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WORKING CAPITAL MANAGEMENT IN NORDIC SMALL AND MEDIUM-SIZED ENTERPRISES

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ABBREVIATIONS

ROA	Return on assets
WCM	Working capital management
NTC	Net trade cycle
CCC	Cash conversion cyccle
ITO	Days of inventories
DAR	Days accounts receivable
DAP	Days accounts payable
GROWTH	Annual sales growth
CASH	Cash holdings
SIZE	Firm size
LEVERAGE	Financial leverage
CFMARGIN	Cash flow margin
CR	Current ratio
INDUSTRYDEV	Growth of industry

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ABSTRACT

A cycle of working capital should be optimized with a focus on inventory and the cooperation of a given value chain. This would be achieved by the reduction of all the components of working capital, also accounts payables, in order to enhance profitability. Previous research has investigated small and medium-sized enterprises (SMEs) in UK, Spain, and Norway. This study will extend this research to SMEs in Sweden and Finland with an aim to shed more light on the non-linear relationship between working capital and profitability which is found in the earlier research literature.

A fixed-effect panel data regression is applied for a large sample of 82 020 firm-year observations to test the effect of the net trade cycle (NTC) and cash conversion cycle (CCC) with its components on the return on assets (ROA). The presence of cash and cash flow alongside size, leverage, and current ratio are controlled for. Industry effects are controlled for with regression on separate industry samples, underlining that the findings are persistent. Finally, the quadratic effect is tested with a detailed analysis of NTC quartiles.

The empirical findings are in line with previous research, working capital should be minimized to a certain optimal point. Furthermore, this thesis finds that the concave relationship between profitability and working capital may not be a consistent one: the relationship is influenced by different factors at the low end of the NTC versus the high end. Namely accounts payables are determining working capital at the low end while elsewhere inventories determine the efficiency. Accounts receivables remain neutral throughout firms. A case study investigation is needed to understand the reasons behind extending accounts payables cycle, before making further inferences on the actual implications of this finding on the risk-return tradeoff in working capital literature.

KEY WORDS: PK-yritykset, Kannattavuus, Käyttöpääoma, Varaston kierto, Ostovelat.

TIIVISTELMÄ

Varastonhallinnan sekä arvoketjujohtamisen tulisi olla käyttöpääoman hallinnan keskiössä. Tästä huolimatta, vallitsevan käsityksen mukaan, käyttöpääoman optimointi merkitsee sen kierron minimoimista. Tämä saavutetaan vähentämällä kaikkia käyttöpääoman osia, myös ostovelkoja, kannattavuuden parantamiseksi. Aikaisemmat tutkimukset ovat käsitelleet pieniä ja keskisuuria yrityksiä (pk-yrityksiä) muun muassa Isossa-Britanniassa, Espanjassa ja Norjassa. Tämä tutkimus löytää vastaavia ilmiöitä ruotsalaisissa ja suomalaisissa pk-yrityksissä. Päätavoitteenaan on tuoda vahvistusta aikaisemmassa tutkimuskirjallisuudessa esiintyvään käyttöpääoman ja kannattavuuden väliseen epälineaariseen suhteeseen.

Tutkimuksessa käytetään 82 020 havainnon paneeliaineistoa. Tutkimushypoteesit keskittyvät kannattavuuden ja käyttöpääomasyklin suhteeseen, jonka on havaittu olevan joko negatiivinen tai kovera epälineaarinen useimmissa tutkimuksissa. Yrityksen koon, velkautuneisuuden ja maksuvalmiuden oletetaan vaikuttavan kannattavuuteen, joten nämä kontrolloidaan paneeliregressiossa. Suhteen vahvuutta kokeillaan vaihtoehtoisilla otoksilla ja käyttöpääomasyklin tunnusluvuilla. Empiiriset havainnot ovat linjassa aikaisempien tutkimusten kanssa. Käyttöpääoma tulee minimoida tiettyyn pisteeseen saakka.

Tässä opinnäytetyössä löydetään näyttöä sille, että kovera suhde kannattavuuden ja käyttöpääoman välillä ei välttämättä ole johdonmukainen: suhteeseen vaikuttavat erilaiset tekijät käyttöpääomasyklin alemmilla tasoilla verrattuna ylempiin tasoihin. Ostovelat, määräävät käyttöpääoman alemmilla tasoilla, kun taas muualla varastot selittävät käyttöpääomasyklin keston. Myyntisaamiset pysyvät neutraaleina läpi otoksen. Kvalitatiivista tutkimusta tarvitaan ostovelkasyklin pidentämisen taustalla vaikuttavien syiden ymmärtämiseksi. Havainto luo vastakkainasettelun kahden vallitsevan teorian välillä ja on varovainen indikaattori lineaarisen kannattavuus-käyttöpääomasuhteen vahvuudesta ja johdonmukaisuudesta. Prantaaksemme ymmärrystä käyttöpääoman ja kannattavuuden välisestä epälineaarisesta suhteesta, tarvitsemme lisää tietoa tutkittavien yritysten luonteesta ja ostovelkasyklin kasvun syistä. Havainto asettaa myös käyttöpääomakirjallisuudessa vallitsevasta tuotto-riski-suhteen tulkinnat uuteen valoon.

AVAINSANAT: PK-yritykset, Kannattavuus, Käyttöpääoma, Varaston kierto, Ostovelat.

1. INTRODUCTION

The subject of working capital management (WCM) delves into a core element of corporate finance; how businesses manage short-term finance to keep the operation going. To personify working capital; it is like a live organ of a company or "the life-blood" as Scherr (1989:4) formulates it. The first articles published on the topic spoke of the money managers' job in a company (Sagan 1955), which is to control the operative investment between buying inputs and receiving cash from the sold output. In practice, it is the study of how companies should make investment in inventories, accounts receivables, and accounts payables. Excessive working capital levels tie up capital from more profitable endeavors while too scarce levels have an adverse impact on service level, supplier relations, and market share through lost sales opportunities. The academic focus on the topic revied after the financial crisis in 2007-2008, as the risks involved with neglected WCM materialized. As systemic crises such as the Covid-19 crises starting in 2020, rising costs of logistics due to among other factors lack of containers in 2021 (Notteboom, Pallis & Rodrigue 2021) and escalation of the war in Ukraine in 2022 keep shocking global supply chains working capital management becomes more complex than ever but inevitably more relevant. PWC Working Capital study (2021) brings up a more challenging environment for working capital management. Net working capital levels have risen due to supply chain complexity and lack of visibility, where companies would need a new model for "just in time planning" as the risks of over or under planning inventories materialize.

This thesis seeks to shed light on the theories surrounding working capital management and investigates the impacts of working capital and other financial metrics on the profitability of small and medium-sized enterprises (SMEs) in Finland and Sweden where no such study of the scale has been conducted previously. The research question of this study is whether companies should focus on minimizing their working capital or whether there is a consistent approach to optimize it according to their financial situation, growth, size, bargaining power and as recent news headlines show – unpredictable systemic crises.

1.1. Objective of the study

The objective of the study is to investigate the relationship between working capital metrics and profitability. This thesis expands the geographic horizon of the field. The first investigation will be on determining if in general the aggressive working capital policy still holds (Deloof, 2003; Enqvist, Graham & Nikkinen, 2014; Lyngstadaas & Berg, 2016). Thereafter the focus is set on the optimization of working capital wherein profitability is increased by optimization of working capital depending on whether the company has excess or two lean of a working capital cycle. Optimality is investigated using a quadratic function form where the relationship between working capital and profitability is expected to be concave or of an inverted U-shape. Robustness is tested by applying the quadratic form to industry samples of the data and lastly by studying the linear relationship on different groups of working capital cycle length. The aim is to reveal that working capital should be decreased at a higher level and increased in certain situations. A nonlinear concave relationship is expected due to the decreasing utility slope of reducing working capital. It is expected that the most profitable companies need working capital for a higher service level and growth. The background of this study is in the extensive literature on the impacts of working capital management and the availability of cash flows on company profitability. Working capital is analyzed with the cycle times of the net trade cycle (NTC). Other working capital metrics are also applied such as the cash conversion cycle and its components as well as the static current ratio. The nonlinearity of the working capital and profitability relationship in SMEs has been studied in Spain (Baños-Caballero, Garcia-Terual & Martinez-Solano, 2014), the UK (Afrifa, 2016) and Norway (Lyngstadaas & Berg, 2016) but not in Sweden and Finland.

1.2. Structure of the study

The thesis is organized into six chapters, the first chapter introduces the field of study and the main questions surrounding it. The second chapter dives into the concept of working capital, its main components, and their relevance to businesses. The third chapter consists of a literature review and hypothesis building for this study. Chapter four is divided into five sections. The first section explains where the data was sourced from and how the final sample was built for the Swedish and Finnish SMEs. The second and third sections introduce the variables used and the models for this study. The fourth section contains the methodology and finally, section five of chapter four describes the data used for the variables in the thesis. Chapter five is the empirical part containing the research results. Chapter six contains conclusions, limitations of the study, and further research suggestions.

2. WORKING CAPITAL

In corporate finance, assets are split into three categories. Firstly, there is capital budgeting, which is concerned with the management of a company's long-term assets such as production facilities and machinery. Secondly, capital management is equivalent to the management of a company's long-term finances. And thirdly, working capital is the management of short-term assets such as cash, receivables, inventories, and liabilities such as payables. Working capital is the most liquid and short-term of the three classifications in corporate finance. (Scherr 1989: 1-2.)

In Figure 1. we see the relationship between different areas of capital management. The grey boxes connected by bold arrows are the core of the working capital cycle and the other parts are circulating at a much slower pace. The core starts from cash, which is used to buy direct labor and materials, after the production process these become inventories. The end products are sold which creates receivables. Although closely related to WCM through the production process, fixed assets are in another dimension of financial management. Also, suppliers’ capital and accrued fixed operating expenses move at a slower pace than the core of working capital.

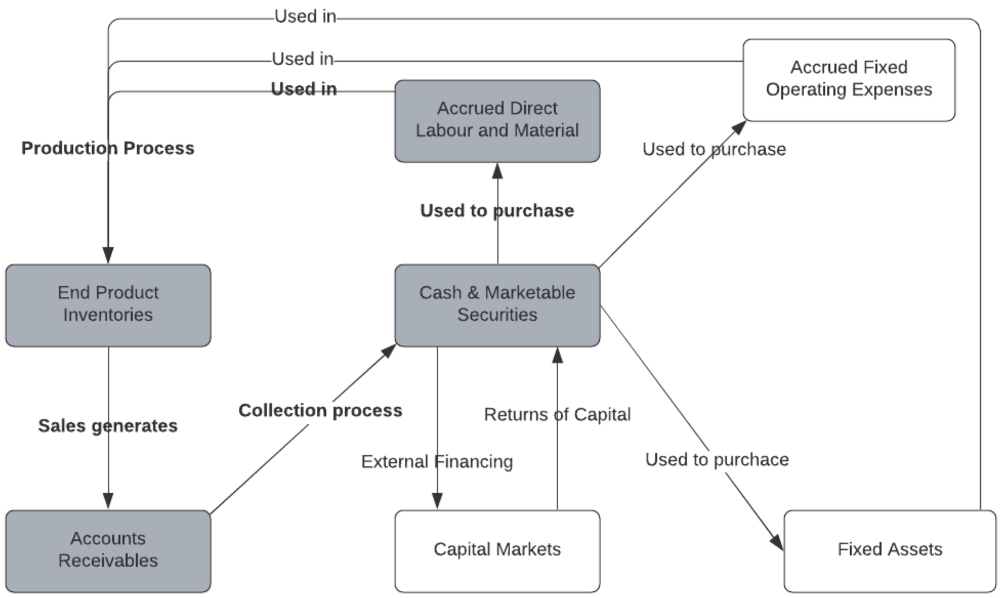

Figure 1. Working capital cycle (Scherr 1989:4)

The purpose of WCM is to actively manage short-term assets and liabilities which are tied up in the operation. By maintaining inventories, collecting payments, and paying bills in an organized manner a company can optimize the cash held up in the operation while maintaining good supplier relations and remaining attractive to customers. Most often companies will strive to minimize investment in working capital as excessive levels will need to be financed and will add value only marginally. WCM plays an important role in the short term and will impact sales directly, therefore its management is of great interest to companies.

