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THE IMPACT OF WORKING CAPITAL MANAGEMENT ON CORPORATE PERFORMANCE UNDER FINANCIAL CONSTRAINTS

Evidence from Metal Industry in Finland

Master's Thesis in
Accounting and Finance

Master's Programme in
Accounting and Auditing

VAASA 2018

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ABSTRACT:

Working capital management plays an essential role in short term financing of companies' everyday operations and has an important effect on both liquidity and profitability. It covers optimization of working capital in the value chain of the entire company, from raw materials to final products. This study investigates the impact of working capital management on corporate performance in a group of non-listed Finnish companies in the machining sector of metal industry between years 2011-2015.

The study adds to the existing literature on the topic by addressing the possible non-linearity of the relationship between working capital management and company profitability. Moreover, the existence and influence of financial constraints are observed in the same context. Based on the latest research on the topic, panel data method and least squares estimation are used to test the effect of net trade cycle (NTC) as a measure of working capital management on company performance, described by P/L ratio. The presence of financial constraints is examined by classifying the companies by cash flow, size and bankruptcy risk.

The empirical findings support the expectation of a non-linear relation between company performance and working capital management, pointing out that deviations from the optimal NTC either up- of downwards reduce the corporate performance, but the result is not statistically significant. Another main result of the study indicates that the optimal working capital level of the companies facing more financial constraints based on size, cost of external financing and interest coverage is lower than for the companies with lesser financial challenges. In this sample, however, the results are statistically significant only with the cost of external financing-criteria. In practice these results suggest that working capital management should be observed as one of the key factors affecting company performance.

1. INTRODUCTION

Working capital can be seen as the life blood of every company. It is an integral part of short-term planning and overall corporate strategy. The way in which working capital is managed can have a significant impact on liquidity as well as profitability of the company (Shin & Soenen 1998: 37). Specifically, working capital investment involves a tradeoff between profitability and risk. Decisions that tend to increase profitability tend to increase risk, and conversely, decisions that focus on risk reduction tend to reduce potential profitability (Garcia-Teruel & Martinez-Solano 2007: 164.) According to PWC's 2015 Annual Global Working Capital Survey, companies have realized after years of working capital deterioration, that optimizing working capital is crucial, and failure to manage it properly can seriously impact their ability to fund day-to-day operations (PWC 2015: 1). An efficient working capital management practice can constitute a competitive advantage for a company. Working capital management aiming at optimal working capital level can create value by reducing the need for finance, freeing up cash for more strategic purposes, increasing profitability, improving liquidity as well as making the operations of the company more efficient, thus decreasing financing costs (Monto, 2013: 22). A general operating cycle of a manufacturing company with the components of the working capital is presented in Figure 1 in the following page.
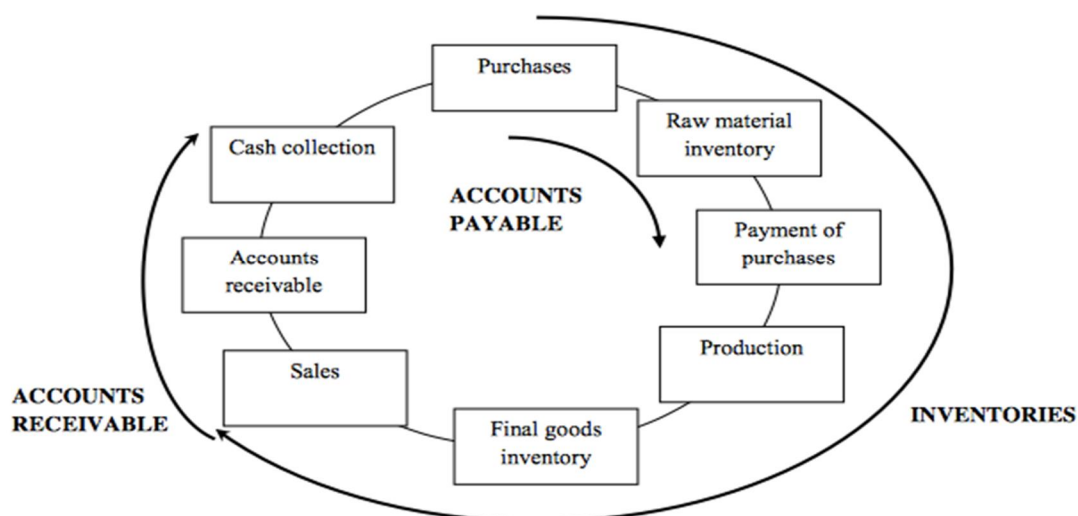
Figure 1. Operating cycle and the components of working capital (adopted from Monto 2013).

