This section will introduce the econometric techniques applied in order to investigate the various aspects of the research question. For all of our models, we apply panel data regressions. Analogous to similar research conducted by Deloof (2003), we incorporate firm fixed effects to estimate the impact of working capital management on return on invested capital. For a company, there are numerous determinants of financial profitability, and over the course of five years it is believed that many of these unknown factors will be constant. Furthermore, it is also highly likely that some of these variables are unobservable and may induce endogeneity through omitted variable bias. An advantage of firm fixed effects is that every company are assigned with their own intercept that absorbs these variables. Ultimately, we are left with the average effect working capital management within firms. Fixed effect estimation also has its restriction in that any relationship of interest determined by a time-invariable factor will be completely wiped out of the model. For instance, the model cannot estimate industry intercepts. Additionally, to remove correlation between observations constant over a year, we include year-fixed effects in our regression models (Petersen, 2009). We are then left with a two-way within fixed effects model to describe the effects of working capital management. To adjust for autocorrelation and heteroscedasticity within firm-clusters, we include robust standard errors in accordance to the White method. Moreover, Petersen (2009) suggests that when the number of firms is larger than the number of years in the panel set, standard errors clustered by firms are unbiased. We therefore adopt this methodology in our regression models.

3.3.1 Cash Conversion Cycle and Return on Invested Capital (H_1)

To analyse how the cash conversion cycle and its components affect return on invested capital, we have constructed the following model, which also serves as the base model in this thesis:

$$R_{it} = \alpha + \beta W_{i,t} + \theta_n \sum_n X_{it} + \gamma_t \sum_t Y_t + \delta_i \sum_i C_i + \epsilon_{it} \tag{3.15}$$

where R_{it} is return on invested capital, the profitability measure is presented in section 3.2.1, for firm i in year t. The various working capital management measures, i.e. independent variables, are represented by variable W_{it}, based on which component of the cash conversion cycle is analysed. As mentioned in section 3.2.2, these variables are lagged one year in order to circumvent the problems related to reversed causality proposed by Deloof (2003). Hence, return on invested capital in period t is regressed on working capital metrics in period *t - 1*. In models containing time-variable firm specific controls, the vector X_{it} represents all the previously defined variables. The control variable in question is identified by n, which run from 1 to 6. In addition, vectors C_i and Y_t contain the firm and time fixed effects, respectively. Finally, ϵ_{it}, is the error term for company i in period t.

In *Hypothesis 1*, we regress *ROIC* on *CCC*, *DSO*, *DIO* and *DPO* in order to identify the effects of working capital management on profitability for the entire sample. In that regard, β is the coefficient of interest. In the first part of this sub-analysis, we first estimate a model with firm and year fixed effects, but without the inclusion of control variables. Further, we add the controls to uncover the impact these may have on *ROIC* and on the coefficients on the working capital management variables. In the second part of the analysis of *Hypothesis 1*, we apply the last model of the first part, but on different subsamples. We categorise the companies into quartiles based on their average working capital management efficiency over the past five years. We treat the metrics separately, and therefore a company may appear in different quartiles for the different measures. By

splitting the companies in quartiles, we aim to explore marginal effects of efficient working capital management in the various performance brackets, and for each metric individually.

3.3.2 Public versus Private and the Effect of Agency Costs (H_2)

In Hypothesis 2, we look at the differences seen in the data between public and private companies concerning their working capital management. Furthermore, we explore whether the difference displayed in the descriptive statistics can be proven statistically significant. The question is analysed by using differences in means, where we look at the five-year averages for the working capital metrics. The procedure is accordance with Welch's t-test for unequal variances. In addition, the test is preferable to the student's t-test since the public company subsample is significantly smaller than that of private, and smaller samples are associated with higher variance (Derrick et al., 2016). Another complication of the differences in sample sizes is that firm-specific characteristics have greater impact on the mean in the smaller public subsample. For instance, a substantial amount of companies in a high inventory sector could obscure the inference from a two-sample t-test. To address this issue, we have regressed the working capital metrics on the control variables in panel data models with fixed firm and time effects for each sample. Subsequently, the fitted values from the regressions were used in the t-tests. The t-statistics accordingly describe the differences in means, given exogenous determinants of working capital management.

Following the comparison of means in the working capital measures, *Hypothesis 2* will try to examine whether the discrepancy can be attributed to differences in return to efficient working capital management and indirectly to identify the presence of differences in agency costs between the two groups. Hence, we apply the base model described in 3.3.1, with incorporation of interaction terms to describe whether the company is public or private. The variable *Public* takes the value of one if the company is publicly listed and zero otherwise. The variables *CCC*, *DSO*, *DIO* and *DPO* are interacted with *Public* to describe the additional effect of working capital management on *ROIC* for publicly listed firms, and the coefficients on these variables are therefore the estimates of interest.

Next, we analyse the direct relationship between agency costs and working capital

management. In this section we use panel data regression models where we regress the different working capital management variables on the two proxies for agency costs *Asset Turnover* and *Cost Ratio*. The models also include control variables and fixed firm and year effects. These are acknowledged in the literature as viable proxies for agency costs (Ang et al., 2000; Florackis and Ozkan, 2004), but we are reluctant to rely solely upon analysis of these variables, as they could be perceived "noisy" for our purposes. Primarily, we are afraid of the close link between the calculation of the working capital variables and the agency proxies may induce an endogeneity problem in our models. In particular, the relationship between the balance sheet items used in the calculations of the working capital variables and total assets used in the denominator of *Asset Turnover* may create complications.

In the last part of the analysis, we try to measure the effects of agency costs on working capital management in a more exogenous manner. The conjecture laid out in *Hypothesis 2* is that different management incentives between public and private firms may explain the difference in working capital policies. This is tested in form of two quasi-experiments, where we look at the effects of deregulation of reporting rules at the Oslo Stock Exchange, and replacement of CFOs among public companies in the analysis period. We believe the deregulation serves as an exogenous shock on agency costs because publicly listed companies from 2017 were only required to report IFRS financial statements on a semi-annually basis, as opposed to quarterly. Consequently, the reduced transparency suffered by external stakeholders decreases monitoring and raises agency costs in these firms (Bushman and Smith, 2001; Black, 2000; Huang and Zhang, 2011). The event is therefore expected to have a negative impact on agency costs and, in turn, working capital management. In other words, we would expect to observe longer cash conversion cycles for public companies from 2017. However, we could question to what extent the deregulation of reporting rules actually would affect the working capital practice of companies as the impact on transparency is somewhat limited. These companies still report according to the IFRS standards semi-annually, and some companies have continued with their quarterly reporting practice.

The second shock applied is believed to have a positive outcome on the cash conversion cycle. Replacement of CFO represents an exogenous shock that reduces agency costs, and

is a well-described phenomenon in the literature (Geiger and North, 2006; Burgstahler and Dichev, 1997; Healy and Wahlen, 1999; Cheng, 2004). Previous research has found that discretionary accruals are significantly reduced when a new CFO is appointed. Moreover, the authors all argue that this is due to diverging incentives for the former and the new CFO. We believe that the change of CFO is fairly exogenous, at least in the short run, although we recognise that the replacement of the CFO may affect other aspects of financial performance and therefore be interlinked with working capital investments through these.

In order to analyse the impact of deregulation of reporting rules for companies listed on the Oslo Stock Exchange, we follow the procedure of Wooldridge (2007) for Difference-in-Difference estimation with panel data of more than two periods. In this context, public companies are the treated group and the treatment effect is observed from 2017, which is defined as the post-period. Hence, the pre-period is all years before 2017. The implied assumption is that the effect of the deregulation is constant in the post-period. Private companies were not subject to the same changes in reporting practices, and they will therefore serve as the control group. This has the advantage of letting us use the full sample of observations. The Difference-in-Difference estimator, referred to as *DiD*, is the product of *Public* and *Post* binary variables, which estimate the additional slope on the regression line for public companies in the post period. This slope is the coefficient τ in the following model:

$$W_{it} = \alpha + \phi Pi + \omega T_t + \tau DiD_{it} + \theta_n \sum_n X_{it} + \gamma_t \sum_t Y_t + \delta_i \sum_i C_i + \epsilon_{it} \tag{3.16}$$

where W_{it} is the working capital metric, P_i is the binary indicator for public companies, T_t is the binary variable signifying the post-period of the treatment and the other terms are equivalent to the base model. In an estimation of Difference-in-Difference with panel data regression models the treatment variable, P_i, and the post-treatment period variable, T_t, will be absorbed in firm and year fixed effects. Therefore, the estimated model is reduced to:

$$W_{it} = \tau DiD_{it} + \theta_n \sum_n X_{it} + \gamma_t \sum_t Y_t + \delta_i \sum_i C_i + \epsilon_{it} \tag{3.17}$$

The framework of Differences-in-Differences-in-Difference (DDD) is adopted to estimate the effects of replacing the CFO in public companies. Naturally, the change of CFO is the treatment and the treated group are the public companies that replaced their CFO in the period of 2014 to 2018. In addition, we have two control groups: public and private companies without CFO intervention. The inclusion of another control group separates the *DDD* from a simple Difference-in-Difference (Wooldridge, 2007). Since we have panel data and arbitrary treatment patterns as well, the procedure is also slightly more complicated. We have gathered information on CFO status for 66 public and private companies in our original data set, and then constructed the variables *New CFO* and *Post*. They are both binary indicators, and the former is unity when a company has replaced its CFO in the period and indicates the treatment group, while the latter is unity for the particular year of the replacement and for every succeeding year in the time span. This imposes the assumption that the effect from the shock on agency costs is constant for each year after the event. Moreover, the product of the two new variables, and the *Public* binary variable, is defined as a new variable, DDD_{it}. The DDD-estimator is given by the coefficient on this variable, τ, from the model below. Additionally, we have defined pre- and post-treatment periods for the companies in the control groups. The segregation point between the two intervals was chosen to be 2016, calculated as the median year the public companies replaced their CFO. In the following regression model, the working capital metric, W_{it}, is regressed on DDD_{it}, and the aforementioned control variables. It also includes fixed firm and time effects given by the vectors Y_t and C_i. Moreover, as for the Difference-in-Difference regression model, including fixed effects will absorb constants and interaction terms perfectly collinear with the fixed effects. Due to the variation in treatment pattern for each company, the *Post* binary variable and its interaction with *Public* are both variable across firms and time and will therefore be included in the estimated model. They are indicated by the variables T_t and P_iT_t in the equation, where T_t is *Post* binary variable and P_i is the *Public* indicator. The constant group identification variables *Public* and *NewCFO* and the interactions between both the two of them, will be wiped out of the regression. This is also the case for the interaction

between *NewCFO* and *Post*. Finally, the model becomes:

$$W_{it} = \alpha + \omega T_t + +\lambda P_i T_t + \tau DDD_{it} + \theta_n \sum_n X_{it} + \gamma_t \sum_t Y_t + \delta_i \sum_i C_i + \epsilon_{it} \tag{3.18}$$

3.3.3 Descriptive Statistics

In this last section of the chapter, we will discuss the descriptive statistics of all variables used in our analyses. Since we use panel data, we will first look at each cross-section in each time period and look for trends or abnormalities. Then we will examine the sample as a whole, in a pooled cross section.

In table 3.1 and figure 3.2 below, we show *ROIC* and the explanatory variables *CCC*, *DSO*, *DIO* and *DPO*, for each year in the time period 2014 to 2018. The independent variables are lagged and therefore display the working capital days one year before the dependent variable. Furthermore, the independent variables are scaled so that they correspond to 10 working capital days.

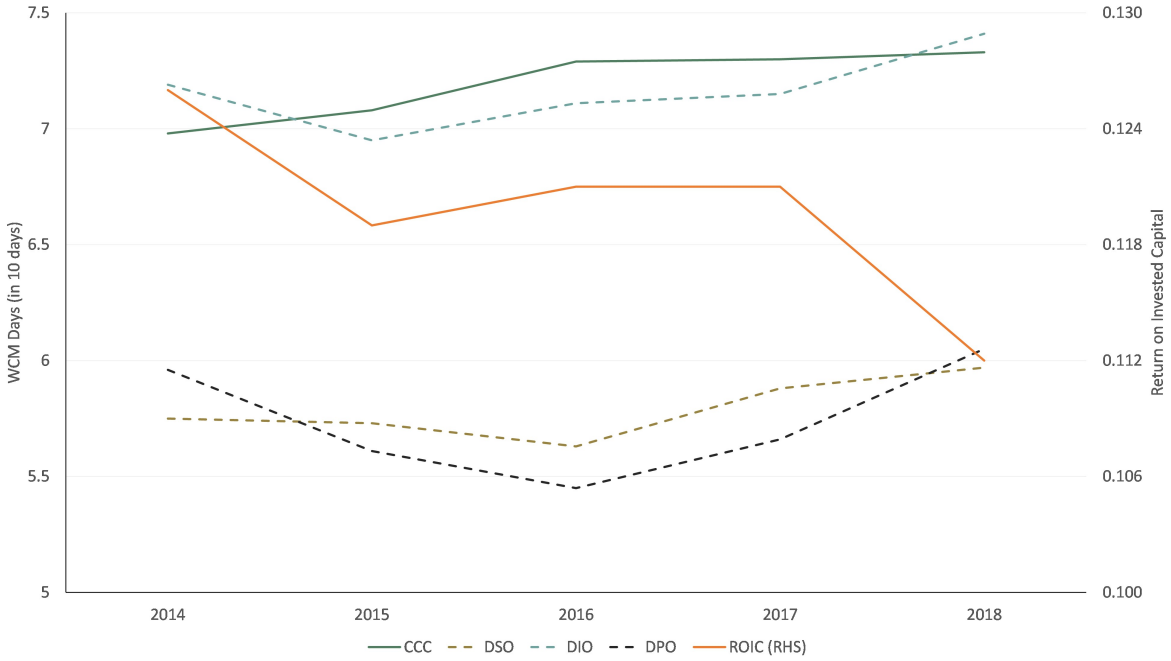
Table 3.1:
Sample Distribution

The table displays the dependent variable *ROIC* and the independent variables *CCC*, *DSO*, *DIO* and *DPO* over the period 2014 to 2018. The independent variables are lagged by one year and scaled to represent 10 days. Each variable is the average in the aggregated sample of both public and private companies in Norway. *N* signifies the number of observations per year, and is constant throughout the period describing a balanced panel set.