Working capital deals with short-term assets and liabilities. This capital is needed to finance the operation on a weekly, monthly, and quarterly basis is working capital. Working capital can be divided into four parts: cash, accounts receivables, inventory, and accounts payables. According to Mullins and Komisar (2009) in a successful company, financial managers succeed in optimizing these four areas. Working capital requirements differ between economies, companies, and industries. (Berk, Demarzo and Harford, 2015:613.)

2.1. Components of working capital

As we can see from Figure 1. at the center of the working capital cycle sits cash and short-term marketable securities. Companies must keep some of their assets in the most liquid form to control their inventory levels and accounts payables. This is due to the concern for insolvency in the case of unexpected events, a company would want to have some liquid backup assets. Companies can invest excess cash in temporary investments which can be sold easily when cash is needed (Scherr 1989: 24-26). Cash plays an important role for SMEs as these companies are more financially constrained than their larger counterparts and thus face higher liquidity risk.

The term accounts receivables (A/R in Figure 1.) refer to income from sold goods that have not yet materialized (Brealey, Myers, and Allen 2017: 787-790). The period between sales and reception of payment is comparable to lending money or giving trade credit to the customer. In managing accounts receivables companies consider how many days or months are given for payment and if there are incentives for paying early or sanctions for paying late. A profitable and trusted business partner gets better terms than one with a poorer reputation.

Receivables management findings in literature have nearly reached a consensus that day's receivables and profitability are negatively correlated (Prasad, Narayanasamy, Paul, Chattopadhyay, Saravanan, 2019). There are still some contradicting findings that argue for prolonging days receivable to increase profitability. In the case of Indian companies, this may be explained by local companies using prolonged customer credit to compete against multinational higher technology companies. (Sharma and Kumar 2011.)

Controlling inventory levels is not the job of the financial manager. Inventory management is a separate matter that would deserve a much closer look. However, this thesis introduces the key elements to keep the focus on WCM. Inventories are the raw materials, unfinished works, and finished products that have not been sold and shipped. They are a part of a company's current assets, less liquid than cash and receivables.

Some studies (Long, Malitz and Ravid, 1993; and Deloof and Jegers, 1996) have found that there are advantages to keeping higher inventories. For example, excess cash and inventories offer more flexibility for positive demand shocks. On the other hand, most studies find that profitability increases when inventories are minimized and the circulation time is rapid (Shin and Soenen, 1998; Deloof, 2003). The fact that there is theory to support both aggressively efficient inventory policies and conservative, risk-averse policies indicates that there indeed is a trade-off between liquidity and profitability.

Inventory costs are balanced between two substituting cost factors; (1) the cost of order handling and delivery and (2) the cost of holding a large inventory, also called carrying cost. The carrying cost consists of storage costs and the lost opportunity cost of the money invested in the inventory. Optimal order size is at the juncture of decreasing order costs and increasing carrying costs. Before the optimal point, frequent orders are raising costs above optimal. After the optimal point, the carrying cost rises too high. The optimal order size, also known as the economic order quantity, is out of the scope of this thesis but remains important in understanding inventory management on the micro level. (Brealey et al. 2017: 787-790)

The relevance of inventory management is underlined by Rafuse (1996). He calls for a refocus of WCM toward inventory management. The paper presents evidence that some of the most profitable companies manage their inventories and supplier relations better than less profitable companies. He claims that by focusing on receivables and payables management, the negotiation power of the large companies is too great. This is harmful to the economy as a whole and SMEs since the management of working capital accounts does not boost growth. A large company that bargains long payables might be reducing its own working capital burden, but the trade-off is that SME suppliers are struggling with their finances. Inventory management, on the other hand, has the potential of decreasing working capital in such a manner that can benefit all interest groups in a vertical relationship. This is because, to make a smaller inventory, companies need to co-operate with each other more and find a mutual benefit in the deal. A win-win situation would then benefit the whole economy. (Rafuse 1996.)

In the previous three subheadings, this thesis has covered what the assets of working capital consist of. Assets are what a company owns and must finance. Accounts payable (AP) is part of a firm's short-term liabilities which are used as part of the financing of short-term assets. AP is comparable to a loan and is also called supplier credit. Having higher AP means that a company is receiving more financing from its supplier, this reduces the net of current assets that need to be financed. In Figure 1. accounts payable would be located between "Cash and marketable securities" and "Accrued direct labor and material".

It is a common belief that a positive correlation between AP days and profitability exists (Lazaridis and Tryfonidis, 2006; Vishnani and Shah, 2007). This means that firms increase their profit by delaying payments to their suppliers to reduce the financing needed for working capital. Deloof (2003) and later Sharma and Kumar (2011) find a negative relationship which could be the result of less profitable firms having the tendency of paying their bills late. Furthermore, the negative relationship is enforced by the views of Refuse (1996) as it points out the harmfulness of prolonging days payables at the cost of a weaker supplier. Extending days payable is the easy choice and firms that are in financial distress might opt to take this path. Firms should try to create a shared destiny mentality for the whole supply chain. Cost reduction is achieved by using fewer resources in managing debtor and creditor transactions and having a more transparent and proactive relationship with suppliers.

2.2. Measuring working capital

There are various proxies for working capital management. The short-term assets or working capital of a company can be quantified with static ratios such as the current ratio which is current assets to current liabilities. Similarly, the quick ratio which is current assets fewer inventories to current liabilities measures even more pure liquidity. These measures are static in nature as they are using balance sheet values which are a snapshot of a specific period (Scherr 1989:352-352). As the short-term assets and liabilities of a company change quickly, a dynamic measure is needed to depict working capital over time.

The cash conversion cycle (CCC) developed by Gitman in 1974 has been used in most studies regarding working capital management. As the procurement, production, distribution, and collection of receivables never happen simultaneously, measuring the cycle length of each working capital component is more relevant than a static measure (Richards and Laughlin, 1980). The CCC indicates how efficiently a company manages its working capital, depicted by the number of days that working capital must be financed by the company. In Figure 2. the operating cycle is the time between buying raw materials and receiving payment. The cash cycle is the operating cycle less the number of days that a company has credit from suppliers in the form of accounts payables. The shorter the cash cycle is the less financing needs there are for working capital and the more efficient a company's operation is.

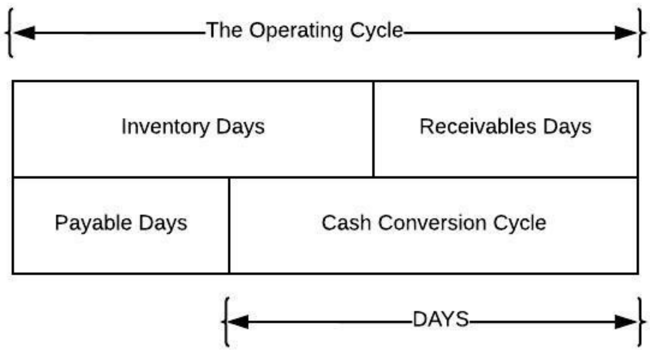

Figure 2. Cash conversion cycle adopted from Jose, Lancaster & Stevens (1996).

Using CCC is advantageous as it recognizes the life expectancies of working capital components as well as the fact that production, distribution, and collection are not instantaneous and synchronized processes but come with a time lag (Richards and Laughlin, 1980; Enqvist et al., 2014)

Following Deloof (2003) and Lyngstadaas & Berg (2016) The formula for the cash conversion cycle:

(1) $Cash\ conversion\ cycle = ITO + DAR - DAP$

Where,

$$Days\ of\ inventory\ (ITO) = \frac{\text{Inventory}}{\text{Cost of Goods Sold}} * 365$$

$$Days\ accounts\ receivale\ (DAR) = \frac{\text{Accounts Receivable}}{\text{Net Sales}} * 365$$

$$Days\ accounts\ payable\ (DAP) = \frac{\text{Accounts Payable}}{\text{Purchases}} * 365$$

Days of inventory (ITO) is the number of days between buying raw materials and shipping finished goods or, to put it simply, how long a company is holding an inventory on average. Days accounts receivable (DAR) computes the number of days it takes to get cash from customers after the goods have been shipped or in other words the extent of trade credit given to customers. Days accounts payable (DAP) computes the number of days it takes to pay bills after the supplier has shipped goods or the length of supplier credit. The composite measure (CCC) depicts the net of working capital in days that a company must finance by itself.

Like the cash conversion cycle, the net trade cycle (NTC) uses sales amount in all the nominators of the working capital formula. First used by Shin & Soenen (1998) it has been used in some of the later studies which find a quadratic relationship between profitability and WCM (Baños-Caballer et al., 2014; Afrifa, 2016). Despite slight differences in formulas, NTC is highly correlated with CCC. This correlation of different measures increases the comparability of findings across the research subject and strengthens the theory (Raheman, 2010). Deloof (2003) finds that NTC gives results corresponding to the CCC. This thesis will use NTC as the main proxy for working capital policy due to the lack of cost of goods sold and purchases accounts for SMEs in the Orbis database although CCC will be controlled for as well.

Modification of Afrifa (2016) NTC formula using the count of days in a year (365) as a multiplier instead of 100. INV being inventories, AR being accounts payable and AP being accounts payable each year:

(2) $$Net\ trade\ cycle = \left(\frac{INV + AR - AP}{Sales}\right) * 365$$

3. LITEARTURE REVIEW AND HYPOTHESIS

The focus in the WCM literature has been on the relationship between cash conversion cycle (CCC) and net trade cycle (NTC) and company profitability, depicted by various accounting and market-based measures. The research findings can be categorized into three groups where the relationship has been found to be either (1) linearly negative; where a decrease in working capital cycle length increases profit, (2) linearly positive; where an increase in working capital cycle length increases profit or (3) nonlinear, where profit is increased by optimizing working capital cycle. Figure 3. the three different WCM to profitability relationships.