1.1. Background of the study

Over the past 20 years, there has been abundance of research on the effect of working capital management on corporate performance. The economic recession periods have underlined the importance of such studies, since working capital decisions play an essential role in profitable operations of a company. As there are numerous studies on the topic, there are also different viewpoints sample wise in the existing literature. The earlier studies mainly used listed companies in a single country as the standpoint of their research, but the later studies have added small and medium-sized companies as well as comparisons between different countries and economical areas. (e.g. Wang 2000; Deloof 2003; Lazaridis & Tryfonidis 2006; Banos-Caballero, Garcia-Teruel & Martinez-Solano 2010.)

In terms of methodology, most of the studies have been quantitative, investigating the relationship between working capital management and profitability, in the means of regression analysis. Most commonly, return on asset of some other profitability ratio has been regressed on the working capital measure, such as cash conversion cycle (CCC) or

net trade cycle (NTC). Typical control variables used in the prior research have been; company size, age, leverage and growth rate. (e.g. Shin et al. 1998; Deloof 2003; Garcia-Teruel et al. 2007; Knauer & Wöhrmann 2013; Yazdanfar & Öhman 2014).

Studies of working capital management fall into two competing views of working capital investment. Under one view, higher working capital levels allow firms to increase their sales and obtain greater discounts for early payments, hence possibly increasing firm value (Deloof 2003). Another view states that higher working capital levels require financing, which leads firms to face additional financing expenses and increase probability of going bankrupt (Kieschnick, LaPlante & Moussawi 2013).

Banos-Caballero, Garcia-Teruel and Martinez-Solano (2014) examine the linkage between working capital management and company performance, combining these two, above-mentioned views and predict that there is a nonlinear relation between investment in working capital and firm value. In other words, an inverted U-shaped (concave) relation between these two factors imply that there is an optimal level of investment in working capital that balances costs and benefits and maximizes firm value. Furthermore, they analyzed if the optimal working capital level is sensitive to alternative measures of financial constraints (Banos-Caballero et al. 2014: 332).

1.2. Objective of the study

Objective of this study is to examine the functional form of the relation between working capital and corporate performance as discussed by Banos-Caballero et al. (2014) using a sample of machining companies in metal industry in Finland, in the period from 2011 to 2015. Specifically, a nonlinear, concave relation between working capital and firm performance is expected. Following earlier research by Shin et al. (1998), net trade cycle (NTC) is used as a measure of working capital management and corporate performance is measured by P/L-ratio. The selection of other variables used in the regression, namely firm size (SIZE), leverage (LEV) and return on assets (ROA) are based on the prior research on the topic. (e.g. Banos-Caballero et al. 2014; Yazdanfar et al. 2014; Lyngstadaas & Berg 2016.)

Another objective is to examine whether the optimal working capital level of more financially constrained firms differ from that of less constrained ones in the sample of this study. It is expected that less financially constrained companies have higher level of optimal working capital and more financially constrained companies in turn have a lower optimum. Following the study of Banos-Caballero et al. (2014), measures used for the existence of financing constraints are following: cash flow, size, interest coverage, cost of external financing and z-score.

1.3. Structure of the study

This study is structured into two parts; the theoretical framework is laid out in sections one, two and three, followed by the empirical part in sections four to six. The first two sections concentrate on introducing the subject under research, as well as on defining working capital management in the scope of this study. The second section explains the determinants of working capital management and outlines the terms used throughout this study. Section three examines the earlier research with respect to corporate performance and financial constraints. At the end of section three, the research questions of this study are introduced, and hypotheses presented. Section four explains the data and methodology used in the empirical part of the thesis, as well as defines the statistical regression models, test equations and variables used. Findings of the empirical part are presented in section five. Section six summarizes the study, discusses the results and their implications in more practical standpoint. In this last section, the limitations of this study are briefly commented and areas for future research, around the subject matter, suggested.