Year	N	ROIC	CCC	DSO	DIO	DPO
2014	1129	0.126	6.98	5.75	7.19	5.96
2015	1129	0.119	7.08	5.73	6.95	5.61
2016	1129	0.121	7.29	5.63	7.11	5.45
2017	1129	0.121	7.30	5.88	7.15	5.66
2018	1129	0.112	7.33	5.97	7.41	6.05

An interesting observation is that *CCC* is fairly stable with a positive drift over the five-year time span, while *ROIC* is more volatile, with a negative trend. In general, these trends are supportive of *Hypothesis 1*, but the higher volatility of *ROIC* indicates other underlying determinant factors as well. In particular, the drop in profitability in 2015 could be explained by the drop in oil prices in 2014 and its repercussions for the Norwegian economy. Further visual inspection displays indications of covariance between *DSO* and *DPO*, suggesting Norwegian companies have had their focus toward squeezing suppliers for extra liquidity and loosening their terms to customers. *DIO* also show an interesting pattern; it falls in 2015 and steadily increases thereafter. This could hypothetically also be seen in conjunction with to the oil crisis.

Figure 3.2:
WCM and ROIC Throughout the Period 2014 to 2018



In table 3.2, the sample is portrayed as agglomerated. The descriptive statistics also include the control variables used in the regression models. Over the period, the average *ROIC* in the sample is 12%, which is close to the gross operating income measure of Deloof (2003) and net operating profit ratio used by Raheman and Nasr (2007), of 12.2% and 11.5% respectively. Although not completely comparable to our operational profitably measure, due to the inclusion of additional operating costs and different balance sheet scaling, it is an indication that our sample acts in accordance with previous research. We do, however, have almost twice the variability in this metric. Looking at the minimum and maximum values, this may be explained by inclusion of more extreme values. Whereas Deloof (2003) operates with bounds of -0.271 to 0.721, we allow for more variation among companies. In our data, these types of observations are related to companies with huge variability in returns from one year to the next, indicating lumpy investments with long horizons. We argue that this is a natural operating cycle for many Norwegian companies and therefore this variability should be included in our analysis. Similarly, we observe a year-over-year growth rates well above that seen in previous studies (Deloof, 2003; Ebben and Johnson, 2011). In addition to irregular investment patterns, our sample shows instances of high growth rates early in the period before stabilising towards the end. Hence, we are able to capture aspects of strategic growth during the period. It is important to underline that we are looking at companies in a different country and over a different period from the current literature and that deviations should therefore be expected. *CCC* and its components are fairly in line with those of similar studies (Deloof, 2003; Lazaridis and Tryfonidis, 2006). The aggregated sample show an average *CCC* of 59.9 days, taking our 10-day scaling into account, and is well in the 44.8 to 189.0 range postulated by previous analyses. Furthermore, the components *DSO*, *DIO* and *DPO* are all very close to the means found in Belgian firms by Deloof (2003).

Table 3.2:
Descriptive Statistics for the Sample Aggregated

The table portrays descriptive statistics for each cross-section pooled, including both public and private companies. In total, the sample consists of 1,129 companies and 5,645 firm-years in a balanced panel data set over the period from 2014 to 2018. The dependent variable *ROIC* is calculated as EBIT adjusted for tax, divided by invested capital. The working capital management variables are lagged by one year and scaled to represent 10 days outstanding. *CCC* is defined as the sum of *DSO* and *DIO*, less *DPO*. *DSO* is account receivables to sales, multiplied by 365 days in a year. *DIO* is inventory as a ratio of cost of goods sold, times 365. Likewise, *DPO* is calculated as the ratio of account payables to cost of goods sold, multiplied by 365. Moreover, *Growth* is the year-over-year growth in total revenues and *Size* is the natural logarithm of total revenues. *Prb. Def.* represents the probability bankruptcy within one year based on Ohlson's o-score. *Leverage* is interest-bearing long-term debt over total assets. Further, *FA Ratio* is fixed financial assets divided by total assets. Lastly, *Cash* is the ratio of cash and cash equivalents to total assets.

				Quantiles				
Variable	N	Mean	Std. Dev.	Min.	p25	Median	p75	Max.
Profitability Variable								
ROIC	5645	0.120	0.277	-2.433	0.034	0.084	0.170	3.186
WCM Variables								
CCC	5645	7.195	8.370	-124.989	2.358	5.990	11.131	85.644
DSO	5645	5.776	3.760	0.000	3.184	5.258	7.502	53.368
DIO	5645	7.164	7.700	0.000	1.033	4.937	10.716	70.082
DPO	5645	5.745	5.640	0.000	2.893	4.926	7.430	151.994
Agency Cost Proxies								
Asset Ratio	5645	1.584	1.123	0.021	0.870	1.410	2.044	16.956
Cost Ratio	5645	0.429	0.238	-0.267	0.245	0.392	0.570	4.212
Control Variables								
Growth	5645	0.113	1.300	-0.862	-0.023	0.057	0.154	81.446
Size	5645	12.900	1.290	9.468	11.945	12.509	13.427	20.355
Prb. Def.	5645	0.265	0.239	0.000	0.066	0.190	0.190	1.000
Leverage	5645	0.242	0.207	0.000	0.066	0.202	0.375	1.615
FA Ratio	5645	0.061	0.103	0.000	0.038	0.022	0.072	0.935
Cash	5645	0.135	0.126	0.000	0.004	0.094	0.194	0.824

Table 3.3 provides the first indications of differences in working capital management between public and private firms. Firstly, we observe that private companies have an average *CCC* almost 26 days longer than that of public firms. Looking further into the details, the table displays large deviations between inventory days and payable days. Public companies have 43 days and 65 days longer *DIO* and *DPO*, respectively. On the other hand, it takes private companies 4 days longer to collect receivables. The visual representation is displayed by figure 3.3. Overall, the descriptive statistics show that public companies are more efficient at managing both their customers and suppliers, and hold inventory to a greater extent. Of course, these statistics do not take firm specific characteristics into account, such as industry and growth. In the comparison between the two sub-sets we address this, and we refer to section 3.3 for the procedure and section 4.2.3 for the results.

Figure 3.3:
Breakdown of Working Capital Discrepancy

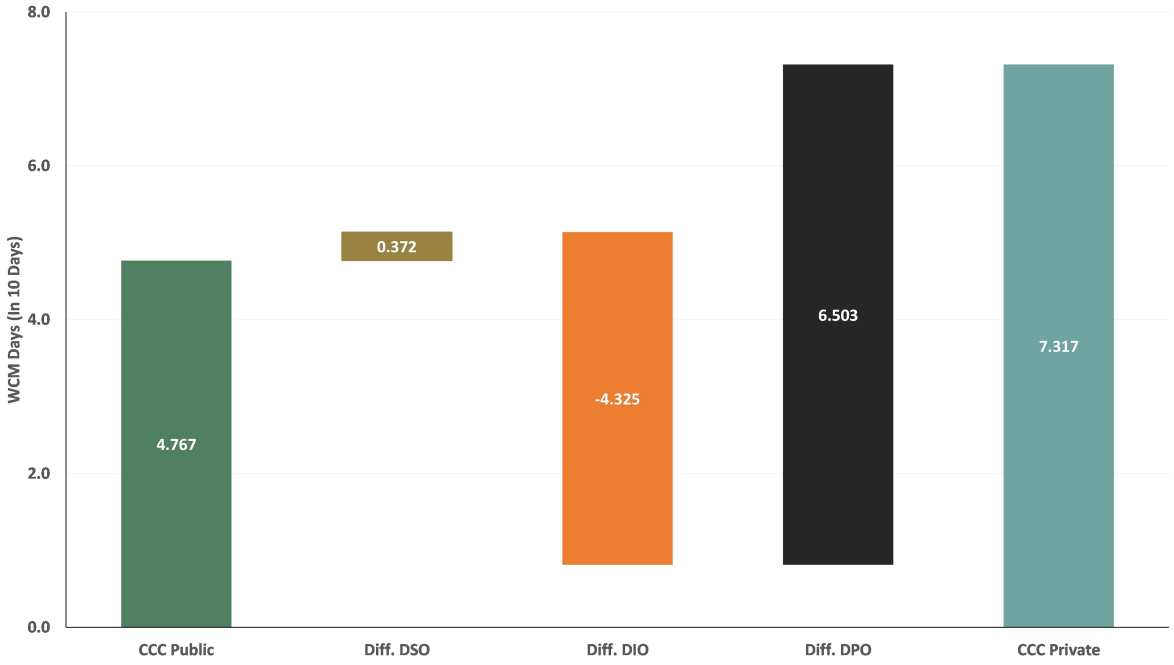


Table 3.3:
Descriptive Statistics for the Private and Public Subsamples

The table displays observations, means, standard deviations and distributions for private and public companies, separately. Each subsample consists of pooled cross-sections in the 2014-2018 time span. The dependent variable *ROIC* is calculated as EBIT adjusted for tax, divided by invested capital. The working capital management variables are lagged by one year and scaled to represent 10 days outstanding. *CCC* is defined as the sum of *DSO* and *DIO*, less *DPO*. *DSO* is account receivables to sales, multiplied by 365 days in a year. *DIO* is inventory as a ratio of cost of goods sold, times 365. Likewise, *DPO* is calculated as the ratio of account payables to cost of goods sold, multiplied by 365. Moreover, *Growth* is the year-over-year growth in total revenues and *Size* is the natural logarithm of total revenues. *Prb. Def.* represents the probability bankruptcy within one year based on Ohlson's o-score. *Leverage* is interest-bearing long-term debt over total assets. Further, *FA Ratio* is fixed financial assets divided by total assets. Lastly, *Cash* is the ratio of cash and cash equivalents to total assets.

	Private Companies								*Public Companies*							
				Quartiles								Quartiles				
Variable	**N**	**Mean**	**Std. Dev.**	**Min.**	**p25**	**Median**	**p75**	**Max.**	**N**	**Mean**	**Std. Dev.**	**Min.**	**p25**	**Median**	**p75**	**Max.**
Profitability Variable																
ROIC	5375	0.122	0.279	-2.433	0.035	0.085	0.173	2.393	270	0.075	0.236	-0.757	0.011	0.072	0.126	3.186
WCM Variables																
CCC	5375	7.317	7.566	-15.293	2.422	6.018	11.180	35.669	270	4.767	17.939	-124.989	-0.274	4.443	10.580	85.644
DSO	5375	5.794	3.731	0.000	3.166	5.282	7.567	40.344	270	5.422	4.208	0.000	3.554	4.810	6.300	53.368
DIO	5375	6.957	7.258	0.000	0.999	4.828	10.558	45.020	270	11.282	13.137	0.000	2.024	8.441	13.775	70.082
DPO	5375	5.434	4.181	0.000	2.793	4.792	7.257	53.591	270	11.937	16.700	0.589	5.621	7.460	10.930	151.994
Control Variables																
Growth	5375	0.096	0.722	-0.862	-0.023	0.057	0.154	49.019	270	0.461	5.000	-0.704	-0.024	0.064	0.150	81.446
Size	5375	12.740	1.123	10.296	11.927	12.460	13.277	18.291	270	15.315	1.825	9.468	14.040	15.414	16.480	20.355
Prb. Def.	5375	0.272	0.240	0.000	0.072	0.120	0.420	1.000	270	0.130	0.182	0.001	0.020	0.060	0.165	0.927
Leverage	5375	0.243	0.209	0.000	0.065	0.204	0.378	1.615	270	0.209	0.169	0.000	0.184	0.184	0.296	0.985
FA Ratio	5375	0.061	0.102	0.000	0.004	0.022	0.073	0.935	270	0.061	0.112	0.000	0.001	0.021	0.066	0.630
Cash	5375	0.137	0.128	0.000	0.038	0.096	0.198	0.824	270	0.091	0.072	0.000	0.041	0.073	0.114	0.412

4 Results and Discussion

In this chapter, we will first present the Pearson's correlations between all variables used in our analysis, before we focus on the results from our analyses of *Hypothesis 1* and *Hypothesis 2*. In *Hypothesis 1*, we apply multivariate regression models to test the relationship between the cash conversion cycle and profitability in Norwegian companies. Furthermore, *Hypothesis 2* is analysed with two variations of the Difference-in-Difference methodology, and we seek to find the impact of agency costs on the differences in working capital policies between public and private firms.

4.1 Pearson's Correlations

Before we analyse the hypotheses, we will elaborate on the Pearson's coefficients between all variables incorporated in our multivariate regression models, and discuss potential interventions with our analyses. The correlation coefficients are presented in table 4.1.

A general observation derived from the table is the low magnitude of the Pearson's correlation coefficients. The likelihood of a multicollinarity issue among the variables is therefore limited. There is no unanimous threshold for the Pearson's correlation in relation to multicollinarity, but correlations below 0.5 are generally considered to be low. Notable exceptions are *CCC* and the correlation with its components. These correlations are to be expected since *CCC* is an additive function of *DSO*, *DIO* and *DPO*, see section 3.2 for further elaboration. Additionally, the working capital metrics are never included together within the same model, so this is of little concern. Furthermore, results from VIF-tests are well below critical levels and we are confident that multicollinearity will not tamper with the standard deviations of our regression models and interfere with the interpretation of the coefficients.

Pearson's correlations do not allow for controls in relationships, and given that the working capital management is a minor determinant of return on invested capital, we do not expect to see a large correlation between the independent variables and *ROIC*. The correlation matrix show a positive relationship between *CCC* and *ROIC*. Although

contrary to our expectations, the correlation coefficient is close to zero and without further controls it would be unlikely that we will find a large impact of *CCC* on *ROIC*. The correlation between *DSO* and *ROIC* shows promise; even though the magnitude of the coefficient is minor, the sign of the coefficient is in line with *Hypothesis 1*. Similarly, one can observe a small negative correlation between *ROIC* and *DIO*. Contrary to the coefficient displayed, we would expect a positive relationship between *DPO* and *ROIC*. However, similar correlations were found by Deloof (2003), and it could be indicative of companies exploiting cash discounts or being affected by credit rationing, as discussed in the literature review.