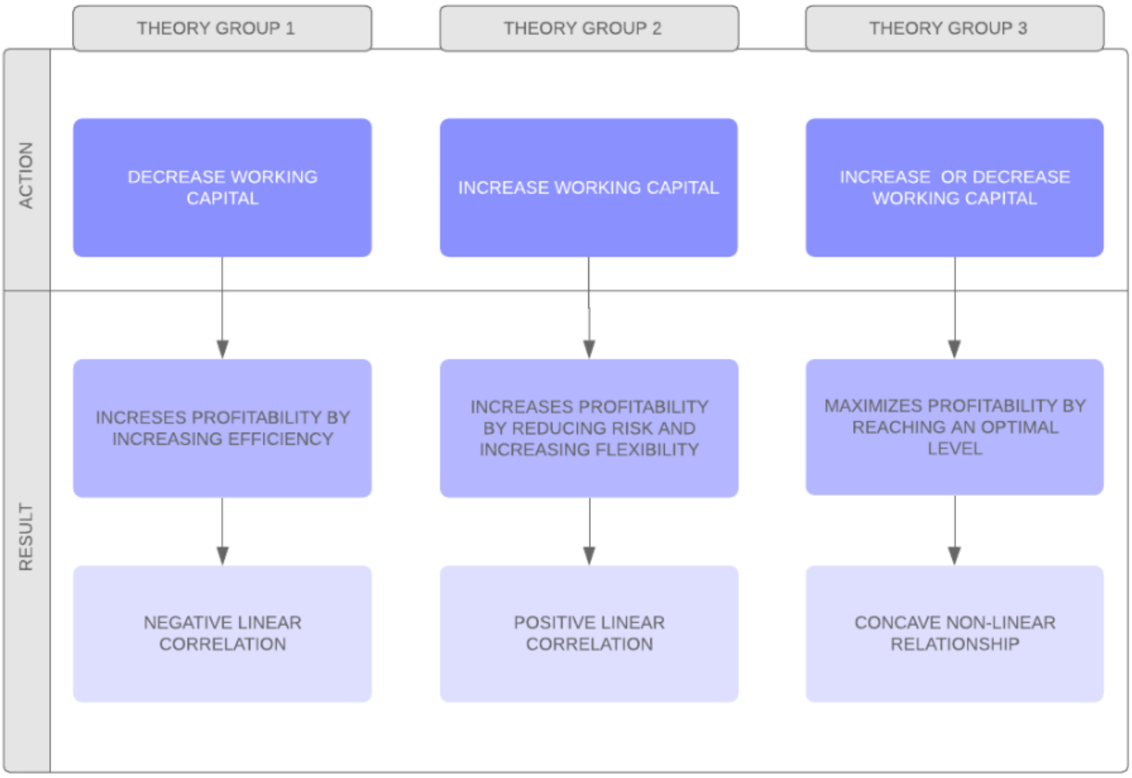

Figure 3. theory groups of working capital management.

Despite quite diverse findings in the field, there is a consensus that by increasing the efficiency of the working capital cycle, company profitability is enhanced. The linearly positive results are few, and most of them are from developing countries where financial markets are less developed, and local companies use receivables to attract sales more aggressively (Sharma and Kumar, 2011) and cash and inventory as a reserve as external financing is scarce (Abuzayed, 2012). The optimality of working capital is accepted by Deloof (2003), as the trade-offs to minimizing inventories and receivables have an impact on stockout risk and sales incentivization, respectively (Long et al., 1993; Deloof & Jegers, 1996). Suppliers might also have an advantage in extending credit compared to financial institutions due to information asymmetry (Smith 1987). It is evident that working capital cannot be minimized beyond a reasonable minimum due to these trade-offs. Apart from these trade-offs, we know that in financial downturns the working capital levels of companies need adjusting as an economy-wide negative shock will leave companies with excessive working capital levels and decreased cash flows to finance it. In addition to the bargaining power of a firm and its working context, investment in working capital depends on a company's capacity to finance its operations internally, cost to external financing & capital market access, and financial distress. (Baños-Caballero et al., 2014).

According to Hoffman (2010), it is important to keep in mind that working capital management is a part of supply chain collaboration between the company, its suppliers, and customers. Managing working capital is not a one-sided financial decision, even firms with superior bargaining power should look at their supply chain as a network that has shared goals. There are ethical issues included in the abuse of bargaining power, but it will also harm supply chain members. In the supply chain the company with the lowest cost of capital and access to financial markets could extend its cash conversion to support the other parties of the supply chain, and in this way distribute low-cost finance via working capital.

Rafuse (1996) calls for a focus on ties with suppliers and customers as the management of accounts is arbitrary and counterproductive to the economy, especially delaying payments to the supplier which is often practiced by larger companies. From the macroeconomic perspective, WCM can improve efficiency only through vertical integration of supply chains and efficient management of inventories. Studies in Belgian and Finnish markets show that some profitable companies are already doing this. The findings of a negative correlation between profitability and payables in speak on behalf of this argument. (Deloof, 2003; Enqvist et al., 2014). More profitable companies have no reason to pay late and miss cash rebates, even if they could finance their operation by exploiting weaker suppliers.

The liquidity risk has been covered more narrowly in working capital management studies in recent years and perhaps rightfully so. The risk of illiquidity in the developed markets where external credit is abundant is not the most relevant factor in working capital management. Then again, the economy is not static, and in times of systemic shocks liquidity management through working capital becomes important once again. Trade-offs are worth keeping in mind even in the developing markets as their importance does not diminish, it only lessens outside of recessions. Furthermore, the benefits of focusing on optimal WCM levels and the trade-off thinking moderate the dominance of aggressive WCM policies and open possibilities for thoughts like those of Rafuse (1996) integrated supply chain policies to be explored and implemented.
Companies that have high internal cash flows should increase the amount of working capital. Also, companies that have below industry median working capital should increase working capital. This means that financially unconstrained companies might hold excessively low working capital levels while they could boost growth and benefit from increased liquidity. These companies can acquire cheaper external funding and use it to leverage higher working capital. The flip side is that during economic turmoil, internal cash flows may plummet in entire industries. This could be a sign of overly efficient WCM, but it must be noted that working capital should reflect industry and macroeconomic conditions therefore companies should be prepared for times when the internal cash flows fall. In such a scenario, overly leveraged working capital could lead to insolvency in the worst cases.

Despite wide-ranging results in earlier research, the following hypothesis building will focus on the most relevant research for the Nordics. Most of these studies suggest a negative correlation between working capital and profitability, while also acknowledging the possible nonlinearity of the relationship. The more recent studies have explored SMEs and the nonlinear relationship in countries such as Spain, the UK, and Norway. This thesis will further the study by focusing on a sample of SMEs in the Nordic countries of Sweden and Finland. To summarize the tradeoffs in working capital we have on the one hand we have excessive working capital resulting in an operational deficit to be constantly financed calling for aggressive WCM, on the other hand, there is a risk of running out of cash to pay suppliers, inventories to manufacture or deliver goods to customers and other obligations that are not met resulting in damaged reputation in the best case and even bankruptcy; this side of the tradeoff calling for more conservatively managed working capital.

3.1. Hypothesis building

Some of the most relevant studies for this thesis are listed in Table 1. with details on the focus market of the study, sample size, years for which the study was conducted, size and nature of the companies, variables used, and finally the main research result relevant in this study.

This section will look closely into Figure 3. theory groups one and three, while theory group two is omitted due to it having no backing in the relevant source literature to this study. Theory group one is quite straightforward, it is well based and has reasonable arguments about minimizing the financial requirements for working capital. Theory group three is much softer and more hypothetical but many studies including Baños-Caballero et al. (2014), Afrifa (2016), and Lyngstadaas & Berg (2016) have shown a quadratic dependence between WCM and profitability. Theory group three supports working capital optimization, which in practice means that a company can have an excessively lean working capital cycle: growth opportunities and service levels suffer when they are no inventories and customers, and even valuable suppliers may be lost with incompatible payment terms.

The relevant question is whether optimization of working capital may not actually have the same dynamic in both extremes. This would indicate that theory group one is still relevant in terms of working capital management but theory group three needs dissection as to when increasing working capital makes sense and which part of the relationship positive relationship is just distress signals from a company that has for example depleted its inventory, started collecting receivables more vigorously and is not able to make payables as fast anymore. Even if in theory “increasing working capital” at a lower level would increase profitability, it is difficult to say what the causalities may be in low working capital levels. In any case, generalization is harder for this end than for companies with excess working capital due to inventories. There is an indication that higher accounts payables length accounts for leaner WCM while at the other edge of excessive working capital the higher inventory levels account for the growth of working capital. As indicated by Deloof (2003) and Enqvist et al. (2014) higher accounts payables could be a sign of something going wrong instead of superior bargaining power being used to finance working capital at the expense of suppliers.

This would mean that there is a clear antidote to excessive working capital which is the leaner and more efficient management of inventories while similar deduction will not work with accounts payables as these can be interpreted in different ways. According to the data at hand, it is evident that the very lowest working capital level is caused by slower accounts payables circulation and these companies are on average less profitable than the companies in the mid lane. More on this in the research results.

Table 1. Relevant previous studies on working capital management

Authors	Journal	Country	Sample size	Years	Sample	Dependent variable	Independent variables	Research results
Deloof (2003)	*Journal of Economics and Finance*	Belgium	1 009	1992-1996	Large firms	GOP and NOP	CCC, Size, Sales Growth, Financial debt, Fixed financial debt	Reducing working capital enhances profitability, optimality referenced
Banos-Caballero et al. (2014)	*Journal of Business Research*	United Kingdom	258	2001-2007	SMEs	Tobins Q	NTC, NTC^2, Size, Leverage, Opportunity growth, ROA	Balancing working capital to an optimal maximizes profitability
Enqvist et al. (2014)	*Research in International Business and finance*	Finland	1 136	1990-2008	Listed firms	GOP	CCC, Current ratio, Debt ratio, Natural logarithm of Sales (size)	Reducing working capital enhances profitability
Pais & Gaman (2015)	*International Journal of Managerial Finance*	Portugal	6 063	2002-2009	SMEs	ROA	CCC, Size (natural log Total assets), Sales growth, Leverage, Current assets ratio, Current liabilities ratio	Reducing working capital enhances profitability, optimality referenced
Afrifa (2016)	*Review of Accounting and Finance*	United Kingdom	6 926	2004-2013	SMEs	ROA and Tobins Q	NTC, NTC^2, Sales Growth, Operating cash flow, Cash holdings, Firm age, Size, Tangible fixed assets, Leverage	Balancing working capital to an optimal maximizes profitability, cash flow consideration is important
Lyngstadaas & Berg (2016)	*International Journal of Managerial Finance*	Norway	21 075	2010-2013	SMEs	ROA	CCC, Size, Sales growth, Debt ratio, GDP growth, Current assets ratio, Current liabilities ratio	Reducing working capital enhances profitability with a decreasing trend, optimality referenced

3.1.1. Systemic shocks and cash flows on working capital

It remains to be seen what the implications of the global logistics difficulties and the Ukraine war are, but these will surely be among the topics for future studies. In the timeline of this thesis (2013-2020) no major shock needs to be controlled for. Despite this, reviewing the importance of cash flows, business cycle impacts are essential in the context of SMEs due to their riskier nature and working capital intensity.

Enqvist et al. (2014) study how working capital affects company profitability in different business cycles. The impact of working capital on profitability is found to increase during the economic downturn. Dynamic internal processes to manage working capital are therefore important irrespective of the economic state, as companies should prepare for worse times before they become actuality. Working capital levels rise when there is growth, but this does not mean that the lavish policies on working capital are beneficial to companies. Having a more accurate forecast of future demand and cash flow is one thing. It will help optimization of inventory levels so that depletion is minimized as well as determine the financial need for operation. Receivables should be analyzed to understand the customer payment process, thereafter both loss of sales and excessive customer credit can be minimized. The impact of macroeconomic fluctuations on the financial stance of companies is evident, in poor economic states sales plummet and the increase of overall uncertainty will constrain the availably of external finance. A study by Einarsson & Marquis (2001) finds that companies take more debt to finance working capital during poor economic states than in good ones where they may rely on internal cash flows. Braun & Larrain (2005) add that companies with higher working capital needs are more dependent on external financing and more affected by economic decline.