2. WORKING CAPITAL MANAGEMENT

Theoretical framework of this study is put forth out in the next four sections that define the terms associated with working capital management, determine the factors influencing working capital decisions and measures used to calculate the cycle times as well profitability ratios.

2.1. Defining working capital

Working capital can be defined as *"the result of the time lag between the expenditure for the purchase of raw materials and the collection for the sale of the finished product"* (Shin et al. 1998: 37). On a broad perspective working capital includes the current (short-term) items on the balance sheet. A typical balance sheet consists of current assets such as cash and cash equivalents, marketable securities, accounts receivable, inventories and prepaid expenses. Current liabilities can be divided into items such as short-term debt, accounts payable and accrued liabilities (White, Sondhi & Fried 1997). In practice, the notion of short-term refers to the capital items that remain in company's balance sheet approximately one year. In the measure of *net working capital,* current liabilities are excluded from the definition. As Eljelly (2004: 48) points out; *"this measure provides a useful tool in accessing the availability of funds to meet current operations of companies."*

(1)   Net working capital = Current assets – Current liabilities

Net working capital can be calculated as working capital percentage by dividing net working capital by revenue, to give better picture of the working capital level, regardless of the size of the company. Net working capital can also be divided by total assets, to calculate the fraction of working capital in the balance sheet. (Virkkala 2015: 5).

Working capital can be seen from two different perspectives, according to its' scope. *Operational working capital* consists of accounts receivable, inventories and accounts

payable, expressing the assets tied to the daily operations of a company. *Financial working capital* includes the items of net working capital which are not tied into operational working capital, and correspond to financial processes, such as cash and marketable securities. (e.g. Knauer et al. 2013; Hill, Kelly & Highfield 2010.)

The notion of *working capital requirement* has been used by several researchers, including Shulman and Cox (1985). According to Hill et al (2010: 784) it can be described as *"the sum of accounts receivable inventories net of accounts payable."* and defined as follows:

(2)   Working capital requirement = Net working capital – Net liquid balance

This study focuses on the management of operational working capital and its' relation to corporate performance. Thus, the term working capital is used to represent operational working capital. Accordingly, working capital in this study is defined as accounts receivable plus inventories less accounts payable.

(3)   Working capital = Accounts receivable + Inventories – Accounts payable

The above-mentioned operational components can also be called the non-cash portion of working capital (Mullins & Komisar 2009). *Accounts receivable* are claims held against the buyer for further receipt of money. Most companies sell their products and services on credit. Similarly, *accounts payable* occur when purchases are done under credit terms. *Inventories* consist of raw material stock, work-in-process and final goods. In many industries, especially in manufacturing, inventories are the most important component of working capital. (Monto 2013.)

As working capital management includes day-to-day decisions in relation to the individual components, management must thrive for an optimal level of each, since inventories, accounts receivable and accounts payable, all affect each other. (Knauer et al; 2013.) In practical terms, an optimal level of raw materials is targeted to ensure smooth production. Purchase of raw material raises the level on accounts payable while work-in-process and final goods create costs and tie-up capital. However, as Wang (2002) points

out, the reduction of inventory levels can also create a risk of lost sales, thus decreasing the accounts receivable. The trade-off between expected profitability and risk must be evaluated by the decision makers in the company, before setting the optimal level of investment in current assets (Garcia-Teruel et al. 2007: 166).

Firms can choose between relative benefits of two basic strategies for working capital policies; aggressive or conservative. *An aggressive working capital strategy* involves maintaining a low level of working capital by reducing accounts receivable and inventories to a minimum at the same time as slowing down the payments of purchase invoices, in other words, trying to extend the amount of short-term credit. In adopting an aggressive working capital policy, the risk of default and even bankruptcy increases. Tight inventory levels can lead to shortages and lost sales and the company's creditworthiness may be lowered by unmet promises in terms of invoices paid late. On the notion of return, the aggressive policies tend to increase return on assets, but not without risk of total income decreasing, when the smooth order-delivery process may be at risk. (Deloof 2003; Garcia-Teruel et al. 2007.)

Conservative working capital management, in turn, works the opposite way. The risks are lower, but the opportunity costs of leaving the investment opportunities unused, decrease the expected return on assets. Conservative policies also lower the sales efficiency of a company and may alienate potential investors. As all the working capital components affect each other, the optimal policy is one in which you allocate only the amount of working capital necessary to simultaneously maximize your revenues and minimize your risks. (Weinraub & Visscher 1998; Banos-Caballero et al. 2014.)