In terms of the control variables, *Growth* has a relatively high correlation with the return on invested capital. This is an expected relationship, as companies with persistently high return on invested capital are thought to have better conditions for profitable growth. Other control variables with relatively high correlation with return on invested capital are *Leverage* and *Prb. Def.*, with the correlations of -0.155 and -0.233 respectively. Probability of default can be considered a synthetic credit score used to assess financial health. Higher probabilities therefore imply liquidity positions where companies are struggling to meet their financial debt obligations and have a greater risk of bankruptcy. Hence, the negative correlation can be explained by the problem of overhanging debt since the access to capital is limited and management is unable to pursue value-adding projects (Krugman, 1988). Considering *Leverage*, the negative correlation is slightly less intuitive. The renown Modigliani Miller theorem states that the value of a firm is independent of its capital structure, and therefore we should expect the operational performance to be unaffected by leverage (Modigliani and Miller, 1958). However, in capital markets with financial frictions such as taxes and bankruptcy costs, the cost of capital exhibits a convex relationship to the leverage ratio. Therefore, the correlation could be explained by increased bankruptcy costs which raise the cost of capital and make otherwise profitable investments unfeasible.

Table 4.1:
Correlation Matrix

The correlation matrix shows Pearson's correlations for all the variables used in the forthcoming analyses. The dependent variable *ROIC* is calculated as EBIT adjusted for tax, divided by invested capital. The working capital management variables are scaled by scaled to represent 10 days outstanding, and one-year lags are also included. *CCC* is defined as the sum of *DSO* and *DIO*, less *DPO*. *DSO* is account receivables to sales, multiplied by 365 days in a year. *DIO* is inventory as a ratio of cost of goods sold, times 365. Likewise, *DPO* is calculated as the ratio of account payables to cost of goods sold, multiplied by 365. Moreover, *Growth* is the year-over-year growth in total revenues and *Size* is the natural logarithm of total revenues. *Prb. Def.* represents the probability bankruptcy within one year based on Ohlson's o-score. *Leverage* is interest-bearing long-term debt over total assets. Further, *FA Ratio* is fixed financial assets divided by total assets. Lastly, *Cash* is the ratio of cash and cash equivalents to total assets.

	ROIC	CCC	DSO	DIO	DPO	CCC_{t-1}	DSO_{t-1}	DIO_{t-1}	DPO_{t-1}	Asset Turnover	Cost Ratio	Growth	Size	Prb. Def.	Leverage	FA Ratio	Cash
ROIC	1																
CCC	0.028	1															
DSO	0.005	0.247	1														
DIO	0.014	0.747	-0.082	1													
DPO	-0.021	-0.327	0.181	0.229	1												
CCC_{t-1}	0.001	0.798	0.134	0.621	-0.269	1											
DSO_{t-1}	-0.017	0.120	0.704	-0.118	0.124	0.228	1										
DIO_{t-1}	-0.001	0.619	-0.116	0.848	0.187	0.712	-0.095	1									
DPO_{t-1}	-0.014	-0.261	0.112	0.156	0.736	-0.361	0.197	0.244	1								
Asset Turnover	0.078	-0.162	-0.251	-0.164	-0.159	-0.153	-0.220	-0.152	-0.127	1							
Cost Ratio	-0.121	-0.125	0.140	-0.029	0.256	-0.139	0.121	-0.045	0.225	-0.282	1						
Growth	0.137	0.086	0.137	0.065	0.055	-0.004	0.063	-0.003	0.043	0.006	0.024	1					
Size	-0.025	-0.052	-0.036	0.016	0.083	-0.036	-0.025	0.031	0.079	-0.006	-0.083	-0.017	1				
Prb. Def.	-0.233	-0.155	-0.042	-0.108	0.061	-0.164	-0.047	-0.122	0.045	0.287	0.145	-0.008	-0.240	1			
Leverage	-0.155	-0.079	-0.035	-0.066	0.005	-0.093	-0.036	-0.077	0.010	-0.373	0.227	-0.013	-0.040	0.349	1		
FA Ratio	-0.035	-0.039	-0.010	-0.072	-0.052	-0.027	0.001	-0.069	-0.053	-0.142	-0.023	-0.007	0.063	-0.153	-0.030	1	
Cash	0.138	-0.115	-0.075	-0.116	-0.039	-0.094	-0.022	-0.111	-0.027	0.087	0.043	0.014	-0.206	-0.242	-0.366	-0.084	1

4.2 Main Results

In this section of the chapter, we will direct our focus towards the *Hypotheses 1* and *2*. We will first have a general discussion of repeated results exhibited from the similar regression models applied in both hypotheses, before we explore the findings related to each hypothesis separately.

4.2.1 General Discussion of the Base Regression Model

The succeeding six regression tables are based on the base model presented in section 3.3, thus they follow the same structure but with some variations to the samples and specifications, which will be addressed upon the discussion of each model. They all include the six control variables presented in section 3.2, in addition to the incorporation of firm and year fixed effects.

With a few exceptions, *Growth* has a statistically significant coefficient in the range of 0.032 to 0.168 throughout the analysis. We believe there is a close interlink between growth and return on invested capital as more profitable companies will have a compounding effect on their growth under the assumption that management teams are consistently able to identify new profit-generating ventures. However, the coefficient is rather small, and the economical relevance is questionable. With a revenue growth of 10%, companies experience a ~ 0.3 percentage point increase in return on invested capital. Furthermore, in the broad majority of our models, the *Size* control variable shows positive coefficients in the range of 0.060 to 0.145 at a 1% significance level. This result is in accordance with existing literature as size is considered an important determinant of company profitability (Hall and Weiss, 1967; Deloof, 2003; Lazaridis and Tryfonidis, 2006). The economies of scale in production drive production costs down, and allow companies to offer a broader range of products. Moreover, larger companies have more market power over their suppliers and a better bargaining position with regard to customers.

In reference to the relationships between *Prb. Def.*, *Leverage* and *ROIC* shown by the Pearson correlation matrix, the inclusion of controls paints a more accurate picture. Our models show that by controlling for the probability of bankruptcy, leverage has no

statistically significant impact on *ROIC*, differing from the negative relationship found by Deloof (2003). Additionally, we observe a negative statistically significant relationship with the probability of default variable itself. This variable can be seen as a proxy of bankruptcy cost, and analogues to the Modigliani and Miller (1958) theorem, the capital structures of the companies are no longer influential when this effect is absorbed. The coefficient on *Prob.Def* is highly significant at a 1% significance level and ranges between -0.584 and -0.247 throughout the models. This would imply that a one percentage point increase in the probability of defaulting within the next 12 months, is associated with roughly half a percentage point lower return on invested capital. These results are as predicted in the literature, as liquidity problems usually cause profitability to decrease. For instance, management must avert its focus from the operations and profit-generating activities, and rather put effort and resources into restoring the solvency of the company. In addition, high probability of default is likely to lead to restructuring costs and suffocates the willingness to invest due to the implications of debt overhang. In our models, *FA Ratio* shows little to no significant impact on *ROIC*. This finding is not surprising, due to the way return on invested capital is defined in this thesis. Financial income is excluded from NOPAT, thus the return on fixed financial assets is not incorporated in the profitability measure. Although the coefficients are of questionable magnitude, the regressions reveal a positive link. Petersen et al. (2017) describe the financial assets as a liquidity buffer which makes companies more resistant to economic turmoil. By lowering the exposure towards cyclicality, the financial performance of the company is more robust. The last control variable included in our models is the *Cash*. In the regression models conducted on aggregated samples, it shows no sign of significance. The coefficients are consistently positively related to *ROIC* and the economic interpretation may be that companies with larger cash balances relative to total assets are less constrained in their day-to-day operations. However, in analyses of various sub-samples, we find some interesting implications. These will be described in the discussion of the relevant models.

The R^2, the portion of variance in the dependent variable which is explained by the independent variables in the regression model, is consistent at levels between 0.46 and 0.82. We see that when including the control variables in 4.2, the R^2 jumps about six percentage points. It is also worth mentioning the F-statistic of the regression tables,

which are consistently significant at a 1% level. Significant F-statistics for these models are expected due to the inclusion of fixed-effects and because the control variables included are acknowledged as determinants of corporate profitability.

4.2.2 Cash Conversion Cycle and Return on Invested Capital (H_1)

In the following section, we will present the results from the analysis of *Hypothesis 1*, where we explain the effects of the cash conversion cycle on return on invested capital. The procedure is divided into two parts. First, we look at the panel data regression model outlined in section 3.3 on the sample as a whole. We start by regressing *ROIC* on *CCC* and the components individually, without the inclusion of control variables, but with fixed firm and year effects. In the next step, the control variables are incorporated in the same models. The regressions are summarised in table 4.2. Additionally, the equivalent regression models with DuPont break-down of *ROIC*, comprised of *NOPAT* margin and *Asset Turnover*, can be found in the appendix. These regressions are included to nuance the understanding of how working capital management affects profitability. Secondly, we have divided the data into different quartiles based on their five-year average performance for each working capital management metric. The motivation is to explore whether there are differentiated effects in the different performance brackets, and identify companies for which effective working capital can be of most value. In light of the literature and *Hypothesis 1*, we would expect the lowest-performing group to have the greater benefit of improving their working capital policies.

The following table includes eight different panel data regression models. The models are presented pairwise, where the first exclude firm-specific time-variant control variables. Models (1) and (2) measure the aggregated effect of *CCC* on *ROIC*, while (3) to (8) measure the effects of the components separately. (3) and (4) examine *DSO*, (5) and (6) analyse *DIO*, and finally (7) and (8) focus on *DPO*. All models contain fixed effects for both firms and years and include robust standard errors clustered by firm (Petersen, 2009).

Table 4.2:
The Cash Conversion Cycle and Profitability for Norwegian Companies Aggregated

The table displays panel data regression models for the relationship between *ROIC* and working capital management. Both public and private companies are included in the sample, which contains 1,129 companies and 5,645 firm-year observations in the time span of 2014 to 2018. *ROIC* is regressed on each working capital related measure separately. Moreover, these variables are lagged by one year and have been scaled to represent 10 days of capital outstanding. Models (1) and (2) show the overall effect of *CCC*, (3) and (4) depict *DSO*, (5) and (6) look at *DIO*, and the two last models (7) and (8) focus on *DPO*. The first model in each pair excludes time-variable control variables. Furthermore, fixed firm and time effects are included in every model, as indicated in the bottom panel of the table. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are displayed in parentheses. Corresponding tables with the effects of *CCC* on *ROIC* broken down with the DuPont identity can be found in the appendix.

	Dependent variable:							
	$ROIC_t$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CCC_{t-1}	-0.003^{***}	-0.003^{***}						
	(0.001)	(0.001)						
DSO_{t-1}			-0.002	-0.003^{**}				
			(0.002)	(0.001)				
DIO_{t-1}					-0.005^{**}	-0.003^{***}		
					(0.002)	(0.001)		
DPO_{t-1}							0.0005	0.00001
							(0.001)	(0.001)
$Growth_t$		0.032^{***}		0.033^{***}		0.032^{***}		0.033^{***}
		(0.011)		(0.011)		(0.011)		(0.011)
$Size_t$		0.060^{***}		0.063^{***}		0.061^{***}		0.061^{***}
		(0.019)		(0.020)		(0.019)		(0.020)
$Prb.Def._t$		-0.459^{***}		-0.458^{***}		-0.459^{***}		-0.459^{***}
		(0.043)		(0.043)		(0.043)		(0.043)
$Leverage_t$		0.028		0.029		0.034		0.030
		(0.050)		(0.050)		(0.050)		(0.050)
$FARatio_t$		0.006		0.013		0.009		0.013
		(0.090)		(0.091)		(0.090)		(0.091)
$Cash_t$		0.133		0.138		0.131		0.135
		(0.102)		(0.103)		(0.103)		(0.103)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.5182	0.571	0.5166	0.5704	0.5181	0.5708	0.5164	0.5699
Adjusted R^2	0.5182	0.5704	0.5165	0.5698	0.5181	0.5703	0.5163	0.5694
Observations	5,645	5,645	5,645	5,645	5,645	5,645	5,645	5,645
F Statistic	17.716^{***}	81.931^{***}	2.462	80.906^{***}	16.850^{***}	81.632^{***}	0.266	80.172^{***}
Note:								*p<0.1; **p<0.05; ***p<0.01

The foremost result from the table is the coefficients on *CCC*. For both the models with and without time-varying control variables, the coefficients are negative -0.003 and significant at a 1% level. This signifies that companies with lower *CCC* on average have higher return on invested capital, and is therefore supportive of *Hypothesis 1* and the literature (Lazaridis and Tryfonidis, 2006; Deloof, 2003; Shin and Soenen, 1998). Furthermore, the finding suggests that 10 days reductions in *CCC* result in a 30 basis point increase in *ROIC*, approximately 4% higher return on invested capital for the median of the Norwegian companies in our sample. Although this may seem negligible, it corresponds to roughly 10% higher valuation, all else being equal.[1]

Observations from the succeeding models based on the sub-components of *CCC* show similar patterns. After incorporating control variables, the coefficient on *DSO* turns significant at a 5% level and equates to -0.003. This could indicate that Norwegian companies have greater benefit from increasing liquidity (Papadakis, 2007), as opposed to growth and signalling effects from extending trade credit (Schwartz, 1974; Petersen and Rajan, 1997). In terms of practical implications, reducing *DSO* by 10 days has the same 30 basis points effect as for *CCC*. Moreover, the identical effect can be seen from *DIO* in models (5) and (6), significant at 5% and 1% levels, respectively. The conforming results from *CCC*, *DSO* and *DIO* could be an indication of the same underlying condition, and congruent to the notion of the effect increased liquidity has on profitability, through growth opportunities and increased solvency (Johnson and Soenen, 2003; Saleem and Rehman, 2011). Interestingly, models (7) and (8) do not show significant results for *DPO*. However, the coefficients' signs are positive and therefore in the direction hypothesised. It is difficult to comment on their economic interpretations, but there could potentially be a strong practice related to the use of cash discounts or a high degree of credit rationing, conflicting with the liquidity effects among the Norwegian companies (Deloof, 2003; Petersen and Rajan, 1997; Paul and Wilson, 2007).