Enqvist et al. (2014) bring up that economic policy to boost cash flows would alleviate the pressure that working capital faces in economic turmoil. The methods are diverse, from accelerated depreciation permits and tax cuts to direct monetary aid. A major reason for bankruptcies is excessive working capital levels irrespective of firm size (Soenen, 1993). Interestingly in the Covid-19 crisis, governments were active in subsidizing the economy, the European Union set off a subsidy package of 750 BEUR (European Parliament, 2020) and the US Federal Reserve has made similar issuances to alleviate financial constraints that companies face and instill trust. Referencing a large-scale survey of German firms Boddin, D'Acunto & Weber (2020) bring up the finding that firms are not as concerned with current and future credit constraints as they are with demand uncertainty. This might be due to the shock not originating in the financial sector. The study emphasizes that companies rely on internal cash flow to finance their operations, it is the uncertainty of demand and sales that will increase external financing, but the government subsidies are not considered important to most of the German firms according to this study made at the beginning of the Covid-19 pandemic. Gourinchas (2020) investigates SME failures during the Covid-19 crises in seventeen European countries. The importance of SMEs to the economy is unquestionable and the severity of the economic recession will depend in a great deal on how the businesses are kept alive until the situation normalizes, otherwise, the widespread unemployment will deepen the following downturn and recover unnecessarily long. Bridging the V-shaped shock is what government subsidization under Covid-19 crisis aimed to achieve. In contrast to the financial crises of 2007, the worldwide pandemic has not caused a major slump in the economies of western countries yet. The feared demand shock to manufacturing firms has mostly been positive.

SMEs constitute 65% of private-sector employment and 54% of the output in the European Union. In normal times, the firms can adjust to demand fluctuation with short-term debt and working capital management. In system-wide economic shocks and longer-lasting demand deficits, these companies are in danger of running out of cash because they are more working capital intensive than larger companies. As smaller companies are riskier, they will not get external financing on as good terms which incentivizes them to finance operating activities with cash flow and reduce the financial needs for operation. The rate of SME business failure approximately doubled in the Covid-19 spring Gourinchas (2020). The reason why SMEs are regularly singled out for studying working capital management is that liabilities constitute the most important source of external financing and current assets form most total assets. Working capital has therefore a greater impact on their performance and survival (Fazzari and Petersen 1993). The firms that went bankrupt during the Covid-19 crisis were from the sectors of Accommodation & Food Services, Arts, Entertainment & Recreation, Education, and Other Services. As might be expected the manufacturing firms were not directly affected as their product was not delivered face to face. What can be deducted from the event though is the fragility of SMEs to shocks and the importance of stable financing compared to large firms which can handle larger gaps, due to having lower stakes in short-term operative financing.

3.1.2. Theory group one

A negative correlation between the working capital and profitability has been shown to exist in many studies (Jose et al.,1996; Shin & Soenen 1998; Deloof 2003, Lazaridis & Tryfonidis, 2006; Garcia-Teruel and Martinez-Solano, 2007; Enqvist et al., 2014). In theory, the efficient management of working capital implies that a company applies an aggressive working capital management policy that aims to minimize the length of the working capital cycle.

One of the first to study the relationship between WCM and profitability was Jose et al. (1996). They find a negative correlation between CCC and ROE as well as ROA. The study emphasizes aggressive working capital policies as a way of increasing profitability. Another finding in this study is that the working capital levels are industry-specific, the significant negative correlation is found to abide in natural resources, manufacturing, retail, and services while construction and financial services are not significantly negatively correlated. In addition to controlling for industry Jose et al. (1996) find that the results are not driven by size. According to the study, this is an important point to prove as larger firms are usually more profitable and have a shorter CCC, partly for having bargain power to extend the length of payables to suppliers.

Deloof (2003) studies the relationship between the components of CCC and gross operating profit (GOP). A negative relation is found between days inventories, days receivables, days payables, and GOP. According to the formula of CCC, a more efficient WCM would imply that days payables and GOP are positively correlated. The study suggests that the negative relation between days payables and GOP is explained by a finding that more profitable firms pay their suppliers in time. Rafuse (1996) arguments on the benefits of vertical integration with suppliers support the findings of Deloof (2003).

Studying a sample of Greek companies, Lazaridis & Tryfonidis (2006) find a negative correlation between days inventories, days receivables, and CCC in relation to GOP. Days payables are positively correlated with GOP. Their findings are strictly in line with the theory of aggressive WCM where the company minimizes the length of the WCM cycle by all the means possible, even at the cost of suppliers by paying them late and hence using their credit to finance the company's own operation.

Garcia-Teruel and Martinez-Solano (2007) study a sample of Spanish SMEs and find a negative correlation between days inventories, days receivable in relation to ROA. No significant correlation between days payables and ROA is found. Finally, profitability can be enhanced by reducing the composite measure of CCC to a reasonable minimum. The study is a valuable addition to the literature as it can be argued that the importance of WCM is greater for SMEs than for large companies.

As in Deloof (2003), Enqvist et al. (2014) find a negative correlation between all the components of CCC and ROA as well as GOP. They add to the literature by looking at the impact of business cycles. The negative correlation between days payables and profitability is explained by the general efficiency in managing working capital. More profitable Finnish companies utilize cash discounts from early payments instead of prolonging accounts payable and using it as trade credit. The negative correlation between accounts receivable and profitability is significant only during the recession. According to Enqvist et al. (2014), this could imply that as overall demand decreases during the recession, less profitable companies give longer trade credit in accounts receivables to attract more sales. The negative correlation between days inventories is found to become even more significant during the recession and remain stable during other times. This would indicate that lean inventory management is more important for company profitability during recessions and less so in booms.

Alipour (2011) studies an emerging market sample of companies from Iran and finds a negative correlation between days accounts receivables, days inventories, CCC, and the profitability measure GOP. The study also documents a positive relationship between accounts payable and GOP in accordance with the findings of Lazaridis and Tryfonidis (2006).

From these findings in diverse markets, years and methodologies the first hypothesis is formulated:

H1: *Aggressive working capital management enhances the profitability of SMEs in Sweden and Finland*

3.1.3. Theory group three

This study deals with SMEs and therefore financial constraints are ever more prevalent, internal cashflows play an essential role and systemic shocks have a strong effect on both. The three aforementioned factors have more to do with risk. Mere aggressive working capital management may not be the only solution either for the tradeoffs in return and risk in WCM and the weaker bargaining power of SMEs. We must first understand what these limitations mean in order to build the next hypothesis.

According to Fazzari et al. (1988), working capital investment is dependent on financial factors such as the availability of internal finance. Fazzari and Petersen (1993) study how working capital can be used to smooth out the impact of cash flow shocks on fixed investment. They show that working capital is sensitive to cash flow shocks as it is relatively easy to adjust due to its liquidity and reversibility.

Higher working capital levels enable firms to extend finance to customers and maintain a higher service level through more ample inventory levels. Paying bills on time will help capture cash discounts. On the other hand, the costs of holding higher working capital will have opportunity costs as the money invested can be invested into something more profitable than cash balance and inventories. Due to trade-offs in working capital levels, the strategy will depend on how financially constrained a company is.

Financially constrained (unconstrained) firms face a higher (lower) cost of holding working capital and therefore they should seek to decrease (increase) working capital. The availability of internal cash flows has an important role, especially in SMEs where eternal financing is more expensive, thus firms with higher cash flows could potentially benefit from higher working capital levels. In addition to the higher internal capacity to finance working capital, access to external finance enables companies to benefit from higher working capital levels (Hill, Kelly, & Highfield, 2010; Baños-Caballero et al., 2014). These two forms of financing are also interdependent as the existence of strong cash flows may reduce the cost of external financing (Greenwald, Stiglitz & Weiss, 1984). In Afrifa's 2016 study cash flows and when cash flows are factored into the working capital, the relationship is found to be convex. Companies with high internal cash flows can increase performance by increasing working capital while companies with lower cash flow generating capacity should minimize working capital for maximal profitability. More financially constrained (unconstrained) firms with lower internal cash flow have a lower (higher) optimal level of working capital.

For small companies and during more financially constrained times, the importance of cash flow rises. Furthermore, Belghitar & Khan (2013) find that financial distress is more severe in SMEs. Information asymmetry (Smith 1987) and transaction costs from smaller scale and less frequent needs SMEs are more dependent on cash flows (Tauringana & Afrifa, 2013). Cash flow also serves as a buffer against unexpected events (Opler et al., 1999) and the likelihood of financial distress (Ferreira & Vilela, 2004). There is evidence that higher availability of cash flow correlates with higher investment in working capital. Baños-Caballero et al. (2014) claim that firms with less financial constraints will benefit from higher working capital levels. Hill et al. (2010) find that higher internal cash flow capacity and access to the capital market is reflected in higher working capital levels. Firms with available cash flows can pay their suppliers faster and collect cash discounts (Deloof 2003) and extend payment terms to customers, attracting more sales (Long et al., 1993). Modigliani & Miller (1958) argue that in a perfect capital market, the internal and external financing sources are perfect substitutes. Due to capital market imperfections, however, external finance may be more expensive than internal finance (Greenwald et al., 1984; Myers and Majluf, 1984).

The impact of cash flow has been studied also in the context of capital structure. Keefe & Yaghoubi (2016) find that cash flow volatility is negatively correlated with the use of long-term debt, while short-term debt and other liabilities are used despite cash flow volatility increase. A negative relationship between cash flow volatility and financial leverage is found in Memon, Chen, Tauni & Ali (2018) and Detthamrong, Chancharat & Vithessonthi (2017). Harris & Roark (2019) study cash flow risk and finds a positive relationship between cash flow risk and firm debt and that companies with the lowest operating cash flows are more reliant on debt. Keefe & Yaghoubi (2016) argues that the higher cost of debt for companies with volatile cash flow is keeping these companies less leveraged. From these findings, it is of interest to find out how different cash flow profile SMEs should manage their working capital. It is conceivable that SMEs with higher cash flow risk in this case lower operating cash flows and more volatile cash flows benefit from the reduction of working capital more than ones with higher and steady cash flow, as the latter are more likely to have to rely on external financing which may be more expensive than internal financing. From the earlier research, we deduct that cash flow plays a very important role for SMEs in terms of working capital needs and thus all models in this thesis will include a proxy for cash holdings and cash flow margin. It is important to keep in mind that in SMEs a larger proportion of total assets are current assets making the management of working capital more relevant.

Using a sample of Spanish SMEs Baños-Caballero, García-Teruel, & Martínez-Solano (2012) study the relationship between profitability and working capital and propose that the relationship between working capital and profitability is non-linear. The results show that the squared term of CCC in the non-linear model is negative in all models indicating a concave relationship. This finding persists with industry, size, and firm age subsamples. With low (high) levels of investment in working, capital profitability may be increased by adding (decreasing) working capital. They determine an optimal working capital level and regress deviations against profitability to ensure robustness.

Banos Caballero et al. (2014) also find a concave relationship between working capital and profitability under financial constraints. The nonlinearity of the working capital to profitability relationship is in line with the trade-off theory in working capital and the proposition was already contemplated in Deloof (2003). However, it can be argued that working capital needs to be managed and this will usually result in leaner operations and lower working capital. Excessive working capital could be an indicator of the lack of proactive working capital management. The theory of Modigliani and Miller (1958) introduces perfect capital markets where internal and external sources of capital are perfect substitutes. Since there are frictions such as agency costs and information asymmetries. As working capital needs to be financed when it is positive (see equation 2), financially constrained firms would therefore benefit from reducing working capital more than unconstrained counterparts. To measure financial constraints the study uses dividend payment, cash flow, size, financial expenses/total debt ie cost of external financing, interest coverage ratio, Whited and Wu Index, and Z-score to proxy financial constraints and distress.

Firms that have a strong internal cash flow generating capacity and better access to capital markets can afford to hold more working capital and this has been observed to take place by Hill et al. (2010). Taking from the trade-offs in working capital, this may even further benefit these financially stronger firms. Baños-Caballero et al. (2014) show that the optimal level of working capital is lower for firms with financial constraints. The financial constraints are controlled by size, leverage, and current ratio variables.