2.2. Determinants of working capital management

There are several factors influencing the working capital management style, scope and practices. This section draws together the determinants derived from prior research and discusses them with respect to this study.

1) Size

Company size has been empirically investigated to have positive relation to the level of working capital, although SME's obtain relatively larger level of working capital as a ratio of sales. Larger companies have better opportunities for financing the working capital mainly because they have easier access to capital markets, better information of the external financing sources and less risk of failing. Smaller companies tend to use more trade credit when facing challenges to finance their operations. (Banos-Caballero et al. 2010.) Although sales growth is found to be positively associated with the amount of trade credit used, the research of Niskanen and Niskanen (2006) found no evidence of such connection in the Finnish companies. This can be explained by the differences between bank-based (e.g. Nordic countries) and market-based financial systems (e.g. U.S.A). According to their paper, on trade credit determinants, even small companies in Finland have better access to bank debt than companies in U.S. In this thesis company size is measured by the natural logarithm of sales.

2) Leverage

According to Chiou, Cheng and Wu (2006), the cost of the funds invested in working capital is higher for firms with larger amounts of debt (i.e. leverage), because they must pay a higher risk premium. Leverage is commonly used determinant in the literature of working capital management. The empirical evidence demonstrates a reduction in the measures of working capital management when firms increase their leverage, thus negative relationship between leverage ratio and cash conversion cycle can be anticipated. In this study leverage is measured by total debt to total assets-ratio.

3) Return

The return of a company can be seen as crucial factor in analyzing the success of working capital policies. Return on assets (ROA) or return on equity (ROE) are the most common denominators to indicate the corporate profitability in studies concerning working capital management. According to Shin et al. (1998) firms with higher levels of return of assets (ROA), have better working capital management since they have greater market dominance, which leads to better bargaining power with suppliers and customers. Accordingly, companies with better performance can obtain external capital more easily and invest in more profitable opportunities. In this thesis P/L-ratio is used as proxy for corporate performance, and ROA as a control variable. These ratios will be introduced in more detail in section 2.4.

4) Growth

Kieschnick et al. (2006) demonstrated that future sales growth has a positive influence on firms working capital level and suggested that inventories could be build up in anticipation of sales growth. There has also been opposite conclusion in the literature over the relationship between the two factors. It has been argued that companies, in rapid growth phase tend to use more trade credit as a source of financing because they have difficulties in finding alternative financing methods. Furthermore, companies might extend more trade credit to their customers in an economic downturn to boost their sales. (Petersen & Rajan 1997.) The growth-variable was defined as the growth opportunity in the article by Banos-Caballero et al. (2014) and calculated by the ratio of intangible assets over total assets. In this study the growth variable is omitted, since there were too many missing values of intangible assets in the data set and the final sample size would have greatly diminished if growth would have taken into consideration.

5) Capacity to generate internal resources

Cash flow has often been introduced as a proxy for a company's capacity to generate internal resources. The external investors and managers dealing with working capital issues, often work with asymmetric information resulting in higher cost for external sources credit, thus making resources generated internally more lucrative choice. The findings of Fazzari and Petersen (1993) show that working capital investment is sensitive to cash flow. The empirical evidence from Niskanen et al. (2006) also supports the earlier research, indicating that firms with strong cash flows from operations use less trade credit in their financing. In this study cash flow is used among other the proxies for financial constraints and is calculated as the ratio of EBIT (Earnings before interest and taxes plus depreciation) to total assets, according to the model provided by Banos-Caballero et al. (2014).

6) Financial constraints

Financially constrained companies are found to have lower levels of working capital than unconstrained ones. There are several measures used in the working capital management literature, that separate firms that are suffering from financial constraints from those companies that are not. In this thesis we are following the example of Banos-Caballero et al. (2014) in classifying the sample by cash flow, size, cost of external financing and bankruptcy risk. Cash flow and size are calculated as explained above. Cost of external financing is a ratio of external financing expenses over total liabilities. The bankruptcy risk is, in turn, expressed by the z-score developed by Erkki K. Laitinen (e.g. Laitinen & Laitinen 2004), as it is bit simpler to calculate than Altman's (1968) z-score used in the paper by Banos-Caballero et al. (2014). Another denominator of bankruptcy risk is interest coverage ratio, which comes from the calculation of the earnings before interest and tax to financial expenses. The greater this ratio, the less problems the firm would face in repaying its debt (Banos-Caballero et al. 2014: 334).