[1]Based on the value driver formula of Koller et al. (2010):

$$Value = \frac{Invested\,Capital * ROIC * (1 - \frac{Growth}{ROIC})}{WACC - Growth} \tag{4.1}$$

with median growth of 5.7%

Table 4.3:
Quarterly Segmentation on Cash Conversion Cycle

The table shows panel data regression models for the relationship between *ROIC* and *CCC*. The aggregated sample, containing both public and private firms, is segregated into quartiles based on the companies' relative performance with respect to *CCC*. The quartiles are calculated based on the companies' five-year averages in the period 2014 to 2018. The top performers are gathered in Q1 and the bottom performers are found in Q4. Furthermore, *CCC* is lagged by one year and has been scaled to represent 10 days of capital outstanding. All time-variable control variables are included and fixed firm and time effects are incorporated in every model. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are displayed in parentheses.

	Dependent variable:			
	ROIC			
	Q1	Q2	Q3	Q4
CCC_{t-1}	0.001	-0.007^{***}	-0.005^{***}	-0.003^{***}
	(0.001)	(0.003)	(0.002)	(0.001)
$Growth_t$	0.077^{**}	0.004	0.078^{***}	0.042^{***}
	(0.031)	(0.003)	(0.022)	(0.001)
$Size_t$	0.018	0.049	0.103^{***}	0.074^{***}
	(0.049)	(0.038)	(0.027)	(0.023)
$Prb.Def._t$	-0.466^{***}	-0.571^{***}	-0.427^{***}	-0.322^{***}
	(0.114)	(0.079)	(0.074)	(0.031)
$Leverage_t$	0.072	0.070	0.030	-0.118^{**}
	(0.176)	(0.065)	(0.062)	(0.050)
$FARatio_t$	-0.083	0.066	0.141	-0.132
	(0.202)	(0.138)	(0.116)	(0.109)
$Cash_t$	-0.157	0.347^{**}	0.202^{**}	0.176^{***}
	(0.311)	(0.153)	(0.100)	(0.062)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.4949	0.602	0.6785	0.8209
Adjusted R^2	0.4924	0.6	0.6769	0.82
Observations	1,410	1,410	1,410	1,415
F Statistic	6.325^{***}	20.993^{***}	49.382^{***}	260.242^{***}

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4.4:
Quarterly Segmentation on Days Sales Outstanding

In the table, *ROIC* is regressed on *DSO* and the time-variant control variables to explore the relationship between profitability and receivables management. Panel data regression models with firm fixed effects and time fixed effects are applied throughout the columns. The aggregated sample of public and private firms over the period 2014 to 2018 is divided into quartiles based on the five-year average cycles of *DSO*. Q1 represents companies with the tightest credit policies towards customers, while Q4 contains the companies with the most days receivables outstanding. *DSO* is lagged by one year and constitutes 10 days of days receivables. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are shown in parentheses.

	Dependent variable:			
	ROIC			
	Q1	Q2	Q3	Q4
DSO_{t-1}	−0.010	−0.005	−0.003	−0.003*
	(0.006)	(0.004)	(0.002)	(0.002)
$Growth_t$	0.168***	0.001	0.045**	0.042***
	(0.049)	(0.003)	(0.023)	(0.001)
$Size_t$	0.026	0.145***	0.054**	0.019
	(0.043)	(0.038)	(0.026)	(0.033)
$Prb.Def._t$	−0.260***	−0.364***	−0.562***	−0.569***
	(0.100)	(0.058)	(0.095)	(0.066)
$Leverage_t$	0.004	0.047	0.040	0.023
	(0.122)	(0.086)	(0.085)	(0.080)
$FARatio_t$	0.004	0.207	−0.042	−0.037
	(0.187)	(0.163)	(0.117)	(0.115)
$Cash_t$	−0.121	0.348**	0.189	0.170
	(0.299)	(0.158)	(0.139)	(0.142)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.5426	0.6363	0.575	0.5776
Adjusted R^2	0.5403	0.6345	0.5729	0.5755
Observations	1,410	1,410	1,410	1,415
F Statistic	8.751***	13.934***	24.823***	48.418***
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4.5:
Quarterly Segmentation on Days Inventory Outstanding

This table describes the relationship between *ROIC* and *DIO* for different inventory management performance quartiles. The quartiles are determined by the five-year average inventory cycle over the time span 2014 to 2018. Furthermore, the sample contains both public and private companies. Each panel data models incorporate fixed effects of firms and years, and also includes all the control variables presented in section 3.2.3. Companies with the shortest average *DIO* are analysed in model Q1, and Q4 portrays the bottom quartile counterparts. In the table, *DIO* represents 10 days of inventory outstanding with a one-year lag. For all models, standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are shown in parentheses.

	Dependent variable:			
	ROIC			
	Q1	Q2	Q3	Q4
DIO_{t-1}	−0.026	−0.006	−0.002	−0.003***
	(0.024)	(0.005)	(0.001)	(0.001)
$Growth_t$	0.006	0.114***	0.026	0.044***
	(0.004)	(0.041)	(0.022)	(0.001)
$Size_t$	−0.002	0.140***	0.081***	0.103***
	(0.036)	(0.044)	(0.029)	(0.024)
$Prb.Def._t$	−0.584***	−0.479***	−0.384***	−0.321***
	(0.113)	(0.071)	(0.065)	(0.041)
$Leverage_t$	0.059	0.051	0.086	−0.111**
	(0.092)	(0.115)	(0.093)	(0.046)
$FARatio_t$	−0.342*	0.354**	0.149*	0.022
	(0.179)	(0.147)	(0.081)	(0.191)
$Cash_t$	−0.209	0.146	0.389**	0.197***
	(0.287)	(0.166)	(0.164)	(0.070)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.471	0.6415	0.6714	0.8053
Adjusted R^2	0.4684	0.6397	0.6697	0.8043
Observations	1,410	1,410	1,410	1,415
F Statistic	8.683***	23.526***	36.628***	202.930***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4.6:
Quarterly Segmentation on Days Payables Outstanding

This last table of quartile analysis displays the effects of *DPO* on *ROIC*. Due to the negative additive relationship between the cash conversion cycle and days payables outstanding, the presumed top-performers are gathered in column Q4. Consequently, companies with the least days of payables outstanding are located in Q1. The quarters are estimated based on five-year averages from 2014 to 2018, for public and private companies. In the regressions, *DPO* is lagged one year and scaled to display 10 days payables outstanding. The models contain firm specific control variables in addition to firm and year fixed effects. Associated standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are included in the parentheses.

	Dependent variable:			
	ROIC			
	Q1	Q2	Q3	Q4
DPO_{t-1}	−0.0003	−0.001	0.002	−0.001
	(0.003)	(0.003)	(0.003)	(0.001)
$Growth_t$	0.00002	0.133***	0.130***	0.043***
	(0.001)	(0.034)	(0.038)	(0.001)
$Size_t$	0.090***	0.091**	0.002	0.063*
	(0.029)	(0.039)	(0.040)	(0.038)
$Prb.Def._t$	−0.247**	−0.479***	−0.567***	−0.413***
	(0.119)	(0.077)	(0.077)	(0.069)
$Leverage_t$	0.022	−0.109	0.116	0.023
	(0.065)	(0.081)	(0.149)	(0.110)
$FARatio_t$	−0.061	0.197	−0.070	0.219
	(0.168)	(0.148)	(0.108)	(0.194)
$Cash_t$	0.019	0.077	0.149	0.352*
	(0.169)	(0.160)	(0.236)	(0.195)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.4599	0.6416	0.5508	0.6308
Adjusted R^2	0.4572	0.6398	0.5485	0.629
Observations	1,410	1,410	1,410	1,415
F Statistic	4.773***	23.603***	24.799***	44.886***

Note: *p<0.1; **p<0.05; ***p<0.01

In the four tables displayed above, we show the full specified models from 4.2, but for sub-samples based on average five-year performance of each working capital metric. Each metric is treated separately: first *CCC*, then *DSO*, followed by *DIO* and, finally *DPO*. For the first three, model Q1 signifies the top performers, while Q4 is the low end. For *DPO*, the order is the opposite due to its negative relation to *CCC*. All models describe the relationship between the metric in question and return on invested capital and, as previously stated, we believe there are diminishing returns to working capital as companies approaches their inherent "optimum".[2]

In the first four columns of table 4.3, we look at how the effect on corporate profitability varies with the performance of companies' working capital management, measured by cash conversion cycle. All coefficients on *CCC* except for Q1 are negative and statistically significant. This supports our initial notion that less efficient companies have a larger benefit on return on invested capital of shortening the cash conversion cycle. Although not explicitly stated in the literature, there are some suggestions that the effect is increasing with the length of the cash conversion cycle (Richards and Laughlin, 1980; Juan García-Teruel and Martinez-Solano, 2007; Faulkender and Wang, 2006). However, the coefficients reveal that it is the second best performers that have the largest effect, followed by the third and fourth quartiles. They take the values of -0.007, -0.005 and -0.003, respectively, at a 1% significance level. This may indicate that the relationship between *CCC* and *ROIC* is of a non-linear nature. More importantly, given the current state of the companies in these quartiles, we believe that the results are of high relevance, both statistically and economically.

The same exercise has been done for all of the three sub-components in tables 4.4 to 4.6. For *DSO*, we observe a negative coefficient for the fourth quartile, at a 10% significance level. This is highly supportive of our hypothesis, as the lowest performers seem to have the greatest effect of efficiency improvements.

Looking at *DIO* in table 4.5, the fourth quartile returns negative and significant coefficient at a 1 % level. Yet again, we observe a large negative effect for the fourth

[2]To clarify, working capital is vital for day-to-day operations and there must therefore be internal restrictions to cuts in the cash conversion cycle

quartile, strengthening the argument of diminishing marginal returns to improvements in the cash conversion cycle. An improvement of 10 days in *DIO* yield a 30 basis points improvement in *ROIC* on average. With reference to the descriptive statistics, this represents a rather substantial improvement.

Table 4.6, where we look at the effect of *DPO*, does not return any results of statistical significance. Although in contradiction with our initial hypothesis, it is slightly less surprising when considering the results in table 4.2. It seems as though Norwegian companies are less sensitive to payable management, possibly due to attractive conditions in the debt capital market in the five-year period, which marginalise the effects of credit rationing (Petersen and Rajan, 1997). Another related explanation could be that favourable credit terms in the markets enable Norwegian companies to take advantage of cash discounts rather than suffering the implied borrowing cost of trade credit by delaying payments to suppliers (Deloof, 2003).

Considering *DPO*, there is some uncertainty related to whether the impact of working capital policies have diminishing effects on return on invested capital. Interestingly, in all of the four tables, the top performers show few signs of a negative relationship, which could suggest that these companies already operate optimally. In addition, further analysis of *CCC*, *DSO* and *DIO* shows the characteristics hypothesised, signifying higher value of working capital management in the lower brackets. Overall the results are highly supportive of a negative relationship between the cash conversion cycle and return on invested capital, indicating that efficient working capital management does indeed improve profitability.

The coefficients on the *Cash* control variable add additional support to the notion that the marginal return on excess cash is diminishing. In tables 4.3 and 4.5, we observe both economically and statistically significant results for Q2-Q4 and Q3-Q4, respectively. Moreover, the only coefficients significant at a 1% level are those of Q4 in both tables. These results are in accordance with our suggestion in *Hypothesis 1*, and are also supported by the existing literature (Faulkender and Wang, 2006).

4.2.3 Public versus Private and the Effect of Agency Costs (H_2)

The main objective of this thesis is to investigate the differences in working capital practice between public and private firms. First we conduct Welch's two-sample t-test for unequal variances for each working capital management metrics, in order to assess whether the discrepancies observed in section 3.4 have significant statistic support. Furthermore, we believe it is important to investigate the effect on return on invested capital for the two groups, as we believe this partially explains why public companies have shorter cash conversion cycles. Hence, we follow the same procedure as with *Hypothesis 1* and use the base-model with binary variables for public companies interacted with the working capital metrics. The results are summarised in table 4.8. Unequal returns on the same types of investment could justify different practices in the two groups. In light of *Hypothesis 2*, dissimilar returns could originate from agency costs and therefore be an explanation for the longer cash conversion cycle of private companies compared to public. However, we recognise that this is an indirect way of measuring the presence of agency costs, with a lot of distorting factors. Thus, in the last part of this section, we will methodically analyse the effect of agency costs on the cash conversion cycle directly. In this part, we first regress the working capital variables on acknowledged proxies for agency costs in the literature, before we utilise two types of exogenous shocks to agency costs, replacement of CFO and deregulation of the reporting rules on the Oslo Stock Exchange. We try to capture these effects on the cash conversion cycle by applying frameworks of Difference-in-Difference estimation.

Table 4.7 below displays the results of the Welch's two-sample t-test for unequal variances. We have tested the means of *CCC* and its components for differences between the public and private sub-samples. First, we control for firm-specific determinants by running panel data regression models with the control variables and fixed effects. Then the fitted values from these regressions are applied in the t-tests[3]. Public company means are subtracted from the means of private companies, thus on a particular metric, positive t-stats signifies longer cycles for private companies. Table 4.8 explores the relationship between *CCC* and the various working capital metrics, differentiated for public and private companies. The panel data regression models are similar to the base model applied under

[3]See appendix for these panel data regressions

Hypothesis 1, with incorporation of the *Public* interaction term on the particular working capital management variable being analysed.