Sufficient cash flow can alleviate the need for expensive outside financing for SMEs (Afrifa, 2016). Cash flow is a central element of financing operating costs, and when cash flow falls the need to use other more costly forms of financing increases. SMEs are prone to be more financially constrained than large companies, they cannot access external finance in a similar manner (Fazzari and Petersen, 1993). Using a sample of UK SMEs Afrifa (2016) explores the relationship between net working capital and firm performance and how cash flows impact this relationship. The companies with lower working capital investment can improve performance up to a point, meaning that the relationship between working capital and performance is concave, in line with Baños-Caballero et al. (2012) and Baños-Caballero et al. (2014).

In Norway, the working capital of SMEs has been studied by Lyngstadaas & Berg (2016). The findings are in line with earlier studies in that profitability is found to correlate negatively with working capital. When controlling for non-linearity following Baños-Caballero et al. (2012) and Pais & Gama (2015) evidence of a quadratic relationship is also documented. Together the confirmation of these main findings in the field confirms that profitability is maximized by reducing working capital to an optimal, after which the trade-offs such as stock-outs and loss of bids to competitors with better terms will start to harm profitability.

Based on the findings of the impact of financial constraints in Baños-Caballero et al. (2012; 2014), Afrifa (2016), and Berg et al. (2017), the following hypotheses are built to evaluate the nonlinearity of the working capital profitability relationship:

H2: *The relation between working capital and profitability is nonlinear and concave: companies with lower (higher) levels of working capital should increase (decrease) working capital*

Duo to the importance of internal cash flows and financial constraints control variables are added in the form of debt ratio, current ratio, and cash flow margin. Filbeck and Krueger (2005) study the different working capital measures between industries and how their values vary between time and industries. They point out that changes in interest rates, rate of innovation, and competition are likely to impact working capital management. As interest rates rise, there would be less desire to make payments early, which would stretch accounts payable, accounts receivable, and cash accounts. Weinraub & Visscher (1998) also find that there is a correlation between shifts in working capital management strategies of industries. These findings suggest strong macroeconomic influences regarding the working capital levels that companies adapt. The importance of working capital management to different industries varies depending on how large the proportion of current assets is relative to total assets. In manufacturing companies, current assets are usually over half of total assets, and in the distribution business even more (Horne & Wachowicz 2000:202). Weinraub & Visscher (1998) study a set of ten different industries. They discover that different industries vary in terms of working capital management aggressivity. The study also finds limited indications that more distinctly consumer-oriented industries would have slightly more aggressive policies. This thesis will control for the effect of industries on the optimal working capital levels.

4. DATA AND METHODOLOGY

The following chapter contains the description of the data and sample construction. The choice of variables for the study as well as model specification for the two hypotheses. After this, the methodology is explored for the empirical part in chapter 5. Lastly, the chapter presents a brief summary of the dataset.

4.1. Data and population

The data was obtained from Bureau Van Dijks Orbis database, which is one of the largest databases that collect the financials of over 400 million companies and entities worldwide. The sample was drawn from Swedish and Finnish public and private companies within a period of eight years from 2013 to 2020. This adds up to the total of 484 004 firm-year observations on the initial sample. Firm-year observations with missing values on any of the variables were left out as well as accounting anomalies such as negative values for sales, inventory, all assets, accounts receivable, or accounts payable. (Hill et al., 2010). An unbalanced panel data is used to account for survival bias as firms that go out of business are not excluded. Furthermore, according to the European Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises, SMEs are selected with the following criteria:

- Turnover less than 50 mEUR
- Total assets less than 43 mEUR

The extreme top and bottom 0,5% of each variable was removed to account for the effect of outliers on the study. The NACE main section was used as a basis for industry categories. From these industries A - Agriculture, forestry and fishing, C – Manufacturing, F - Construction, G - Wholesale and retail trade; repair of motor vehicles and motorcycles, 08 - H - Transportation and storage, 09 - I - Accommodation and food service activities, 10 - J - Information and communication were selected into the study. The total number of firm year observations is 82 020 with 26 196 individual firms.

4.2. Variables used

This section will discuss the variable choices in this study. Formulations are presented at the end of the section in table 2. The variables used in this thesis will follow the relevant preceding studies of Baños-Caballero et al. (2014) and Afrifa (2016) as the hypotheses are also built on these. This means employing NTC and its square NTC2. Control variables are based more broadly on the research literature, including firm size, sales growth, leverage, and current assets ratio.

4.2.1. Dependent variable

The previous studies have used various measures for profitability and performance. The literature review Table II summarizes which measures are used in the most relevant studies regarding this thesis. Firm profitability is used following Afrifa (2016) as the measure was widely available for most SMEs. ROA is calculated as earnings before interest and tax (EBIT) divided by the average of total assets. It scales the firm’s operative profitability with total assets and is a good counterpart for the operative measures of working capital. The reason for not using gross operating profit which was used by Deloof (2003) and Enqvist (2014) was the lack of cost of goods sold accounts in Finnish and Swedish SMEs.

4.2.2. Control variables

The main independent variable, net trade cycle (NTC) was first used in the Shin & Shoen 1998 study on working capital management. The measure is dynamic, meaning that it considers the fact that working capital is never a static measure. As its later alternative cash conversion cycle (CCC), NTC is a ratio of working capital accounts to the volume of sales in that period, multiplied by the days in a year to get a cycle measure of days. The formula is as follows:

The accuracy of this measure is slightly worse than that of CCC because we are not comparing the preferable accounts. The sales amount is not as accurate as purchases to accounts payable nor is it as accurate as of the cost of goods sold to inventories. The reason why NTC is used as the main WCM variable in this study is that not all companies and most SMEs are missing purchases and cost of goods sold accounts in the database. The two measures have been used interchangeably in prior literature giving the same end results as well. As earlier stated in this thesis the high correlation and benchmarking tests in earlier studies (Deloof, 2003; Aktas, Croci & Petmezas, 2015) have proven the measure of NTC reliable in the fields of WCM studies. The measure of CCC and its components will be used from a smaller sample as a control. The meaning of CCC and its components are as discussed earlier in the theoretical part, the most interesting component being inventory turnover as it is a concrete aspect that a firm can improve by itself, unlike payables and receivables which must be negotiated and are subject to bargaining power.

Several control variables have also been found to affect firm profitability in the models to be estimated. Following Deloof (2003), Enqvist et al. (2014), and Afrifa (2016), this thesis controls for firm size, and sales growth. To control for business cycles Enqvist et al. (2014) and Lyngstadaas and Berg (2016) use GDP as a control variable, this thesis will follow by using yearly industry level surplus. Financial constraints and risks are controlled extensively with current ratio and cash to net assets. SMEs are usually riskier than larger companies and need some cash and a solid current ratio to not default in case bank loans are not widely available. Leverage as financial debt to total assets is further used to determine the long-term risk in the financial standing of a company. The health of a firm – the ability to create internal cashflows – is proxied by a cash flow margin.

Company size has been controlled for in nearly all studies in the field. It is negatively correlated with profitability across the literature. This could be due to greater diversification in larger companies (Goddard, Tavakoli & Wilson, 2005) or due to misaligned managerial incentives which lead to expansion instead of profitability maximization (Stulz, 1990). Company size has also been found to have an increasing impact on working capital levels as larger companies have better access to capital markets as there is less information asymmetry and risk of failure. Smaller firms being more reliant on trade credit (Baños-Caballero, García-Teruel & Martínez-Solano 2010).

Several studies incorporate the sales growth factor into the models (Afrifa, 2016; Lyngstadaas & Berg, 2016) and show that profitability increases with sales growth. The growth of sales would also have an increasing impact on inventories which would grow alongside sales expectations (Kieschnick, Laplante & Moussawi, 2006). Furthermore, giving prolonged payment terms to customers would increase the need for working capital. On the other hand, firms might resort to trade credit when growing and in the absence of external funding.

The amount of leverage a company is expected to impact profitability negatively as in Deloof (2003) and Baños-Caballero et al. (2012). It is hypothesized by Benito and Vlieghe (2000) that highly leveraged would be more financially constrained which could negatively impact valuable investment opportunities and eventually harm profitability. Goddard et al. (2005) confirm this finding stating that firms with high gearing lose profits from servicing the debt. According to Chiou, Cheng and Wu (2006), more leveraged companies have a higher cost of financing due to the risk premium they must pay. From the past findings, we see that leverage plays an important role in working capital management in that financially constrained companies should strive to minimize the need for external financing by minimizing working capital.

Goddard et al (2005) find that more liquid firms have higher profitability. In a similar manner, Enqvist et al. (2014) find that having higher liquidity measured by current ratio improves profitability. The same result persists across most models in the study, therefore current ratio will be one of the control variables in the model. Firms keep a substantial amount of assets as cash for their liquidity as is found by Guney, Ozkan A., Ozkan N. (2003). According to the study on average British firms hold 10,3% of total assets as cash. Another liquidity measure that is employed is cash to net assets ratio, it is expected that SMEs hold a larger portion of cash than large companies due to financial constraints and higher risk.

Cash flow resembles cash-generating ability, a matter which is essential for SMEs as they do not have access to an abundance of external financing. During a systemic crisis, it is an essential indicator of the health of a business.

Table 2. Regression variables

VARIABLE	ACRONYM	DESCRIPTION
Profitability	ROA	Earnings before interest and tax (EBIT) divided by average of total assets
Net trade cycle	NTC	(Accounts receivables+inventories-accounts payables) divided by sales multiplied by 365
Cash conversion cyccle	CCC	ITO+DAR-DAP
Days of inventories	ITO	(Inventory/cost of goods sold) multiplied by 365
Days accounts receivable	DAR	(Accounts receivables/sales) multiplied by 365
Days accounts payable	DAP	(Accounts payables/cost of goods sold) multiplied by 365
Annual sales growth	GROWTH	Sales divided by last year sales
Cash holdings	CASH	Cash & equivalent divided by net assets (total assets minus cash & equivalent)
Firm size	SIZE	Natural logarithm of total assets
Financial leverage	LEVERAGE	Loans and long-term debt divided by total assets
Cash flow	CFMARGIN	Net income plus depreciation divided by sales
Current ratio	CR	Current assets minus cash & equivalent divided by current liabilities
Growth of industry	INDUSTRYDEV	Yearly operating surplus by industry

4.3. Methodology

Following Banos Caballero (2014), Afrifa (2016), and Berg et al. (2016) in their studies on the non-linear effects of working capital on company profitability, this thesis will follow. Panel data methodology is assessed to be suitable to make a regression for the crosssectional time-series dataset. One of the benefits of panel data methodology is that it allows controlling for firm-level individual heterogeneity (Hsiao, 2003).

Following Baltagi (2005) panel data methodology is also beneficial because it can work with larger and more informative data, variability, and degrees of freedom. According to Wooldridge (2002) panel data can be used to create consistent estimators in case omitted variables exist. The regression model is also tested with one year lagged variables to see if they correspond with non-lagged results.

The functional form of working capital and profitability relationship has been contested in the later studies and thus both linear and nonlinear models are tested. The quartiles of NTC duration in days are also analyzed and the linear models are tested on these to investigate whether these sample sets give different results. The panel data model itself is a solution to heteroscedasticity as it allows for multiple intercepts to coexist. To prove this log variables are tested but not reported with the same main model to see if the results stay relatively similar, indicating that heteroscedasticity will not be an issue.

To determine the best method for the study, pooled ordinary least squares method is tested against both fixed and random effects models with Lagrange Multiplier (LM-test). The null hypothesis is rejected in both cases, meaning that pooled OLS model is left out. To determine between the use of a random or fixed effect model a Hausman test is conducted. When the unobserved errors are correlated with independent variables, the fixed-effect model is preferred. Fixed effects mean that the model fixes the variability to an ID, in this case, the company. It implies that companies are different. The random-effects model on the other hand implies that the variability is random between companies. For all models, the null hypothesis was rejected thus fixed effect panel regression is preferred over the random effects model.