7) Industry and seasonality of operations

There have been studies that focused their analysis on differences in working capital management across industries. Havawini, Viallet and Vora (1986), for example, indicate that there are significant differences in working capital behavior between different industries. The industry effect might be explained by differences in trade credit and investment in inventories. As an example, companies in service industry hold practically no inventories compared to manufacturing firms. The empirical evidence in this study is based on companies in metal industry, more specifically machining sector. In this industry the small and medium sized firms typically work as subcontractors to larger companies and have to hold relatively large level of inventories in raw materials and work-in progress, in order to satisfy the needs of the customers. Furthermore, the larger companies on customer's side often demand much looser terms of payment from the subcontractors than the subcontracting companies are able to ask from their suppliers. Niskanen et al. (2006) also suggested that there are differences in the levels of accounts receivable and accounts payable between industries.

The seasonality of the operations can be a major factor determining the working capital management policies and it varies between industries. Hill et al. (2010) argue that sales volatility cause firms to manage their working capital more aggressively. This effect can be detected in practice for example in shipbuilding industry. The accounts receivable tends to increase in peak seasons of sales, but the levels of inventories and payables are highest at the time when the company-internal cash flow is at the lowest. According to Enqvist, Graham and Nikkinen (2014), the macroeconomic business cycles also effect the levels of working capital. They argue that during economic downturns, companies should pay closer attention to working capital management, since it has more significant effect on profitability.

2.3. Measuring working capital

Financial analysts and company management have traditionally used current ratio and quick ratio as a key indicators of company's liquidity position (Richards & Laughlin 1980: 32). *Current ratio* measures whether the company has enough resources to meet its short-term obligations. It compares company's current assets with its current liabilities but fails to consider the expected cash flow of company or the accounts receivable that might be in danger of write-off as well as unsalable inventories. Hence, it gives a rather static view on the performance of a company. *Quick ratio* measures a company's ability to meet its short-term obligations with its most liquid assets by eliminating inventories. It represents more of a liquidation view to corporate performance, but nevertheless offers a look at a company at a certain balance sheet date and does not consider the fluctuations during a financial year (Richards et al. 1980.) As both of the above-mentioned traditional measures of company performance are static and do not offer a going-concern viewpoint, the more dynamic metrics to assess the working capital will be introduced in the following three sections. The turnover ratios will be discussed first, followed by cash conversion cycle and its modifications. The definition and short discussion of net trade cycle will be given in section 2.3.3. Lastly, a brief look at the measures of profitability, concerning this study, will be taken in section 2.3.4.

2.3.1.　　　Turnover ratios

Turnover ratios (activity ratios) measure the amount of time in which each working capital item is replaced during a financial year. It combines balance sheet and income statement information, to express the efficiency of the company on how it uses its assets to earn revenue. The following definitions are commonly used to calculate the turnover ratios:

(4)　　　*Accounts receivable turnover = Net sales / Accounts receivable*

(5)　　　*Inventory turnover = Cost of goods sold / Inventory*

(6)　　　*Accounts payable turnover = Cost of goods sold / Accounts payable*

Furthermore, average days outstanding ratios indicates the number of days the specific working capital item is tied in the balance sheet, as the turnover ratios above are divided by 365 days. (Virkkala, 2015: 8).

Days sales outstanding (DSO) or the average collection period defines the number of days it takes for its' customers to pay the bills. (e.g. Deloof 2003; Jose, Lancaster & Stevens 1996):

*(7)   Days sales outstanding = Accounts receivable / Net sales * 365*

Days inventory outstanding (DIO) is a measure for the company's inventory management. The average inventory period expresses the time from delivery of raw materials to sale of finished products (Knauer et al. 2013).

*(8)   Days inventory outstanding = Inventory / Cost of goods sold * 365*

Days payables outstanding (DPO) or the average payment period expresses the number of days the company on average takes to pay its suppliers, creating liabilities in the balance sheet. (e.g. Deloof 2003; Jose et al. 1996):

*(9)   Days payable outstanding = Accounts payable / Cost of goods sold * 365*

The above described turnover ratios are elements that determine the cash conversion cycle and other related cycle models, that are widely used as proxies for the efficiency of working capital management. The cash conversion cycle and net trade cycle are introduced in more detail in the following two sections.