Table 4.7:
Welch's Two-Sample T-Test for Unequal Variances

The table displays results of two sample t-test for differences in the means of *CCC* and its components between public and private companies. Working capital management variables have been estimated with panel data regression models containing the control variables and fixed firm and year effects to adjust for firm-specific determinants. Thereafter Welch's two sample t-tests are applied to the fitted values. The means of public companies are subtracted from private companies in one-sided tests.

	Means of Fitted Values			
Variable	**Private**	**Public**	**t-statistic**	**p-value**
CCC	7.454	4.879	2.576	0.005
DSO	5.831	5.418	1.713	0.044
DIO	7.038	11.443	-5.826	0.000
DPO	5.415	11.982	-7.324	0.000

The results from the first row confirm that the CCCs of public companies on average are shorter compared to those of private firms. Moreover, the t-statistic is significant at 1%. Additionally, the test on *DSO* shows the same outcome, but only at a 5% significance level. Both *DIO* and *DPO* show differences in means at a 1% significance level. From the table, we also observe that these t-statistics are negative, implying more days inventory and payables outstanding in public firms. This is to be expected from *DPO* due to the negative additive relation to *CCC*. However, the negative estimate on *DIO* indicates that public companies are holding inventory significantly longer than private companies. A possible explanation could be that public companies are more prone to stock-outs or experience more severe consequences of them (Deloof, 2003; Blazenko and Vandezande, 2003; Rotemberg and Saloner, 1986). This result could also be attributed to unknown characteristics of our particular sample of public companies, apart from the factors adjusted for in the regression models from which the fitted values are derived. Nevertheless, it is noteworthy that *CCC* is significant lower for public companies in spite of higher *DIO*, a result that underpins the notion of structural differences in working capital management in the two groups. Moreover, with reference to *Hypothesis 2*, there is reason to believe that private companies experience more agency costs on average (Jensen, 1986; Opler et al., 1999; Ferreira and Vilela, 2004). The latter will be subject for further investigation in the following analyses.

Table 4.8:
The Cash Conversion Cycle and Profitability for Public and Private Companies

The table portrays the relationship between profitability and working capital management, and the marginal effects seen among public companies. The sample consists of 1,129 public and private companies over the period 2014 to 2018. *ROIC* is regressed on each working capital related measure separately in panel data regressions. Moreover, these variables are lagged by one year and have been scaled to represent 10 days of capital outstanding. The variable *Public* is interacted with the working capital management variables and describes the marginal effect of increasing working capital cycles for public companies. Each model includes firm specific time-variable controls and fixed effects for both firms and years. The standard errors in the parentheses are clustered for firms and are heteroscedasticity and autocorrelation robust.

	Dependent variable:			
	$ROIC_t$			
	(1)	(2)	(3)	(4)
CCC_{t-1}	-0.003^{***}			
	(0.001)			
CCC_{t-1}*Public	0.001			
	(0.002)			
DSO_{t-1}		-0.002^{*}		
		(0.001)		
DSO_{t-1}*Public		-0.006^{**}		
		(0.003)		
DIO_{t-1}			-0.003^{***}	
			(0.001)	
DIO_{t-1}*Public			-0.002	
			(0.003)	
DPO_{t-1}				0.0001
				(0.001)
DPO_{t-1}*Public				-0.0002
				(0.001)
$Growth_t$	0.032^{***}	0.032^{***}	0.032^{***}	0.033^{***}
	(0.011)	(0.011)	(0.011)	(0.011)
$Size_t$	0.060^{***}	0.062^{***}	0.061^{***}	0.061^{***}
	(0.019)	(0.020)	(0.019)	(0.020)
$Prb.Def._t$	-0.459^{***}	-0.458^{***}	-0.459^{***}	-0.459^{***}
	(0.043)	(0.043)	(0.043)	(0.043)
$Leverage_t$	0.028	0.030	0.035	0.030
	(0.050)	(0.050)	(0.051)	(0.050)
$FARatio_t$	0.005	0.013	0.009	0.013
	(0.090)	(0.091)	(0.090)	(0.091)
$Cash_t$	0.134	0.139	0.132	0.136
	(0.102)	(0.103)	(0.103)	(0.102)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.571	0.5705	0.5708	0.5699
Adjusted R^2	0.5704	0.5699	0.5702	0.5693
Observations	5,645	5,645	5,645	5,645
F Statistic	71.725^{***}	71.014^{***}	71.480^{***}	70.136^{***}
Note:				*p<0.1; **p<0.05; ***p<0.01

Looking at the first model in table 4.8, only the *CCC* coefficient for the aggregated sample shows statistical significance. It amounts to -0.003, which is statistically significant at a 1% level. Regarding the public interaction term, there are no significant differences on the return on invested capital between public and private companies.

The most interesting finding of this table is found in column 2. The *DSO* coefficient on the second model is negative and significant, with a coefficient of -0.002 at a 10% significance level. Interestingly, the interaction term between *DSO* and *Public* shows a negative marginal effect on return on invested capital. It is -0.006 at a 5% significance level, indicating an additional increase of 60 basis points on *ROIC* for 10 days reduction in *DSO*, compared to private companies. On one hand, this result could be attributed to lower agency costs because of higher transparency and frequent monitoring (Bushman and Smith, 2001; Black, 2000; Huang and Zhang, 2011). However, since similar results are absent from the other variables, it is difficult to make a definitive conclusion. On the other hand, this could also be caused by high market power among public companies, which enables them to dictate terms to a higher degree than their private peers (Richards and Laughlin, 1980). Still, this interpretation does not rule out the role of agency costs as a determinant for working capital policies. For *DIO* and *DPO*, there are no significant results from *Public* interactions affecting the return on invested capital. The *DIO* variable is unchanged from the results shown previously in table 4.2, while *DPO* does not yield any significant results from this analysis either.

In regard to *Hypothesis 2*, the results from table 4.8 do not give a clear indication that the difference in management of working capital between public and private companies can be ascribed to differing returns on the invested capital. Moreover, we have to look elsewhere for an explanation for the discrepancy found in the two sub-samples. Additionally, there is no strong evidence for presence of agency costs as a determinant factor. As mentioned, this is to be expected due to the indirect relationship of agency costs on *ROIC* through *CCC*. As elaborated on in chapter 2, this relationship is distorted from various elements, and in the following analysis we will therefore try to measure the effect of agency costs in a more direct manner.

In the two following tables we present panel regression models where we regress the working capital variables on the agency cost proxies *Asset Turnover* and *Cost Ratio*. The regressions are performed on the aggregated sample of both public and private companies in order to establish the link between working capital management and agency costs empirically. The models all contain control variables and fixed effects.

Table 4.9 yields very interesting results. Firstly, there is a highly significant negative relationship between *CCC* and *Asset Turnover*, supporting the findings in the literature that agency costs increase investments in working capital (Jensen, 1986; Ferreira and Vilela, 2004). Although the coefficient is significant at a 1% level, the economic impact is questionable. With reference to the descriptive statistics, a ~ 0.3 increase in *Asset Turnover*, representing a 20% increase, reduces *CCC* by approximately four days. Similar results are shown by *DSO* and *DIO*. On the other hand, *DPO* displays the same negative effect, which is unexpected. Moreover, this could be an indication of an unobserved effect and an endogeneity problem, as mentioned in section 3.4. This argument is strengthened by the observations in table 4.10, where the only significant link between working capital management and *Cost Ratio* is *DPO* at a 10% significance level.

As a side note, the two tables do, however, show some noteworthy results with regard to other parts of the working capital literature. The negative relationship between *Size* and *DSO* has been shown to be connected to market power (Shin and Soenen, 1998). Furthermore, the negative significant relationship between *DPO* and probability of default underline the conjecture of Deloof (2003) that struggling companies find it difficult to pay suppliers and therefore have more payables outstanding. Finally, the negative results shown on the *Leverage* coefficients for both *DSO* and *DPO* are in line with the theory of credit rationing (Petersen and Rajan, 1997; Schwartz, 1974), indicating that companies with easy access to capital will extend trade credit and pay suppliers early.

Overall, the tables point in the direction of a link between working capital and agency costs, although, there are reasons to believe that there are obscuring factors. In the last part of this section we will therefore utilise factor of exogenous nature to try to estimate the relationship between the two, and also the difference in working capital management observed between public and private companies in Norway.

Table 4.9:
Working Capital Management and Asset Turnover as a Proxy for Agency Costs

The table describes the relationship between agency costs and working capital management for 1,129 public and private companies in Norway in the time-span 2014 to 2018. *CCC*, *DSO*, *DIO* and *DPO* are regressed on the agency cost proxy *Asset Turnover*. The models include firm specific time-variable controls and fixed effects for both firms and years. The standard errors in the parentheses are clustered for firms and are heteroscedasticity and autocorrelation robust.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
Asset Turnover	−12.524***	−11.572***	−12.602***	−11.650***
	(2.946)	(2.443)	(3.282)	(3.073)
Growth	4.351*	3.282**	3.181*	2.112***
	(2.523)	(1.376)	(1.666)	(0.619)
Size	−13.477	−9.807**	−12.124	−8.454
	(8.812)	(3.938)	(8.158)	(6.226)
Prb. Def.	−12.721	6.572	1.573	20.866***
	(8.467)	(4.340)	(7.274)	(4.610)
Leverage	11.383	−22.470***	5.862	−27.991***
	(19.297)	(5.633)	(19.458)	(9.222)
FA Ratio	−98.499***	−63.255***	−64.500***	−29.256*
	(22.702)	(16.499)	(17.222)	(17.450)
Cash	3.284	3.155	1.082	0.953
	(7.827)	(4.963)	(6.003)	(3.914)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.7854	0.7423	0.8087	0.8004
Adjusted R^2	0.7852	0.742	0.8085	0.8002
Observations	5,645	5,645	5,645	5,645
F Statistic	23.846***	65.857***	21.076***	32.914***
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4.10:
Working Capital Management and Cost Ratio as a Proxy for Agency Costs

The table shows panel data regression models which describe the relationship between the working capital management variables, *CCC*, *DSO*, *DIO* and *DPO*, and the agency cost proxy *Cost Ratio*. The sample consists of 1,129 public and private companies in Norway over the period from 2014 to 2018. In the models, both firm and year fixed effects are included, in addition to company characteristic time-variant control variables. Associated standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are included in the parentheses.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
Cost Ratio	4.214	12.048	23.608	31.443*
	(18.354)	(7.834)	(15.180)	(17.944)
Growth	4.187*	3.166**	3.100**	2.079***
	(2.484)	(1.284)	(1.552)	(0.510)
Size	−17.082**	−12.135***	−13.370*	−8.424
	(7.915)	(3.818)	(7.549)	(5.268)
Prb. Def.	−13.080	4.891	−1.993	15.978***
	(8.134)	(4.641)	(6.337)	(4.543)
Leverage	17.661	−16.801***	11.867	−22.595**
	(19.319)	(5.372)	(19.711)	(8.940)
FA Ratio	−86.535***	−51.625***	−51.095***	−16.185
	(21.091)	(15.447)	(13.073)	(14.589)
Cash	4.303	3.499	0.690	−0.114
	(7.756)	(4.696)	(6.447)	(4.142)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R2	0.7835	0.7342	0.807	0.7981
Adjusted R2	0.7833	0.7338	0.8067	0.7978
Observations	5,645	5,645	5,645	5,645
F Statistic	17.957***	44.188***	14.975***	25.052***
Note:				*p<0.1; **p<0.05; ***p<0.01

In tables 4.11 and 4.12, we apply two different shocks to agency costs to measure the effects on working capital management: deregulation of reporting rules at the Oslo Stock Exchange and the replacement of CFOs for public companies, respectively. The two tables are structured similarly, where each column describes the effects of the shock on the working capital management metrics separately. The first is estimated using Difference-in-Difference methodology with panel data. Each regression model therefore contains fixed effects for firms and years, and includes robust standard errors clustered for firms. In the second table, we follow a Difference-in-Difference-in-Difference estimation with variable treatment patterns and panel data. These models also contain fixed firm and year effects. We refer to section 3.3 for further elaboration of the technical execution.

In table 4.11, we have applied the deregulation of the accounting rules on the Oslo Stock Exchange as a shock on agency costs. The coefficient on *DiD* indicates the effect of the deregulation on the companies' different working capital management metrics. As is evident from the table, the signs of the coefficients on the *DiD* estimator are quite ambiguous, and unexpected according to our hypothesis and prior research. It has been found that the restrictiveness of financial reporting regulations has a negative effect on the magnitude of agency costs (Pae et al., 2006; Levitt, 1998). By loosening the requirement for IFRS reporting from quarterly to semi-annual, the shareholders receive less frequent information, which reduces the transparency in the market. This implies higher agency costs, which in turn is positively related to the cash conversion cycle (Jensen, 1986; Opler et al., 1999; Ferreira and Vilela, 2004). However, table 4.11 displays indications of the opposite. We see that the coefficient of the *DiD* estimator, when regressed on *CCC*, is negative and statistically significant at a 5% level. Furthermore, this seem to be driven by the coefficient on *DPO*, which is positive and significant at the same level. At face value, the deregulation resulted in a 28 days reduction in *CCC* and could indicate other side-effects apart from the impact on agency costs. Moreover, the shock in itself might not be strong enough to cause an effect. Although going in a less restrictive direction, the legislation still demands semi annual reporting in accordance with IFRS standards. In addition, we know that several companies still report in accordance with IFRS on a quarterly basis. These potential explanations will be subject for further discussion in section 5.2, where we will elaborate on the limitations of our thesis.