Durbin-Watson test is performed to control for autocorrelation in the models, and the possible need for a lagged variable if autocorrelation is detected. The null hypothesis was accepted, and thus serial correlation does not cause problems. Multicollinearity is not an issue as the largest VIF value out of all the variables was 1.52, this being well below the limit of 5, which is considered a sufficient indicator (Studenmund, 1998).

4.3.1. Model Specification

The model is specified so that in all models we have ROA as the dependent variable resembling profitability. The main explanatory variable is NTC, measured in days with the remaining variables being controls for profitability used in earlier literature. The first model tests hypothesis one; Aggressive working capital management enhances the profitability of SMEs.

The model for the second hypothesis is similar in all but the added quadratic term for the main independent variable. The quadratic relation proposed in the second hypothesis claims that the relationship between profitability and working capital is concave. The mathematical form of a concave relationship is indicated by having a positive main variable (NTC) and a negative quadratic term (NTC2).

For robustness, various modifications of the two main models are done with different variables and samples. Both models are also conducted using the CCC and its components. These will be explained in more detail in chapter 5. Furthermore, the robustness check for industries and quartiles of NTC is done by sampling the data, models remaining the same. These models are executed with fixed effects panel regression:

$$(1)\quad ROA_{i,t} = B_0 + B_1 NTC_{i,t} + B_2 GROWTH_{i,t} + B_3 CASH_{i,t} + B_4 SIZE_{i,t} + B_5 LEVERAGE_{i,t} + B_6 CFMARGIN_{i,t} + B_7 CR_{i,t} + B_8 INDUSTRYDEV_t + v_i + e_{i,t}$$

$$(2)\quad ROA_{i,t} = B_0 + B_1 NTC_{i,t} + B_1 NTC^2{}_{i,t} + B_2 GROWTH_{i,t} + B_3 CASH_{i,t} + B_4 SIZE_{i,t} + B_5 LEVERAGE_{i,t} + B_6 CFMARGIN_{i,t} + B_7 CR_{i,t} + B_8 INDUSTRYDEV_t + v_i + e_{i,t}$$

Where ROA is return on assets, NTC is net trade cycle, GROWTH is sales growth year-on-year, CASH is cash weight in total assets, SIZE company size, LEVERAGE financial leverage, CFMARGIN is cash flow proxy; CR is current ratio, INDUSTRYDEV is the yearly operating surplus by industry. i is firm i, t is time and finally, the two error components are υ, the individual error component (characteristic of each firm) and e is residual error (time-varying unobservable factors affecting ROAi,t).

4.4. Sample description

Table 3. contains descriptive statistics for the main sample. The mean ROA is 10 percent, NTC duration is on average 47 days long, and growth is 11 percent. Firm size does not vary greatly in the sample, being on average 7.48 (total assets equals approximately 3.1 mEUR). Current ratio averages at 1.3, having slightly more current assets than liabilities. Cash to net assets has a mean value of 24 percent which is higher than the ratio of 10,3 percent found by Guney et al. (2003), the leverage of SMEs is on average 18 percent and finally, cash flow margin is 7 percent. The study of Enqvist et al. (2014) reports higher leverage for large, listed firms which is understandable under the context of financial constraints theory discussed in the literature review section.

Table 3. Descriptive statistics

	ROA	NTC	GROWTH	SIZE	CR	CASH	Leverage	CFMargin
Mean	0,10	46,99	0,11	7,48	1,33	0,24	0,18	0,07
Median	0,09	36,55	0,02	7,42	1,11	0,11	0,12	0,08
SD	0,15	49,29	0,45	1,25	0,92	0,36	0,19	-0,59
Min	-0,74	-77,89	-0,54	1,99	0,08	0,00	0,00	0,02
1st quartile	0,03	12,71	-0,10	6,63	0,73	0,03	0,00	0,06
4th quartile	0,17	70,15	0,18	8,30	1,64	0,30	0,30	0,11
Max	0,74	359,40	5,71	12,16	7,69	3,05	0,84	0,42
Number of firms								26 196
Number of obs.								82 020

Notes: ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; GROWTH is the year-to-year sales growth percentage; CASH is cash and equivalent divided by net assets; SIZE is the natural logarithm of total assets; LEVERAGE is loans plus long term debt divided by total assets; CFMARGIN is net income plus depreciation divided by sales; CR is current assets minus cash and equivalent divided by current liabilities.

5. RESEARCH RESULTS

This chapter will contain the empirical results which were obtained using the R program. In the first section the linear model is tested, after this, the quadratic function form is fitted to see if the dependence of ROA and working capital is nonlinear. The third section controls for the robustness of the quadratic dependence at the industry level. The last section is an analysis of the quartiles of NTC, there are descriptive statistics on the quartiles, and lastly linear regression with the initial model on these quartiles.

Table 4. presents Pearson's correlation matrix for all variables included in the main model. A negative and significant relation is found between ROA and NTC indicating that an aggressive working capital policy would increase profitability as found by Deloof (2003), Lyngstadaas & Berg (2016), and Enqvist et al. (2014). In addition to the below variables, this study will control for the other WCM measures, the CCC and its components, using a smaller sample. These results are reported alongside the main model in Table 5. linear dependence and 6. for the quadratic dependence.

Table 4. Pearson's correlation matrix

	ROA	NTC	GROWTH	SIZE	CR	CASH	LEVERAGE	CFMARGIN	IND.
ROA	1								
NTC	-0.06****	1							
GROWTH	0.17****	-0.07****	1						
SIZE	-0.07****	0.29****	-0.10****	1					
CR	0.05****	0.54****	-0.08****	0.24****	1				
CASH	0.30****	-0.19****	0.06****	-0.19****	-0.14****	1			
LEVERAGE	-0.20****	-0.02****	0.00	0.00	-0.20****	-0.29****	1		
CFMARGIN	0.57****	-0.06****	0.03****	0.10****	-0.01*	0.12****	0.06****	1	
IND.	0.02****	-0.04****	-0.01***	-0.05****	-0.02****	0.01****	-0.02****	-0.01****	1

Notes: ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; GROWTH is the year-to-year sales growth percentage; CASH is cash and equivalent divided by net assets; SIZE is the natural logarithm of total assets; LEVERAGE is loans plus long term debt divided by total assets; CFMARGIN is net income plus depreciation divided by sales; CR is current assets minus cash and equivalent divided by current liabilities; IND. is the yearly operating surplus by industry.

5.4. Working capital management and profitability

Table 5. presents the results of the first hypothesis with the main model and four variations included. The results are in line with many of the previous studies that have found aggressive WCM policy to impact profitability positively (Deloof, 2003; Lyngstadaas & Berg (2016) and Enqvist et al. (2014). Furthermore, the same results on negative relation between ROA and DAP also appear, where earlier studies have hypothesized that more successful firms pay their suppliers quicker because this finding does go against the general mechanism of efficient WCM increasing profitability. This result complements the finding of Enqvist et al (2014) on the part of Finnish and Swedish SMEs. The control variables are consistent across models and mostly reflect the prior research findings. Growth can be seen as a sign of opportunity and expansion, also reflected in profitability. Interestingly size is negatively associated with SME profitability, the same results are documented consistently in Afrifa (2016) on a sample of UK firms. Lyngstadaas & Berg (2016) on the other hand find in all models that larger SMEs in Norway are more profitable than their smaller counterparts. The coefficients for NTC and CCC show that relationship is 0.3 to 1 percent of increase in ROA for 100 days decrease in working capital.

With these findings, which persist with NTC, CCC, ITO, and DAR, the first hypothesis can be accepted, aggressive working capital management affects profitability positively. The alternative models in Table 5. are as follows:

(1.1) $ROA_{i,t} = B_0 + B_1CCC_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(1.2) $ROA_{i,t} = B_0 + B_1ITO_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(1.3) $ROA_{i,t} = B_0 + B_1DAR_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(1.4) $ROA_{i,t} = B_0 + B_1DAP_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

Table 5. Linear relationship between ROA and working capital

Variable	(1)	(1.1)	(1.2)	(1.3)	(1.4)
NTC	-0.00003**				
	(-2.542)				
CCC		-0.0001***			
		(-6.122)			
ITO			-0.0001***		
			(-11.697)		
DAR				-0.0002***	
				(-6.088)	
DAP					-0.0004***
					(-16.254)
GROWTH	0.064***	0.071***	0.070***	0.073***	0.071***
	(56.934)	(32.418)	(31.607)	(33.130)	(32.423)
CASH	0.067***	0.057***	0.055***	0.056***	0.052***
	(43.331)	(18.352)	(17.852)	(17.711)	(16.884)
SIZE	-0.012***	-0.013***	-0.012***	-0.013***	-0.013***
	(-25.499)	(-14.564)	(-14.208)	(-14.464)	(-14.727)
LEVERAGE	-0.137***	-0.128***	-0.125***	-0.132***	-0.130***
	(-49.434)	(-25.021)	(-24.480)	(-25.794)	(-25.717)
CFMARGIN	1.226***	1.499***	1.500***	1.506***	1.507***
	(184.261)	(106.069)	(106.502)	(105.902)	(107.353)
CR	0.014***	0.007***	0.008***	0.005***	0.001
	(19.598)	(6.093)	(7.170)	(4.487)	(0.514)
INDUSTRYDEV	0.004***				
	(4.476)				
Observations	82,020	23,146	23,146	23,146	23,146
LM test	0.00	0.00	0.00	0.00	0.00
Wu Hausman	0.00	0.00	0.00	0.00	0.00
Adjusted R^2	0.232	0.288	0.292	0.288	0.298

Notes: This table presents firm fixed effects regression with ROA as the dependent variable; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; CCC, ITO, DAR and DAP are alternate working capital measures used for controlling effects; GROWTH is the year-to-year sales growth percentage; CASH is cash and equivalent divided by net assets; SIZE is the natural logarithm of total assets; LEVERAGE is loans plus long term debt divided by total assets; CFMARGIN is net income plus depreciation divided by sales; CR is current assets minus cash and equivalent divided by current liabilities; INDUSTRYDEV is the yearly operating surplus by industry. t-values are below coefficients ***, **and *represent significance at the 0.01, 0.05 and 0.10 levels, respectively.

5.5. Quadratic relationship of working capital

This section considers the findings of Baños-Caballero et al. (2014), Afrifa (2016), and Lyngstadaas & Berg (2016) on a quadratic dependence between working capital management and profitability. This section considers hypothesis two: The relation between working capital and profitability is concave, suggesting that an optimal level of working capital exists. For there to be a concave and for an optimal length of NTC to exist, the main variable NTC should be positive and the quadratic term NTC^2 should be negative (B1>0 & B2<0).

The results in Table 6. show that a concave relationship between ROA and NTC and CCC exists. The components of CCC reveal more varying inconclusive results, DAP being convex relative to ROA. The turning point of a quadratic formula $(y = ax^2 + bx + c)$ is at $x = -b/2a$. Using a univariate model between NTC and ROA the turning point sets at approximately 40 days. However, depending on the model and variables included the turning point varies from 40 days to the high 110 days.

The relationship indicates that below the optimal there are benefits to increasing working capital such as earlier payments and cash discounts and increasing potential for growth which would require a larger inventory. Above the optimal costs of financing working capital start to dominate and the relation between working capital and profitability turns negative. The turning point figures are purely academic as any real optimal would be case-dependent, but they do strengthen the motives for firms to actively pursue working capital optimization.