2.3.2.   Cash conversion cycle

Cash conversion cycle (CCC) is widely used as a measure for efficient working capital management in the finance and accounting literature. It originates from the *operating cycle* and was first introduced by Gitman (1974), under the name of *cash cycle* and

developed further by Richards et al. (1980). By definition, it is the time lag between the expenditure for the purchases of raw materials and the collection of sales of finished goods. According to Shin et al. (1998), cash conversion cycle represents the continuing flow of cash from suppliers to inventory to accounts receivable and back. Formally, CCC, quoted in days, is computed as follows:

(10)   *Cash conversion cycle = DSO + DIO – DPO*

The aim of an efficient working capital management has traditionally been set on shortening the cash conversion cycle, thus increasing company profitability. The individual elements of CCC play a crucial role in this; inventories (DIO) can be decreased by effective planning of the production, accounts receivable (DSO) levels by tightening the payment terms of customers and accounts payable (DPO) levels by negotiating longer terms of payment with respect to suppliers. The length of the CCC also corresponds to sufficiency of cash flows in the company and the level of external financing needed for the working capital. When the internal growth of the company is not enough to finance the working capital, accounts payable levels tend to increase and have an opposite effect on cash conversion cycle. (Deloof 2003: 576; Nobanee, Abdullatif & Al Hajjar 2011: 149, Knauer et al. 2013: 79, 85.) The elements and idea of cash conversion cycle are combined in graphical form in Figure 2.
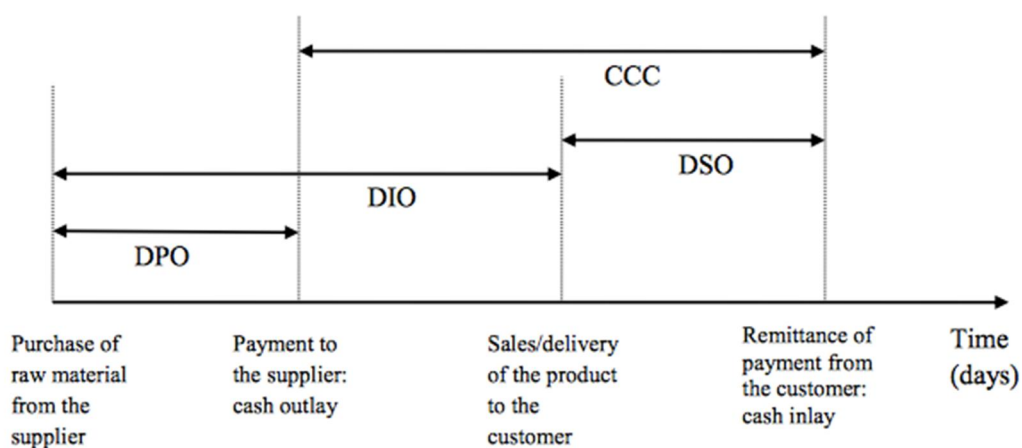

Figure 2. Cash conversion cycle (CCC) (adopted from Richards et al. 1980).

A similar measure, only called *cash-to-cash cycle* has been used in supply chain management lately to calculate the process efficiency in all operations of a company, including purchases, manufacturing, transportation and sales activities (Farris & Hutchinson 2002).

As the latest research points out, the relation between working capital and profitability is not linear, but concave, indicating that an optimal level of working capital exists. This means that tighter working capital management may affect the company profitability positively only *to a certain extent* and this should be taken into consideration when using the CCC of NTC as proxies for working capital management. Banos-Caballero et al. (2014) suggest that managers should keep as close to the optimum as possible to avoid additional financing expenses and deteriorating firm value.