Table 4.11:
The Impact of Deregulation of Reporting Practices on Agency Costs and the Cash Conversion Cycle

The regressions in the table depict the effects of the deregulation of the Oslo Stock Exchange's reporting rules on the working capital management metrics. Difference-in-Difference methodology for panel data is applied, with the inclusion of control variables and fixed firm effects and fixed year effects. The variable *DiD* is the Difference-in-Difference estimator, which shows the impact of the deregulation for public firms in the period from 2017 compared to the control group of private companies. Moreover, it serves to indicate differences in agency costs between public and private companies. The sample consists of 5,645 firm-year observations, and the post-period constitutes one year of observations due to the lagged dependent variables. Furthermore, the aggregated sample contains 270 firm-year observations for public companies. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are displayed in parentheses.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
DiD	-27.728^{**}	-0.609	-5.657	21.462^{**}
	(13.067)	(3.085)	(8.842)	(8.842)
Growth	4.061^{*}	3.112^{**}	2.976^{*}	2.027
	(2.464)	(1.342)	(1.634)	(1.634)
Size	-17.798^{**}	-13.621^{***}	-16.313^{**}	-12.136
	(8.710)	(3.786)	(7.920)	(7.920)
Prb. Def.	-12.180	6.889	1.955	21.023^{***}
	(8.433)	(4.395)	(7.246)	(7.246)
Leverage	17.026	-16.623^{***}	12.104	-21.544
	(19.001)	(5.366)	(19.496)	(19.496)
FA Ratio	-84.173^{***}	-52.417^{***}	-52.219^{***}	-20.463
	(21.123)	(15.619)	(13.659)	(13.659)
Cash	4.235	4.373	2.341	2.479
	(7.604)	(4.880)	(6.008)	(6.008)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.7846	0.7336	0.8065	0.7977
Adjusted R^2	0.7843	0.7332	0.8063	0.7974
Observations	5,645	5,645	5,645	5,645
F Statistic	21.075^{***}	42.646^{***}	13.417^{***}	23.727^{***}

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4.12:
The Effect of Replacing the CFO
on Agency Costs and the Cash Conversion Cycle

The table shows the impact of replacing the CFO for public companies in the time-span 2014 to 2018 on the working capital management measures. The change of CFO represents a shock in agency costs and the effects are estimated by applying a Difference-in-Difference-in-Difference framework with panel data regression models. The analysis uses two control groups: public and private companies without intervention in the CFO position. The variable *DDD* identifies the effect in the post-period, which follow a variable pattern for each company. For the control group, the post-period is determined as 2016 to 2018 based on the median year of CFO replacement among public companies in the period. The sample consists of 340 firm-year observations and all regressions contain firm-specific time-variable controls and fixed effects for both firms and years. Robust standard errors for heteroscedasticity and autocorrelation, clustered by firms, are reported in parentheses.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
DDD	15.711	9.628*	0.534	−5.550
	(15.250)	(5.325)	(19.528)	(19.746)
Time	−8.981	4.075	−13.416	−0.359
	(11.267)	(4.202)	(8.726)	(11.259)
Time*Publ_index	−11.771	−4.829	7.060	14.001
	(9.139)	(3.746)	(13.057)	(15.555)
Growth	9.174***	3.922***	8.113***	2.862**
	(2.239)	(0.670)	(1.909)	(1.294)
Size	43.055**	7.846	13.799	−21.410
	(20.417)	(9.839)	(20.249)	(21.975)
Prb. Def.	−26.990*	−22.830**	−25.909	−21.748
	(15.515)	(9.115)	(18.353)	(16.754)
Leverage	56.125	5.946	63.772*	13.592
	(51.552)	(12.357)	(33.062)	(48.539)
FA Ratio	2.524	7.243	12.005	16.725
	(44.925)	(23.292)	(38.057)	(68.964)
Cash	4.744	21.860*	−27.251	−10.135
	(31.770)	(12.984)	(24.840)	(22.378)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.9191	0.9064	0.9051	0.9911
Adjusted R^2	0.9169	0.9039	0.9026	0.9908
Observations	340	340	340	340
F Statistic	23.819***	88.514***	10.567***	2.931***
Note:				*p<0.1; **p<0.05; ***p<0.01

In table 4.12, we have used the replacement of CFO as a shock on agency costs with a Difference-in-Difference-in-Difference (DDD) methodology, as we expect the change of CFO to have a negative effect on agency costs (Geiger and North, 2006; Healy and Wahlen, 1999; Burgstahler and Dichev, 1997). The *DDD* variable represents the treatment effect on the treatment group; see section 3.3.4 for further elaboration. The *DDD* estimator is the coefficient on *DDD*, and it is interpreted as the effect of replacing the CFO for public companies in the post period, compared to the public and private companies in the control groups without CFO intervention.

Analyses of the *DDD* estimators show results conflicting with the findings of the existing literature concerning the relationship between the CFO-replacement, agency costs and the implied effect on working capital management (Jensen, 1986; Opler et al., 1999; Ferreira and Vilela, 2004). Additionally, all the coefficients are pointing in the opposite direction to our expectations stated in *Hypothesis 2*, and the *DSO* model yields a positive coefficient, significant at a 10% level. This serves as an indicator of worsening working capital management. The other coefficients on the working capital management variables are, however, not statistically significant and we are not able to claim with confidence that changes in the CFO position actually decrease the efficiency of working capital management.

Based on the analyses in table 4.11 and 4.12, we do not have statistical significant evidence supporting a conclusion that agency cost is the reason for the large difference in working capital balances between public and private companies.

5 Conclusion and Limitations

5.1 Conclusion

The objective of this thesis is bipartite. Firstly, we examine the effect of working capital management on return on invested capital for Norwegian companies. Secondly, we attempt to explain the differences in working capital management between publicly listed and privately owned companies from the perspective of agency theory. More concisely, we want to investigate whether the distinctive characteristics in these two ownership structures cause different exposure to agency costs, and subsequently different cash conversion cycle policies. Hence, our research question was stated as follows:

Can the Agency Problem explain the difference in the cash conversion cycles of Norwegian public and private companies?

In our results section, we present findings indicating that there is a statistically significant relationship between the cash conversion cycle and return on invested capital for Norwegian companies. We also observe confirming relationships between the two sub-components, days sales outstanding and days inventory outstanding, and return on invested capital, implying that operational profitability is more sensitive to management of inventories and receivables relative to the management of payables in Norway. These results support the findings of the existing literature (Deloof, 2003; Shin and Soenen, 1998; Lazaridis and Tryfonidis, 2006). Moreover, we discovered indications that the return on improvement is of a diminishing nature, as indirectly suggested by Richards and Laughlin (1980) and Juan García-Teruel and Martinez-Solano (2007). Although not perfectly consistent, our findings reveal that companies outside the top-performing quartile have a larger effect of improvement, compared to the top-performing firms.

In the second section of the analysis, we found statistically significant evidence of systematical differences in working capital practice between public and private companies in Norway. Moreover, we unveiled marginal effects in the relationship between days sales outstanding and return on invested capital for public companies, which could serve as a partial explanation for the differences in cash conversion cycle. In further analyses of

relationship between agency costs and the cash conversion cycle, we found some indications of a link between the two. However, analyses of exogenous shocks on agency costs provided unexpected statistically significant results. Furthermore, the signs of the *DiD* estimators on *CCC* and *DPO* in table 4.11 indicate a negative relationship between agency costs and the cash conversion cycle. In table 4.12, the DDD-estimators are more ambiguous and carefully point to the same negative relationship, but this time in form of *DSO*. However, the results are hardly significant. Based on these findings, we are able to conclude that there is a difference in how private and public companies manage their working capital. Nevertheless, we cannot conclude that this inconsistency is caused by agency costs.

These findings emphasize the importance of efficient working capital management. Moreover, it underpins the potential in optimizing the cash conversion cycle for private companies in particular. However, the focus on working capital for public companies has also been shown to be rewarding. Especially, when considering the effect on valuation, improvements of the cash conversion cycle have the potential of improving the company value drastically. Furthermore, a reduction of investments in working capital affects the cash flow in a direct manner, which subsequently is perceived as attractive by shareholders.

5.2 Limitations

An important feature of this chapter is the elaboration on the limitations with this thesis. In the following sections, there will be a discussion of these limitations, and the implications they have in regard to our analysis and results.

Firstly, we have used a data sample of companies with reported 2018-revenues above 100 million NOK. Although this provides us with a large data set, we exclude the vast majority of Norwegian companies. Thus, we cannot be certain that the observed effects hold for all Norwegian companies. A second limitation to the data set is the restricted number of public companies compared to private companies. Due to our restrictions for the companies included in the data set, we have excluded several of the companies currently trading on the Oslo Stock Exchange, mainly due to lack of financial data for the period analysed. We believe the lack of data on the public side of the comparison is the primary reason for the absence of significance in some of our results, and particularly in

the last part of our analysis.

Further, we have combined data from two different databases. Ideally, we would use the same database for the entire dataset to make all individuals perfectly comparable. However, the access to data on private Norwegian companies is fairly limited, and requires use of specific databases. Thus, we were forced to combine data from the Orbis database and the Soliditet database. The implication is that there is some divergence in how the financial statements are reported in each database, and we had to aggregate and make sure the data was comparable manually.

Besides this, the numbers used in our data are consistently year-end figures. Thus, we are not able to capture the operational behaviour throughout the year. The implications of only looking at year-end reporting are that natural fluctuations may be perceived incorrectly. An example is in the case 31st of December being on a Saturday or Sunday. Given that a payment is due the last day of the year, the payment will be registered in the following year, and thus be reported as account payables in the current year. This could wrongly be interpreted as declining payables management year-over-year when in reality no policy changes were made. Another complication with the annual reporting is the incentives applying to the management. As discussed in section 2.3.3, by pushing the payment of deferrals to the next year, the management is able to report a stronger cash balance due to higher payables and a more cash on hand. Ideally, we would have looked at quarterly figures in order to get a more precise picture of the practice through the year. However, this information is not available for private companies in Norway, and hence, such an analysis is impossible.

Regarding the proxies on agency cost, endogeneity is an ominous limitation. Although supported by existing research as feasible proxies, these are quite noisy and we could expect that several factors in the error term could affect these variables. However, the thesis does not rely entirely on the variables to determine the link between working capital and agency costs.

Further, we need to consider the limitations in the last section of our analysis. When applying the Difference-in-Difference methodology, it is always an issue associated with the

exogeneity of the shocks. In our case, we are most concerned about the CFO-replacement, as we suspect that such an event might affect other aspects of corporate operations than merely the working capital practice. As the principal financial manager of the company, the CFO has a large impact on various decisions from capital structure to growth strategies. However, we believe these effects materialise over a longer horizon, and thus the effect on working capital is believed to be fairly exogenous. An additional problem with this shock is the magnitude of information collected. Ultimately, we would have analysed the effect of a CFO replacement for more companies in our sample, but due to the time restrictions of this thesis, we have only been able to gather this information for a minor selection. Considering the effects of deregulations on the Oslo Stock Exchange, we could question to what extent this actually would affect the working capital practice of companies as the impact on transparency is somewhat limited. These companies still report according to the IFRS standards semi-anually, and some companies have continued with the quarterly reporting practice.

Finally, we have to assume constant effects of the shocks when applying the DiD and DDD methodologies. Given the very nature of our shocks, and particularly the CFO replacement, this assumption might be violated. As discussed in the literature review, the reason why we expect declining agency costs in association with a CFO substitution is the different incentives that appeal to the old and the new CFO. However, based on this argumentation, we might see that the incentives of the new CFO only holds for the first phase of the tenure. As the time progresses, they could converge towards the incentives of the old CFO, putting the company in the same position as it was prior to the CFO replacement. Fortunately, our post-period is relatively short, which we believe mitigate this risk.

5.3 Proposals for Future Research

One recommendation for future research is to further investigate the discrepancy in the cash conversion cycle between private and public companies. One approach is to look to other markets where the access on data for public companies is larger. Another angle which would be interesting to explore, is a comparison of the working capital practice in different geographical markets, and the causes for potential differences. As previously mentioned, there is an extensive amount of research on the financial implications of working capital management. However, the vast majority of this research focuses on a single market. A multi-national comparison offers more insight into what dictates the optimal working capital policy. Moreover, best practice for a given company might be found outside the companies' home market.

In addition, we believe there is a lot of potential for future research in the Norwegian sphere. Firstly, we believe that an extension of the time period analysed allows for interesting discoveries. The financial climate (aside from the oil price shock) has been stable throughout our chosen period. As stable and low interest rates are one of the arguments for the limited effect of days payables outstanding on corporate profitability in our results, we believe it would be interesting to look at a period with larger fluctuations in market conditions.

Furthermore, future research should dig deeper into the explanation for why there exist differences in working capital policies between public and private companies in Norway. We have now opened a new chapter in working capital research, and hope that future papers with more flexible time-frames are able to expand on our ideas, or explore alternative solutions. Moreover, we hope that there will be an expansion on the connection between working capital and agency costs in the forthcoming. As we have stated, with support from the existing literature, there seems to be a theoretical link between the two concepts. We believe that an investigation of the practical relationship between the two will be of both theoretical and practical value. In this regard, to further explore the role of the CFO in association with working capital management might be a intriguing path to follow.

References

Amihud, Y. and Lev, B. (1981). Risk reduction as a managerial motive for conglomerate mergers. *The bell journal of economics*, pages 605–617.

Ang, J. S., Cole, R. A., and Lin, J. W. (2000). Agency costs and ownership structure. *the Journal of Finance*, 55(1):81–106.

Arditti, F. D. (1967). Risk and the required return on equity. *The Journal of Finance*, 22(1):19–36.

Berger, A. N. and Udell, G. F. (1995). Relationship lending and lines of credit in small firm finance. *Journal of business*, pages 351–381.

Bernhoft, A., Kvifte, S., and Tofteland, A. (2011). Finansregnskap–god regnskapsskikk og ifrs 2. utgave.

Black, B. S. (2000). The legal and institutional preconditions for strong securities markets. *UClA L. REv.*, 48:781.

Blazenko, G. W. and Vandezande, K. (2003). Corporate holding of finished goods inventories. *Journal of Economics and Business*, 55(3):255–266.

Børs, O. (2016). Oslo børs. *Hentet Desember*, 5:2019.

Brealey, R. A., Myers, S. C., Allen, F., and Mohanty, P. (2012). *Principles of corporate finance*. Tata McGraw-Hill Education.