Figure 4. displays the relationship between profitability and working capital. On the horizontal axis are the durations of NTC divided into percentiles, increasing from left to right while ROA is on the vertical axis. The graph contains a boxplot of ROA for each percentile of NTC. The dotted red line resembles the median ROA for the entire sample.

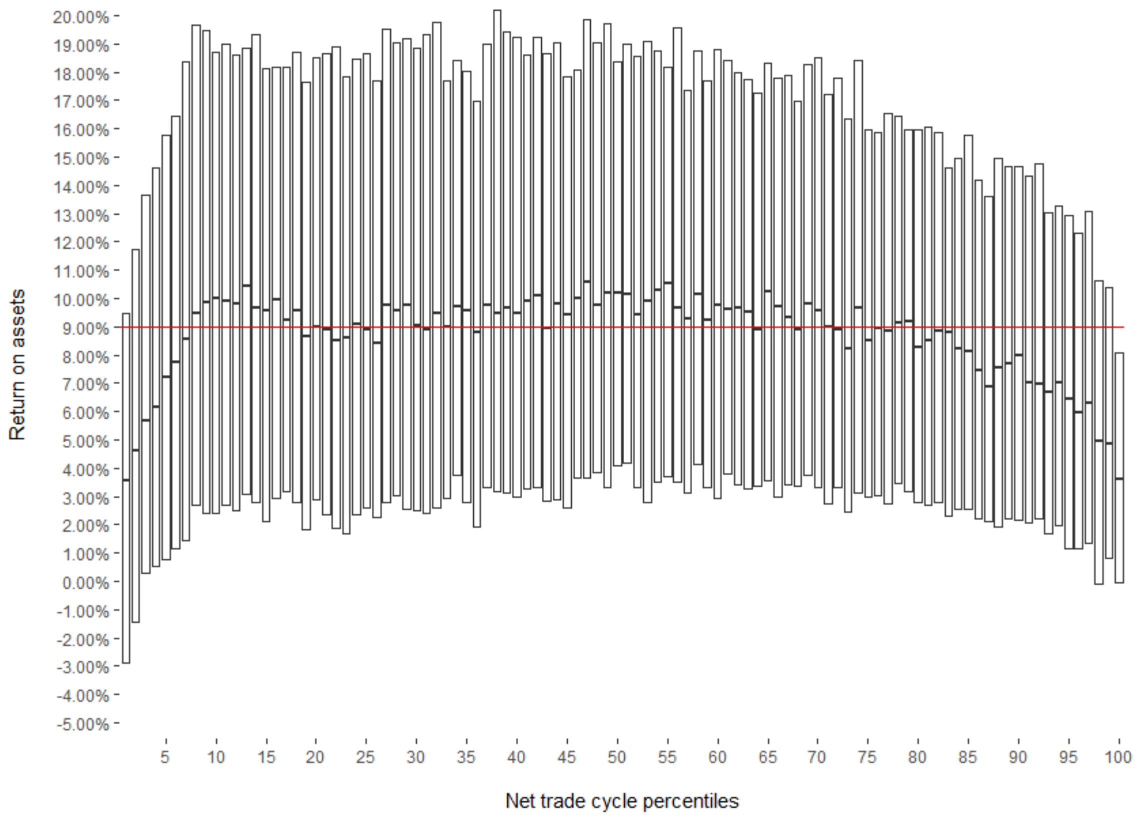

Figure 4. Relationship between ROA and NTC.

What we can see from the visualization of Figure 4. is that the profitability measured by ROA is above the sample average for companies approximately between percentiles nine and seventy, while being under the median on the outer edges where the duration for NTC is both lowest and highest in the entire sample. This is an indicator that working capital has a nonlinear concave relationship with profitability and should be optimized. Visual examinations of the relationship persist across, years, industries, and countries as expected. For example, the reason why the wholesale and retail industry doesn't show a concave relationship as expected is that the retail industry has a more linear negative relationship with profitability. As the slope does start out positive for retail as well we cannot rule out that the negative working capital figures are not an indicator of something else entirely, extreme growth, bad management, poor business environment, or even financial distress: inability to make payables in time as Deloof (2003) and Enqvist et al. (2014) have hypothesized.

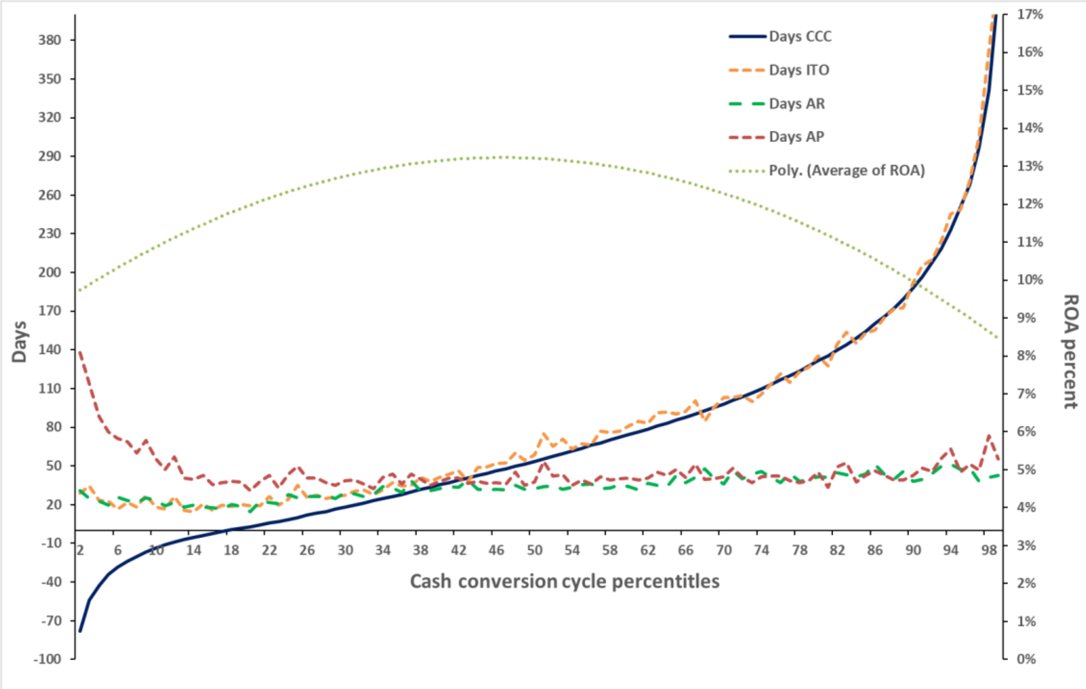

Figure 5. The components of CCC and profitability.

Figure 5. indicates that the relationship between working capital and profitability would be concave also when observing the cash conversion cycle. Looking at the components of working capital we see that the relationship between working capital and profitability would have different underlying reasons at the two ends of the concave relationship. While high working capital levels are largely correlated with inventory cycle length, extremely low and negative working capital is more attributed to the rising payables cycle. The reason for higher payables duration would be the basis for an extended study, although the fact that profitability is lower with higher payables would be again supportive of the companies not being able to make these payables earlier. The alternative models in Table 6. for controlling working capital components are as follows:

(2.1) $ROA_{i,t} = B_0 + B_1 CCC_{i,t} + B_1 CCC^2{}_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(2.2) $ROA_{i,t} = B_0 + B_1 ITO_{i,t} + B_1 ITO^2{}_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(2.3) $ROA_{i,t} = B_0 + B_1 DAR_{i,t} + B_1 DAR^2{}_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

(2.4) $ROA_{i,t} = B_0 + B_1 DAP_{i,t} + B_1 DAP^2{}_{i,t} + CONTROLS_{i,t} + v_i + e_{i,t}$

Table 6. Quadratic dependence between ROA and working capital

	(2)	(2.1)	(2.2)	(2.3)	(2.4)
NTC	0.0003***				
	(13.794)				
CCC		0.0001***			
		(5.691)			
ITO			-0.0001***		
			(-4.692)		
DAR				-0.0002*	
				(-1.892)	
DAP					-0.001***
					(-10.545)
QUADRATIC	-0.00000***	-0.00000***	-0.00000	-0.00000	0.00000***
	(-16.440)	(-10.874)	(-0.340)	(-0.495)	(4.763)
GROWTH	0.045***	0.071***	0.070***	0.073***	0.070***
	(48.866)	(32.537)	(31.585)	(33.127)	(32.380)
CASH	0.067***	0.058***	0.055***	0.056***	0.051***
	(46.147)	(18.744)	(17.839)	(17.717)	(16.573)
SIZE	-0.012***	-0.013***	-0.013***	-0.013***	-0.013***
	(-24.691)	(-15.278)	(-14.177)	(-14.471)	(-14.511)
LEVERAGE	-0.143***	-0.129***	-0.125***	-0.132***	-0.131***
	(-49.838)	(-25.211)	(-24.479)	(-25.790)	(-25.826)
CFMARGIN	1.169***	1.503***	1.500***	1.505***	1.508***
	(197.602)	(106.736)	(106.489)	(105.812)	(107.471)
CR	0.008***	0.005***	0.008***	0.005***	0.00001
	(12.466)	(4.671)	(7.100)	(4.476)	(0.006)
INDUSTRYDEV	0.004***				
	(4.657)				
Observations	82,020	23,146	23,146	23,146	23,146
Wu Hausman	0.00	0.00	0.00	0.00	0.00
Adjusted R^2	0.237	0.293	0.292	0.288	0.299

Notes: This table presents firm fixed effects regression with ROA as the dependent variable; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; CCC, ITO, DAR and DAP are alternate working capital measures used for controlling effects; QUDRATIC is the squared term of the first independent variable in each model; GROWTH is the year-to-year sales growth percentage; CASH is cash and equivalent divided by net assets; SIZE is the natural logarithm of total assets; LEVERAGE is loans plus long term debt divided by total assets; CFMARGIN is net income plus depreciation divided by sales; CR is current assets minus cash and equivalent divided by current liabilities; INDUSTRYDEV is the yearly operating surplus by industry. t-values are below coefficients ***, **and *represent significance at the 0.01, 0.05 and 0.10 levels, respectively.

5.3. Industry effects of working capital

This section will control for the diverse effects that industries have on working capital as varying effects have been found by Weinraub & Visscher (1998) and Filbeck & Krueger (2005). The relevant studies in the field have all controlled for industry effects as well. Table 7. presents the means and medians for each variable by industry. The industries have been taken from NACE main section with slight modifications to wholesale and retail sample where repair of motor vehicles and motorcycles firms have been omitted. The mean values are presented with medians in parenthesis. Industries vary from an average of seventy-one days NTC in manufacturing to the low of two days in accommodation and restaurants.

Table 8. presents the regression results following hypothesis and model two: The relation between working capital and profitability is concave, suggesting that the optimal level of working capital exists. The variables are shown on the vertical axis while the industries of interest are on the horizontal axis. Results show a significant concave relationship for A - Agriculture, forestry and fishing, C – Manufacturing, F – Construction, H - Transportation and storage, and I - Accommodation and restaurants. Two industries showed inconclusive results these being G - Wholesale and retail trade and J - Information and communication. Analyzing the dataset, wholesale and retail are surprisingly not in line with the literature despite being working capital intensive in character, but this seems to be because retail firms show an exceptionally strong negative relation between ROA and working capital on all levels.