There are some modifications to cash conversion cycle that have been developed later but have been rarely used in the empirical research. The *weighted cash conversion cycle* (WCCC), introduced by Gentry, Vaidyanathan & Lee (1990) gives a more precise picture of the different stages of inventory; raw materials, work in progress and finished goods. It scales the timing, by the amount of funds in each step of the CCC. It does give more accurate information than the conventional cash conversion cycle, but in many cases the required information for calculating it, is not publicly available to external analysts. (Shin et al. 1998: 38)

A group of Finnish researchers have further developed the cash conversion cycle in their theoretical models for production industry. Talonpoika, Monto, Pirttilä & Kärri (2014) introduced the *modified cash conversion cycle (MCCC)*, which also considers the advance payments that are not regarded as factor in the original cash conversion cycle developed by Richards et al. (1980). In many industries, especially when operating in project basis, advance payments can be a significant source of financing. The MCCC is calculated by deducting a new component, days advance payments outstanding, from the standard cash conversion cycle. Talonpoika et al. (2014) consider only the received advance payments in their model, but they further argue that the model can be used for other components of operational working capital as well. Downside of this model is, that

it can hardly be used for larger sampled due to the difficulties in attaining the information to calculate the advance payments.

2.3.3.   Net trade cycle

As an alternative approach, another dynamic measure for working capital turnover is the net trade cycle (NTC). Developed by Shin et al. (1998) the net trade cycle describes the number of sales days required for the company to finance working capital. In practice, the NTC is the ratio of the three main working capital components, divided by sales in days. This approach loses some of the accuracy, but has a distinctive advantage, since it is easier to calculate, and the information is found for all types of companies, including the ones that use total cost accounting (Knauer et al. 2013: 80-81).

The NTC is calculated as follows:

(11)   Net trade cycle = (Accounts receivable + Inventories – Accounts payable) * 365/ Sales

The research by Shin et al. (1998) demonstrated that by shortening the NTC companies can increase their profitability. The net trade cycle and cash conversion cycle are often used interchangeably in research purposes or the hypotheses are tested with both cycles for comparison. In some cases, the calculation of NTC gives longer cycle times, since the value of inventories cannot be calculated for their selling price and the inventory to sales ratio shortens the inventory turnover ratio. In general, the net trade cycle proves to be an easily calculated metric assessing, for example, the effect of a company growth to the financing requirements of working capital.

2.4. Working capital and profitability

Profitability is the primary goal in any business venture. Profitability can be defined to be the ability of a company to use its resources to generate revenues in excess of its expenses. In other words, it is a company's capability of generating profits from its operations. Profitability of a firm is represented by the rate of return on its capital

employed. It can be measured by indexes related to turnover (sales) or by ratios the connected to assets.

The most used proxy for profitability in the earlier studies on the topic has been return on assets (ROA) (Knauer et al. 2013: 81-82). ROA shows the percentage of how profitable a company's assets are in generating revenue. Return on assets is defined as follows:

(12)   *Return on assets = (Operating income / Total assets) * 100*

Return on equity (ROE), in turn, measures the profits earned in relation to shareholder investments. The ROE is not as popular metric in the earlier research on the subject, since the capital structures of companies affect the ratio and all results are not comparable. ROE is defined in following way:

(13)   *Return on equity = (Net income / Shareholder's equity) * 100*

Finally, the return on investment, ROI expresses the amount of return on an investment relative to the cost of investment. To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment, and the result is expressed as a percentage or a ratio. The calculation of ROI is following:

(14)   *Return on investment = (net income + finance costs + taxes) / total cost of investment * 100*

As Knauer et al. (2013: 82) states in their survey, most prior working capital studies have used ROA and/or ROE as a measure for profitability (e.g. Jose et al. 1996; Shin et al. 1998; Wang 2002; Banos-Caballero et al. 2012). There are exceptions, however, and gross operating income (gross margin divided by total assets, less financial assets) has also been a well-used ratio to measure company profitability (e.g. Deloof 2003; Lazaridis et al. 2006). In this study the corporate performance is measured by P/L-ratio and calculated as follows:

(15)   *P/L-ratio = (net profit + depreciation and amortization) / sales * 100*

P/L-ratio identifies the profit gained by the operations of the company, taking the taxation into account as well. Thus, it is measuring the success of the operational activities of a company and expresses the amount of profit, the company is able to generate to its own needs. ROA, in the other hand, is used as control variable, in this study.