Burgstahler, D. and Dichev, I. (1997). Earnings management to avoid earnings decreases and losses. *Journal of accounting and economics*, 24(1):99–126.

Bushee, B. J. and Leuz, C. (2005). Economic consequences of sec disclosure regulation: evidence from the otc bulletin board. *Journal of accounting and economics*, 39(2):233–264.

Bushman, R. M. and Smith, A. J. (2001). Financial accounting information and corporate governance. *Journal of accounting and Economics*, 32(1-3):237–333.

Carlton, J. (2000). Amazon stock sinks after credit report. *Wall Street Journal (June 26, 2000) A*, 3.

Cassar, G. (2004). The financing of business start-ups. *Journal of business venturing*, 19(2):261–283.

Cheng, S. (2004). R&d expenditures and ceo compensation. *The Accounting Review*, 79(2):305–328.

Chiou, J.-R., Cheng, L., and Wu, H.-W. (2006). The determinants of working capital management. *Journal of American Academy of Business*, 10(1):149–155.

Dalci, I., Tanova, C., Ozyapici, H., Bein, M. A., et al. (2019). The moderating impact of firm size on the relationship between working capital management and profitability. *Prague Economic Papers*, 2019(3):296–312.

Damodaran, A. (2007). Return on capital (roc), return on invested capital (roic) and

return on equity (roe): Measurement and implications. *Return on Invested Capital (ROIC) and Return on Equity (ROE): Measurement and Implications (July 2007)*.

Darun, M. R. (2011). *The determinants of working capital management practices: a Malaysian perspective*. PhD thesis, Lincoln University.

Darun, M. R., Roudaki, J., and Radford, J. J. (2015). The evolution of working capital management research.

Deloof, M. (2003). Does working capital management affect profitability of belgian firms? *Journal of business finance & Accounting*, 30(3-4):573–588.

Deloof, M. and Jegers, M. (1996). Trade credit, product quality, and intragroup trade: some european evidence. *Financial management*, pages 33–43.

Deloof, M. and Jegers, M. (1999). Trade credit, corporate groups, and the financing of belgian firms. *Journal of Business Finance & Accounting*, 26(7-8):945–966.

Demsetz, H. (1983). The structure of ownership and the theory of the firm. *The Journal of law and economics*, 26(2):375–390.

Derrick, B., Toher, D., and White, P. (2016). Why welch's test is type i error robust. *The Quantitative Methods in Psychology*, 12(1):30–38.

Ding, Y., Hope, O.-K., Jeanjean, T., and Stolowy, H. (2007). Differences between domestic accounting standards and ias: Measurement, determinants and implications. *Journal of accounting and public policy*, 26(1):1–38.

Dowdell, T. D. and Krishnan, J. (2004). Cap forum on enron: Former audit firm personnel as cfos: Effect on earnings management. *Canadian Accounting Perspectives*, 3(1):117–142.

Drobetz, W., Grüninger, M. C., and Hirschvogl, S. (2010). Information asymmetry and the value of cash. *Journal of Banking & Finance*, 34(9):2168–2184.

Ebben, J. J. and Johnson, A. C. (2011). Cash conversion cycle management in small firms: Relationships with liquidity, invested capital, and firm performance. *Journal of Small Business & Entrepreneurship*, 24(3):381–396.

Elliehausen, G. E. and Wolken, J. D. (1993). The demand for trade credit: an investigation of motives for trade credit use by small businesses. *Fed. Res. Bull.*, 79:929.

Erdogan, B., Kant, R., Miller, A., and Sprague, K. (2016). Grow fast or die slow: Why unicorns are staying private. *McKinsey. com.*

Faulkender, M. and Wang, R. (2006). Corporate financial policy and the value of cash. *The Journal of Finance*, 61(4):1957–1990.

Ferreira, M. A. and Vilela, A. S. (2004). Why do firms hold cash? evidence from emu countries. *European Financial Management*, 10(2):295–319.

Florackis, C. and Ozkan, A. (2004). Agency costs and corporate governance mechanisms: Evidence for uk firms, university of york. Technical report, UK. Working Paper Series.

Geiger, M. A. and North, D. S. (2006). Does hiring a new cfo change things? an

investigation of changes in discretionary accruals. *The Accounting Review*, 81(4):781–809.

Gentry, J. A., Vaidyanathan, R., and Lee, H. W. (1990). A weighted cash conversion cycle. *Financial Management*, pages 90–99.

Halil, E. and Hasan, A. (2012). The effect of firm size on profitability: An empirical icelandic firms. *Bifröst Journal of Social Science*, 1:33–42.

Hall, M. and Weiss, L. (1967). Firm size and profitability. *The Review of Economics and Statistics*, pages 319–331.

Harris, M. and Raviv, A. (1996). The capital budgeting process: Incentives and information. *The Journal of Finance*, 51(4):1139–1174.

Hawawini, G., Viallet, C., and Vora, A. (1986). Industry influence on corporate working capital decisions.

Healy, P. M. and Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. *Accounting horizons*, 13(4):365–383.

Huang, P. and Zhang, Y. (2011). Does enhanced disclosure really reduce agency costs? evidence from the diversion of corporate resources. *The Accounting Review*, 87(1):199–229.

Hubbard, R. G. (1997). Capital-market imperfections and investment. Technical report, National Bureau of economic research.

Jafari, I. J., Salahinezhad, M., and Jalili, A. (2014). Effects of working capital management on firm's bankruptcy probability. *International SAMANM Journal of Finance and Accounting*, 2(1).

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review*, 76(2):323–329.

Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *the Journal of Finance*, 48(3):831–880.

Jensen, M. C. and Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, 3(4):305–360.

Jiang, J. X., Petroni, K. R., and Wang, I. Y. (2010). Cfos and ceos: Who have the most influence on earnings management? *Journal of Financial Economics*, 96(3):513–526.

John, A. O. and Adebayo, O. (2013). Effect of firm size on profitability: Evidence from nigerian manufacturing sector. *Prime Journal of Business Administration and Management (BAM)*, 3(9):1171–1175.

Johnson, R. and Soenen, L. (2003). Indicators of successful companies. *European Management Journal*, 21(3):364–369.

Jose, M. L., Lancaster, C., and Stevens, J. L. (1996). Corporate returns and cash conversion cycles. *Journal of Economics and finance*, 20(1):33.

Juan García-Teruel, P. and Martinez-Solano, P. (2007). Effects of working capital

management on sme profitability. *International Journal of managerial finance*, 3(2):164–177.

Keown, A. J. (2004). *Foundations of finance: The logic and practice of financial management.* .

Koller, T., Goedhart, M., Wessels, D., et al. (2010). *Valuation: measuring and managing the value of companies*, volume 499. john Wiley and sons.

Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of development Economics*, 29(3):253–268.

Lazaridis, I. and Tryfonidis, D. (2006). Relationship between working capital management and profitability of listed companies in the athens stock exchange. *Journal of financial management and analysis*, 19(1).

Levitt, A. (1998). The importance of high quality accounting standards. *Accounting horizons*, 12(1):79.

Lieberman, M. B. (1987). Excess capacity as a barrier to entry: An empirical appraisal. *The Journal of Industrial Economics*, pages 607–627.

Long, M. S., Malitz, I. B., and Ravid, S. A. (1993). Trade credit, quality guarantees, and product marketability. *Financial management*, pages 117–127.

Mathuva, D. (2015). The influence of working capital management components on corporate profitability.

May, D. O. (1995). Do managerial motives influence firm risk reduction strategies? *The Journal of Finance*, 50(4):1291–1308.

McConnell, J. J. and Servaes, H. (1990). Additional evidence on equity ownership and corporate value. *Journal of Financial economics*, 27(2):595–612.

McConnell, J. J. and Servaes, H. (1995). Equity ownership and the two faces of debt. *Journal of financial economics*, 39(1):131–157.

Menon, K. and Williams, D. D. (2004). Former audit partners and abnormal accruals. *The Accounting Review*, 79(4):1095–1118.

Modigliani, F. and Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American*, 1:3.

Moessner, R. and Allen, W. A. (2010). Central bank co-operation and international liquidity in the financial crisis of 2008-2009.

Morck, R., Shleifer, A., and Vishny, R. W. (1988). Management ownership and market valuation: An empirical analysis. *Journal of financial economics*, 20:293–315.

Mueller, E. (2008). How does owners' exposure to idiosyncratic risk influence the capital structure of private companies? *Journal of Empirical Finance*, 15(2):185–198.

NACE, R. (1990). Statistical classification of economic activities in the european community. *Official Journal L 293*.

Nilsson, H. (2010). The effect of company characteristics on working capital management. *Umeå School of Business*.

NorskArbeidskapital (2017). Arbeidskapitalstyring 2017 – en undersøkelse av små og mellomstore norske bedrifter.

Nuhiu, A. and Dërmaku, A. (2017). A theoretical review on the relationship between working capital management and company's performance. *Acta Universitatis Danubius. Œconomica*, 13(3).

Nzioki, P. M., Kimeli, S. K., Riwo Abudho, M., and Nthiwa, J. M. (2013). Management of working capital and its effect on profitability of manufacturing companies listed on nairobi securities exchange (nse), kenya.

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of accounting research*, pages 109–131.

Opler, T., Pinkowitz, L., Stulz, R., and Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of financial economics*, 52(1):3–46.

Ortiz-Molina, H. and Phillips, G. M. (2010). Asset liquidity and the cost of capital. Technical report, National Bureau of Economic Research.

Pae, J., Thornton, D. B., and Welker, M. (2006). The reduction of firms' ownership induced agency costs following financial reporting reform in the european union. *Available at SSRN 873607*.

Papadakis, V. (2007). Growth through mergers and acquisitions: how it won't be a loser's game. *Business Strategy Series*, 8(1):43–50.

Papadogonas, T. A. (2006). The financial performance of large and small firms: evidence from greece. *International Journal of Financial Services Management*, 2(1-2):14–20.

Pashigian, B. P. (1968). Limit price and the market share of the leading firm. *The Journal of Industrial Economics*, pages 165–177.

Paul, S. and Wilson, N. (2006). Trade credit supply: An empirical investigation of companies level data. *Journal of Accounting, Business & Management*, 13.

Paul, S. and Wilson, N. (2007). The determinants of trade credit demand: Survey evidence and empirical analysis. *Journal of Accounting, Business & Management*, 14.

Petersen, C., Plenborg, T., and Kinserdal, F. (2017). Valuation-credit analysis-performance evaluation.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *The Review of Financial Studies*, 22(1):435–480.

Petersen, M. A. and Rajan, R. G. (1997). Trade credit: theories and evidence. *The review of financial studies*, 10(3):661–691.

Pinkowitz, L. (2000). The market for corporate control and corporate cash holdings. *Available at SSRN 215191*.

Porter, M. E. et al. (1979). The structure within industries and companies' performance. *Review of economics and statistics*, 61(2):214–227.

PriceWaterhouseCoopers (2015). Perfect timing: 2015 norway working capital survey.

PriceWaterhouseCoopers (2017). Pressure in the system. working capital study region in focus: The nordics.

PriceWaterhouseCoopers (2019). Creating value through working capital: Unlocking cash in a digital age.

Raheman, A. and Nasr, M. (2007). Working capital management and profitability–case of pakistani firms. *International review of business research papers*, 3(1):279–300.

Rajan, R. G. and Zingales, L. (1995). What do we know about capital structure? some evidence from international data. *The journal of Finance*, 50(5):1421–1460.

Regjeringen (2012). Norge 2020: Hva skal vi leve av i fremtiden?

Richards, V. D. and Laughlin, E. J. (1980). A cash conversion cycle approach to liquidity analysis. *Financial management*, pages 32–38.

Rotemberg, J. J. and Saloner, G. (1986). A supergame-theoretic model of price wars during booms. *The American economic review*, 76(3):390–407.

Saleem, Q. and Rehman, R. U. (2011). Impacts of liquidity ratios on profitability. *Interdisciplinary journal of research in business*, 1(7):95–98.

Saunders, A., Strock, E., and Travlos, N. G. (1990). Ownership structure, deregulation, and bank risk taking. *the Journal of Finance*, 45(2):643–654.

Schwartz, J. (2000). Amazon. com shares up 20% on forecast. *Washington Post (July 15 2000) E*, 2.

Schwartz, R. A. (1974). An economic model of trade credit. *Journal of financial and quantitative analysis*, 9(4):643–657.

Shane, S. and Cable, D. (2002). Network ties, reputation, and the financing of new ventures. *Management science*, 48(3):364–381.

Sharma, A. K. and Kumar, S. (2011). Effect of working capital management on firm profitability: Empirical evidence from india. *Global business review*, 12(1):159–173.

Shin, H.-H. and Soenen, L. (1998). Efficiency of working capital management and corporate profitability. *Financial practice and education*, 8:37–45.

Short, H. and Keasey, K. (1999). Managerial ownership and the performance of firms: Evidence from the uk. *Journal of corporate finance*, 5(1):79–101.

Singh, M. and Davidson III, W. N. (2003). Agency costs, ownership structure and corporate governance mechanisms. *Journal of Banking & Finance*, 27(5):793–816.

Smith Jr, C. W. and Warner, J. B. (1979). On financial contracting: An analysis of bond covenants. *Journal of financial economics*, 7(2):117–161.

Stiglitz, J. E. and Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, 71(3):393–410.

Sulen, E. (2004). Ifrs; betydningen for norske ikke børsnoterte selskaper. *Praktisk økonomi & finans*, 20(04):19–26.

Valipour, H., Moradi, J., and Farsi, F. D. (2012). The impact of company characteristics on working capital management. *Journal of Applied Finance and Banking*, 2(1):105.

Wooldridge, J. (2007). What's new in econometrics? lecture 10 difference-in-differences estimation. *NBER Summer Institute, available at: www. nber. org/WNE/Slides7–31–07/slides_ 10_ diffindiffs. pdf, accessed April*, 9:2011.