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Table 7. Industry averages and means

Sectors	No. of firms	ROA	NTC	GROWTH	SIZE	CR	CASH	LEVERAGE	CFMARGIN
A - Agriculture, forestry and fishing	753	0,08 (0,07)	38 (23)	0,07 (0,02)	7,56 (7,58)	0,98 (0,73)	0,18 (0,1)	0,31 (0,31)	0,14 (0,14)
C - Manufacturing	6 525	0,09 (0,08)	71 (64)	0,07 (0,01)	7,89 (7,84)	1,6 (1,37)	0,17 (0,07)	0,19 (0,15)	0,07 (0,06)
F - Construction	6 503	0,13 (0,11)	41 (31)	0,17 (0,06)	7,05 (7)	1,23 (1,08)	0,29 (0,16)	0,15 (0,08)	0,07 (0,06)
G - Wholesale and retail trade	5 688	0,09 (0,09)	59 (53)	0,07 (0,01)	7,72 (7,69)	1,69 (1,45)	0,2 (0,09)	0,14 (0,08)	0,04 (0,03)
H - Transportation and storage	2 977	0,08 (0,07)	20 (19)	0,09 (0,02)	7,29 (7,24)	0,81 (0,68)	0,2 (0,11)	0,26 (0,25)	0,11 (0,1)
I - Accommodation and restaurants	2 152	0,1 (0,08)	2 (1)	0,1 (0,01)	6,69 (6,6)	0,76 (0,57)	0,36 (0,18)	0,19 (0,12)	0,06 (0,05)
J - Information and communication	1 598	0,1 (0,09)	44 (37)	0,23 (0,09)	7,45 (7,32)	1,16 (0,98)	0,43 (0,24)	0,12 (0,01)	0,06 (0,07)
Total	26 196	0,1 (0,09)	48 (37)	0,11 (0,02)	7,46 (7,41)	1,33 (1,12)	0,24 (0,11)	0,18 (0,12)	0,07 (0,06)

Notes: This table presents the averages and medians in parenthesis for each variable in the different industries; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; GROWTH is the year-to-year sales growth percentage; SIZE is the natural logarithm of total assets; CR is current assets minus cash and equivalent divided by current liabilities; CASH is cash and equivalent divided by net assets; LEVERAGE is loans plus long term debt divided by total assets; CFMARGIN is net income plus depreciation divided by sales.

Table 8. Quadratic dependence between NTC and ROA by industry

Variable	Agriculture	Manufacturing	Wholes. and Retail	Construction	Transp. and Storage	Accomm. and restaur.	Inform. and comm.
NTC	0.0003***	0.0002***	-0.0001	0.0004***	0.001***	0.0003*	0.00004
	(3.623)	(3.379)	(-1.373)	(6.814)	(7.711)	(1.918)	(0.420)
NTC2	-0.00000***	-0.00000***	-0.00000**	-0.00000***	-0.00001***	-0.00000	0.00000***
	(-3.342)	(-5.336)	(-2.466)	(-7.389)	(-5.476)	(-0.929)	(2.798)
GROWTH	0.052***	0.051***	0.035***	0.052***	0.053***	0.015***	0.007***
	(11.447)	(28.372)	(17.666)	(32.771)	(19.680)	(5.491)	(2.666)
CASH	0.066***	0.059***	0.041***	0.068***	0.078***	0.057***	0.046***
	(7.187)	(17.334)	(13.232)	(22.347)	(14.387)	(13.305)	(8.432)
SIZE	-0.023***	-0.010***	-0.008***	-0.020***	-0.014***	-0.024***	0.018***
	(-5.540)	(-10.894)	(-7.787)	(-16.521)	(-9.396)	(-6.687)	(3.615)
LEVERAGE	-0.053***	-0.094***	-0.075***	-0.184***	-0.106***	-0.097***	-0.211***
	(-5.044)	(-19.973)	(-14.739)	(-27.488)	(-16.526)	(-7.715)	(-10.248)
CFMARGIN	0.802***	1.120***	1.824***	1.663***	0.941***	2.109***	0.305***
	(33.826)	(128.303)	(115.398)	(103.197)	(54.692)	(60.819)	(32.175)
Observations	2,593	22,800	18,015	20,488	9,539	6,738	5,483
Wu Hausman	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adjusted R^2	0.24	0.40	0.38	0.32	0.17	0.29	-0.07

Notes: This table presents firm fixed effects regression with ROA as the dependent variable; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; SIZE is the natural logarithm of total assets; GROWTH is the year-to-year sales growth percentage; CFMARGIN is net income plus depreciation divided by sales; LEVERAGE is loans plus long term debt divided by total assets; CASH is cash and equivalent divided by net assets; CR is current assets minus cash and equivalent divided by current liabilities. *t*-values are below coefficients ***, **and *represent significance at the 0.01, 0.05 and 0.10 levels, respectively.

5.4. Quartile analysis of net trade cycle

To control for the different relationships of WCM the sample is split into quartiles based on the length of NTC. The first quartile contains companies with -78 to 13 days long NTC and the fourth quartile contains firms with 70 to 359 days duration, respectively. According to hypothesis two: The relation between working capital and profitability is concave, suggesting that the optimal level of working capital exists. Taking from this we expect the relationship between working capital and profitability to be different at the extreme quartiles, more specifically positive at lower working capital cycle levels and negative at the highest working capital levels.

Table 9. presents the descriptive statistics for each quartile. Indeed, the middle quartiles presented exhibit the highest profitability with an average of 11 percent. The first quartile makes an average profit of 9 percent, and the fourth quartile has an average of 8 percent. Also noteworthy is that larger companies have longer NTC lengths and are growing at a slower pace. The Students t-test was conducted to control for differences between quarter samples, showing that each variable mean differs significantly between the groups. The companies with a lower net trade cycle exhibit a higher cash holding which could be due to them being riskier and more financially constrained. The current ratio is lower in linear relation when NTC is lower, which is logical due to both being measures of working capital. Despite having the highest growth rate, the descriptive statistics of the first quartile do not indicate any excess leverage.

Table 9. Descriptive statistics by net trade cycle quartile

Variable	1st quartile	2nd quartile	3rd quartile	4th quartile	t-value & sig. level
Range of NTC	—78-13	13-37	37-70	70-359	
NTC	-2 (1)	25 (25)	52 (51)	114 (100)	-368.84 (0.000)
ROA	0,09 (0,08)	0,11 (0,1)	0,11 (0,1)	0,08 (0,07)	8.81 (0.000)
GROWTH	0,15 (0,03)	0,14 (0,04)	0,1 (0,03)	0,06 (-0,01)	20.55 (0.000)
SIZE	7,01 (6,98)	7,2 (7,13)	7,56 (7,48)	8,04 (7,99)	-87.98 (0.000)
CR	0,78 (0,64)	1,04 (0,93)	1,43 (1,29)	2,06 (1,8)	-151.99 (0.000)
CASH	0,33 (0,17)	0,28 (0,15)	0,21 (0,11)	0,14 (0,06)	56.64 (0.000)
LEVERAGE	0,18 (0,11)	0,19 (0,13)	0,17 (0,11)	0,17 (0,12)	6.16 (0.000)
CFMARGIN	0,07 (0,05)	0,08 (0,07)	0,07 (0,06)	0,06 (0,05)	9.52 (0.000)
Number of firms					26 196
Number of obs.					82 020

Notes: This table compares quartile groups based on the length of NTC; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; SIZE is the natural logarithm of total assets; GROWTH is the year-to-year sales growth percentage; CFMARGIN is net income plus depreciation divided by sales; LEVERAGE is loans plus long term debt divided by total assets; CASH is cash and equivalent divided by net assets; CR is current assets minus cash and equivalent divided by current liabilities. The last column depicts a Students t-test between 1st and 4th quartiles, p-values in parentheses.

The regressions were estimated using the linear model (model one in this thesis). Table 10. presents the results and support for hypothesis two is found in that quartile one shows a positive relation between NTC and ROA while quartile four indicates a significant negative relationship. Furthermore, the results are insignificant for the middle quartiles where we would expect the optimal NTC level to lie, indicating that there is no clear relationship between profitability and working capital for the companies having average working capital.

Table 10. Linear relationship between ROA and NTC, quartile analysis

	Quartiles by NTC duration:			
	(1)	(2)	(3)	(4)
NTC	0.001***	0.0002	0.00001	-0.0002***
	(11.728)	(1.439)	(0.101)	(-12.983)
GROWTH	0.046***	0.077***	0.086***	0.055***
	(18.134)	(27.907)	(31.102)	(26.328)
CASH	0.083***	0.079***	0.057***	0.011***
	(26.498)	(21.075)	(14.057)	(2.680)
SIZE	-0.009***	-0.017***	-0.015***	-0.009***
	(-7.245)	(-14.514)	(-14.468)	(-11.017)
LEVERAGE	-0.143***	-0.143***	-0.139***	-0.085***
	(-21.518)	(-20.534)	(-22.027)	(-18.542)
CFMARGIN	1.289***	1.248***	1.237***	1.167***
	(76.336)	(71.706)	(81.061)	(112.947)
CR	0.021***	0.035***	0.019***	0.003***
	(8.069)	(14.330)	(11.043)	(4.072)
Observations	20,505	20,505	20,505	20,505
Wu Hausman	0.00	0.00	0.00	0.00
Adjusted R^2	-0.036	-0.102	0.019	0.307

Notes: This table presents firm fixed effects regression with ROA as the dependent variable; ROA is the earnings before interest, tax and depreciation over the average total assets; NTC is inventories plus receivables minus payables as a percentage of sales revenue times 365; SIZE is the natural logarithm of total assets; GROWTH is the year-to-year sales growth percentage; CFMARGIN is net income plus depreciation divided by sales; LEVERAGE is loans plus long term debt divided by total assets; CASH is cash and equivalent divided by net assets; CR is current assets minus cash and equivalent divided by current liabilities. t-values are below coefficients ***, **and *represent significance at the 0.01, 0.05 and 0.10 levels, respectively.

6. CONCLUSIONS

The finding of this study indicate that the working capital management of SMEs should aim to be aggressive in reducing the time of inventory turnover, days accounts receivables, and days accounts payables to optimize profitability (Deloof, 2003; Lyngstadaas & Berg, 2016; Enqvist et al., 2014). Furthermore, the relationship between working capital and profitability is concave as earlier studies on SMEs have shown (Baños-Caballero et al., 2014; Afrifa, 2016; Lyngstadaas & Berg, 2016). The concave relationship is found to exist because at the lowest working capital levels firms start to have higher accounts payables times. This could be a sign of poor business health as the minimization of the working capital cycle itself signifies a lower financial need for operation and would theoretically enhance business profitability while the opposite is found. We cannot rule out other reasons such as the different nature of business for these firms and therefore a future study should investigate the significance of the rising accounts payables cycle and its causes. The robustness of these results comes from testing different samples, different measures of working capital, and different model formulations and functional forms.

The strength of this thesis is that it was conducted using a large dataset of 82 020 observations on multiple industries and tested across different models and KPIs. The main limitation of this study is that many SMEs were dropped out of the study due to missing values on one of the variables and thus we were left with the companies that would be more medium-sized and not small. Another key limitation was the quantitative nature of this study which eludes the finer details of working capital and profitability dynamic that is taking place in very firm-specific contexts, making it much more difficult to suggest causation. An exemplary case of this is the positive working capital and profitability relationship which was taking place due to higher accounts payable cycle figures. We cannot outright claim that companies should quicken accounts payables cycle, as the causation for profitability is most likely somewhere else and the delayed payments are merely a symptom of business faring poorly.

For future research, a matter of interest is the volatility of cash flows as working capital can also be considered a buffer for this volatility, planning, and optimization can be done to a different level when the business is stable. Earlier research has indicated that internal financing plays a role in the optimization of working capital, but according to the arguments which consider riskiness, external financing, and growth potential the stability of the cash flows is an unobserved dimension. For this study, a higher frequency dataset would be needed extending multiple years if not decades.

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