Appendix

Table A0.1:
Industry Categorisation

No.	A*38 code	ISIC Rev. 4/NACE Rev. 2	Divisions	Included
1	A	Agriculture, forestry and fishing	01 to 03	Yes
2	B	Mining and quarrying	05 to 09	Yes
3	CA	Manufacture of food products, beverages and tobacco products	10 to 12	Yes
4	CB	Manufacture of textiles, apparel, leather and related products	13 to 15	Yes
5	CC	Manufacture of wood and paper products, and printing	16 to 18	Yes
6	CD	Manufacture of coke, and refined petroleum products	19	Yes
7	CE	Manufacture of chemicals and chemical products	20	Yes
8	CF	Manufacture of pharmaceuticals, medicinal chemical and botanical products	21	Yes
9	CG	Manufacture of rubber and plastics products, and other non-metallic mineral products	22 and 23	Yes
10	CH	Manufacture of basic metals and fabricated metal products, except machinery and equipment	24 and 25	Yes
11	CI	Manufacture of computer, electronic and optical products	26	Yes
12	CJ	Manufacture of electrical equipment	27	Yes
13	CK	Manufacture of machinery and equipment n.e.c.	28	Yes
14	CL	Manufacture of transport equipment	29 and 30	Yes
15	CM	Other manufacturing, and repair and installation of machinery and equipment	31 to 33	Yes
16	D	Electricity, gas, steam and air-conditioning supply	35	Yes
17	E	Water supply, sewerage, waste management and remediation	36 to 39	Yes
18	F	Construction	41 to 43	Yes
19	G	Wholesale and retail trade, repair of motor vehicles and motorcycles	45 to 47	Yes
20	H	Transportation and storage	49 to 53	Yes
21	I	Accommodation and food service activities	55 and 56	Yes
22	JA	Publishing, audiovisual and broadcasting activities	58 to 60	Yes
23	JB	Telecommunications	61	Yes
24	JC	IT and other information services	62 and 63	Yes
25	K	Financial and insurance activities	64 to 66	*No*
26	L	Real estate activities	68	Yes
27	MA	Legal, accounting, management, architecture, engineering, technical testing and analysis activities	69 to 71	Yes
28	MB	Scientific research and development	72	Yes
29	MC	Other professional, scientific and technical activities	73 to 75	Yes
30	N	Administrative and support service activities	77 to 82	Yes
31	O	Public administration and defence, compulsory social security	84	*No*
32	P	Education	85	*No*
33	QA	Human health services	86	Yes
34	QB	Residential care and social work activities	87 and 88	Yes
35	R	Arts, entertainment and recreation	90 to 93	Yes
36	S	Other services	94 to 96	*No*
37	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	97 and 98	*No*
38	U	Activities of extra-territorial organisations and bodies	99	*No*

Figure A0.1:
DuPont Model

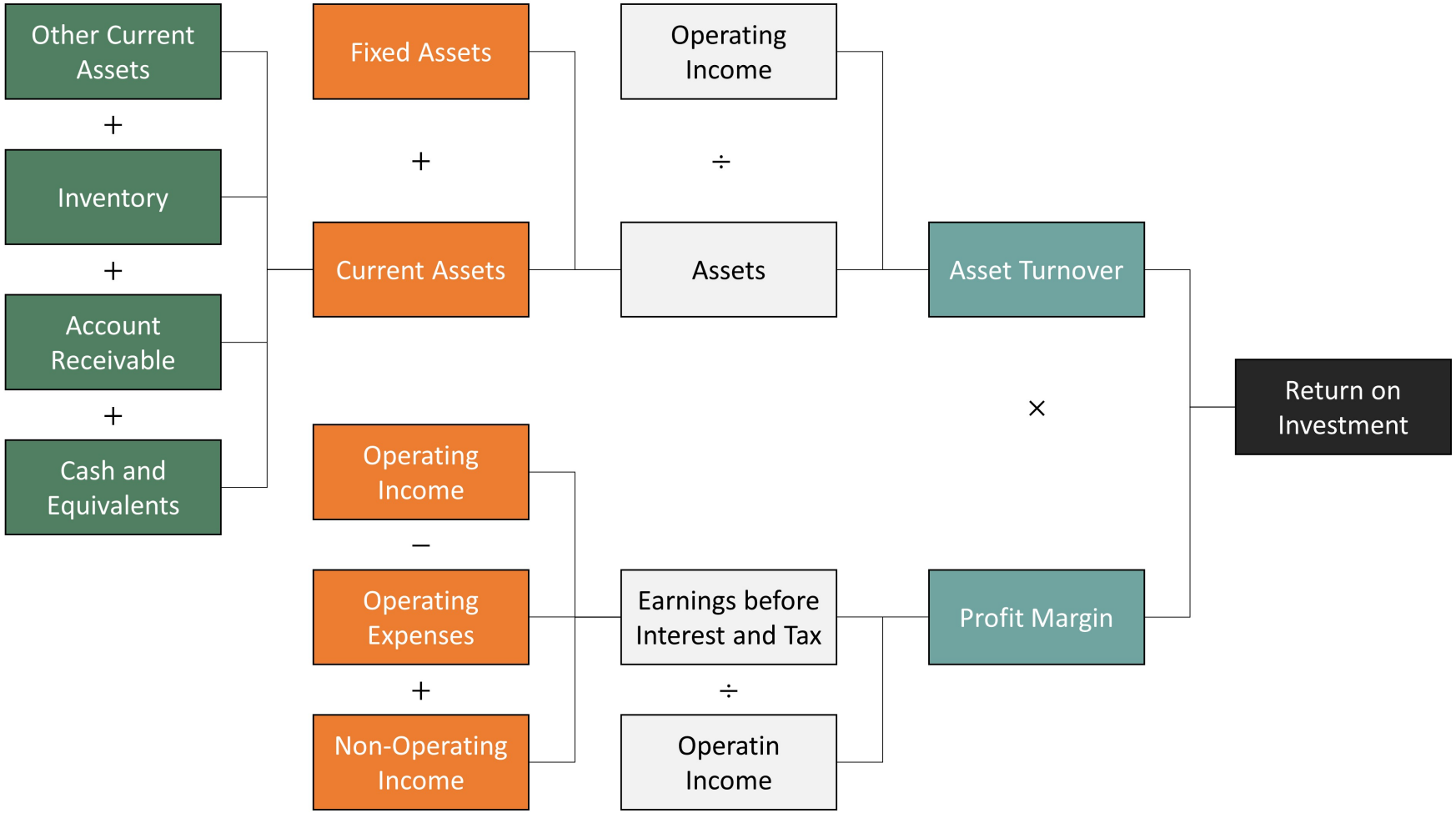


Table A0.2:
The Effect of Cash Conversion Cycle on NOPAT Margin

The table displays panel data regression models for the relationship between *NOPAT Margin* and working capital management. Both public and private companies are included in the sample, which contain 1,129 companies and 5,645 firm-year observations in the time span of 2014 to 2018. *NOPAT Margin* is regressed on each working capital related measure separately. Moreover, these variables are lagged by one year and have been scaled to represent 10 days of capital outstanding. Models (1) and (2) show the overall effect of *CCC*, (3) and (4) depict *DSO*, (5) and (6) look at *DIO*, and the two last models (7) and (8) focus on *DPO*. The first model in each pair excludes time-variable control variables. Furthermore, fixed firm and time effects are included in every model, as indicated in the bottom panel of the table. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are displayed in parentheses.

	Dependent variable:							
	NOPAT_margin							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CCC	−0.0001	−0.0001						
	(0.001)	(0.001)						
DSO			0.0003	−0.0001				
			(0.001)	(0.001)				
DIO					−0.001	−0.001*		
					(0.001)	(0.001)		
DPO							−0.001**	−0.001**
							(0.0003)	(0.0004)
Growth		−0.001		−0.001		−0.002		−0.001
		(0.001)		(0.001)		(0.001)		(0.001)
Leverage		−0.009		−0.009		−0.008		−0.008
		(0.023)		(0.023)		(0.023)		(0.023)
FA Ratio		0.063**		0.063**		0.062**		0.065**
		(0.029)		(0.029)		(0.029)		(0.029)
Size		0.067***		0.067***		0.067***		0.068***
		(0.016)		(0.016)		(0.016)		(0.016)
Prb. Def.		−0.182***		−0.182***		−0.182***		−0.181***
		(0.024)		(0.024)		(0.024)		(0.024)
Cash		0.009		0.009		0.007		0.009
		(0.024)		(0.024)		(0.024)		(0.024)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.6727	0.7225	0.6727	0.7225	0.6737	0.7235	0.6731	0.7231
Adjusted R^2	0.6726	0.7221	0.6727	0.7221	0.6736	0.7231	0.673	0.7227
Observations	5,645	5,645	5,645	5,645	5,645	5,645	5,645	5,645
F Statistic	0.101	115.497***	0.425	115.484***	13.793***	118.217***	5.227**	117.060***

Note: *p<0.1; **p<0.05; ***p<0.01

Table A0.3:
The Effect of Cash Conversion Cycle on Asset Turnover

The table show panel data regression models used to estimate the relationship between working capital management and net operating asset turnover for Norwegian companies. Both public and private companies are included in the sample, which contain 1,129 companies and 5,645 firm-year observations in the time span of 2014 to 2018. *Asset Turnover* is regressed on each working capital variabele in pairs of two. Models (1) and (2) show the overall effect of *CCC*, (3) and (4) depict *DSO*, (5) and (6) look at *DIO*, and the two last models (7) and (8) focus on *DPO*. The first model in each pair excludes time-variable control variables. Moreover, these variables are lagged by one year and have been scaled to represent 10 days of capital outstanding. Furthermore, fixed firm and time effects are included in every model, as indicated in the bottom panel of the table. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are displayed in parentheses.

	Dependent variable:							
	Asset_turnover							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CCC	−0.020	−0.021						
	(0.020)	(0.020)						
DSO			0.048	0.043				
			(0.069)	(0.071)				
DIO					−0.032**	−0.032***		
					(0.013)	(0.012)		
DPO							0.025	0.025
							(0.022)	(0.023)
Growth		−0.028		−0.024		−0.028		−0.025
		(0.054)		(0.051)		(0.053)		(0.052)
Leverage		−2.016		−1.986		−1.968		−2.036
		(1.322)		(1.330)		(1.321)		(1.313)
FA Ratio		−2.810		−2.752		−2.785		−2.793
		(6.366)		(6.360)		(6.362)		(6.367)
Size		0.608		0.589		0.620		0.588
		(0.594)		(0.612)		(0.594)		(0.604)
Prb. Def.		−1.002		−1.011		−0.998		−1.010
		(1.407)		(1.416)		(1.406)		(1.414)
Cash		0.296		0.284		0.271		0.310
		(3.140)		(3.160)		(3.144)		(3.143)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.4882	0.4886	0.4882	0.4887	0.4886	0.4886	0.4882	0.4886
Adjusted R^2	0.4881	0.488	0.4882	0.488	0.4886	0.488	0.4881	0.488
Observations	5,645	5,645	5,645	5,645	5,645	5,645	5,645	5,645
F Statistic	0.267	0.575	0.460	0.584	0.340	0.579	0.300	0.574

Note: *p<0.1; **p<0.05; ***p<0.01

Table A0.4:
Working Capital Variables Regressed on Control Variables for Norwegian Private Companies

The table contains panel data regressions used to retrieve fitted values for private companies to be used in Welch's t-tests, see section 4.2.3. The sample consists of 5,375 private company firm-years derived from the period 2014 to 2018. The models include company specific time-variant control variables and fixed firm and year effects. Standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are shown in parentheses.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
Growth	−0.219**	−0.021	−0.129	0.069
	(0.096)	(0.049)	(0.087)	(0.050)
Size	−1.800***	−1.174***	−1.358***	−0.733***
	(0.356)	(0.180)	(0.320)	(0.185)
Prb_def	−1.074*	0.870***	0.331	2.275***
	(0.613)	(0.310)	(0.552)	(0.319)
Leverage	2.153**	−1.774***	0.910	−3.018***
	(0.979)	(0.495)	(0.882)	(0.509)
FA Ratio	−8.899***	−5.997***	−5.666***	−2.764***
	(1.743)	(0.882)	(1.570)	(0.906)
Cash	−0.497	−0.126	−0.401	−0.030
	(0.435)	(0.220)	(0.392)	(0.226)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.9977	0.9973	0.998	0.9975
Adjusted R^2	0.9977	0.9973	0.998	0.9975
Observations	5,375	5,375	5,375	5,375
F Statistic	10.421***	16.787***	6.166***	16.239***

Note: *p<0.1; **p<0.05; ***p<0.01

Table A0.5:
Working Capital Variables Regressed on Control Variables for Norwegian Public Companies

The table shows regression models where the working capital variables are explained by the control variables and fixed effects for firms and years. Fitted values from the panel data regression models are used in Welch's t-tests in section 4.2.3. The sample consists of 270 firm-years for public companies in the time-span 2014 to 2018. For all models, standard errors clustered for firms and robust for heteroscedasticity and autocorrelation are shown in parentheses.

	Dependent variable:			
	CCC	DSO	DIO	DPO
	(1)	(2)	(3)	(4)
Growth	0.896***	0.402***	0.554***	0.060
	(0.256)	(0.061)	(0.182)	(0.262)
Size	1.661	−0.563	−0.721	−2.945*
	(1.731)	(0.411)	(1.233)	(1.772)
Prb_def	−6.237	−2.732**	−1.556	1.948
	(4.538)	(1.078)	(3.233)	(4.646)
Leverage	−2.171	−0.132	4.914	6.953
	(5.746)	(1.366)	(4.094)	(5.882)
FA Ratio	−3.518	1.671	−1.042	4.146
	(8.811)	(2.094)	(6.278)	(9.021)
Cash	−0.760	1.357*	−0.368	1.749
	(3.410)	(0.810)	(2.430)	(3.491)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R^2	0.9987	0.9987	0.9988	0.9983
Adjusted R^2	0.9986	0.9986	0.9988	0.9983
Observations	270	270	270	270
F Statistic	10.263***	77.302***	9.659***	2.881**

Note: *p<0.1; **p<0.05; ***p<0.01