3. PRIOR RESEARCH

Earlier research in the field has mainly concentrated on studying the effect of working capital management in relation to company profitability, using cash conversion cycle (or net trade cycle) as a proxy for working capital management. A typical research setting in the studies since late 1990's has been to regress ROA or some other profitability ratio on cash conversion cycle and its' separate components. Popular control variables in this type of regression model have been company size, growth rate and debt ratio. (e.g. Shin et al. 1998; Garcia-Teruel et al. 2007.) A common and most traditional view to assess the efficiency of working capital management, is to expect a linear, negative relation between cash conversion cycle and company profitability. Thus, a longer cash conversion cycle affects company performance negatively and a shorter cycle has a positive impact on profitability. However, some studies have come to different conclusions when regressing the profitability ratios against the individual components of cash conversion cycle (DSO, DIO and DPO or equivalent). The latest research supports the idea that the above discussed relationship is more likely to be non-linear and deviations from optimal level of working capital reduce profitability. (Banos-Caballero et al. 2014.) The prior research on the topics related to this study will be discussed in the next three sections.

3.1. Working capital management and corporate performance

Jose et al. (1996) were among the first researchers to address the topic, using a large sample of listed companies in US over the period of 1974-1993. They used long run average values for each company instead of treating every company-year value as a specific observation. The result of their study indicated that cash conversion cycle (CCC) had a negative effect on, both ROA and ROE. They reached the same results in cross-sectional sample as well as in industry-specific samples except for construction industry. They found out that the negative impact of working capital level on profitability varies by industry and is not dependent on company size. However, larger companies tend to have generally shorter CCC and higher ROA.

One of the most cited papers on the topic has been the study by Shin et al. (1998), investigating the relationship between the company's net trade cycle (NTC) and its profitability. Profitability was measured by operating income plus depreciation as a percentage of total assets and net sales. Moreover, Jensen's Alpha and Treynor Index were calculated to measure the risk-adjusted stock returns. They used a Compustat sample of almost 60 000 observations from listed US companies, covering a period of over 20 years and found a strong negative association between a firm's NTC and its profitability as well as stock returns. Shin et al. (1998) divided the sample into eight industries to examine the industry effect and concluded that the overall negative relation between NTC and risk adjusted stock return holds, but the level differs depending on industry under study. The empirical evidence in this study shows that profitability of a company can be increased, and shareholder value created by reducing the company's net trade cycle to a reasonable minimum.

Wang (2000) examined the relation between liquidity and working capital management on both profitability and market value in Japanese and Taiwanese companies, in 1985-1996. He used correlation and regression analysis to study the effect of cash conversion cycle on return on assets (ROA) and return on equity (ROE) in the sample of 1900 companies. Wang classified the companies according to their market value, using Tobin's Q-ratio. The results show more significant negative effect of cash conversion cycle on ROA in higher market value companies than companies with lower market value. The relationship of CCC and ROA varies considerably between industries, but not between the companies in the two different countries, regardless of the different financial systems of Japan and Taiwan.

Deloof (2003) investigated the relation of cash conversion cycle and gross operating income for a sample of 1009 large Belgian non-financial firms in 1992-1996. Number of days' accounts receivable (DSO), inventories (DIO) and accounts payable (DPO) were used as measures of trade credit and inventory policies. The estimations using of both fixed effect regression and ordinary least squares (OLS) model confirmed a strong negative association between CCC, DSO, DIO and DPO. These results suggest that managers can create value for the shareholders by reducing the levels of inventories and accounts receivable to a reasonable minimum. Deloof also found a negative correlation

between accounts payable and gross operating income, which can be a sign of weakly performing companies paying their invoices late. Similarly, the negative impact of inventory on profitability can be caused by an increase in inventory due to declining sales. Therefore, according to Deloof's study, it cannot be ruled out that the negative relation between working capital management and profitability is a consequence of profitability affecting WCM and not the other way around.

Eljelly's (2004) study on the tradeoff between liquidity and working capital in relation to profitability used a small sample of quoted firms in Saudi Arabia over the period of 1996-2000. Cash gap and current ratio were used as proxies for liquidity and contribution margin percentage as a measure for profitability. The study reveals that there is a significant, negative relation between profitability and liquidity measures. As many of the earlier researchers, Eljelly also used size and industry as dummy variables. His conclusion was that cash gap is more significant measure in capital-intensive industries, while current ratio is more significant in labor-intensive industries. Size is also found to have some influence over profitability within economic sectors, but not in the overall sample. Eljelly was one of the first researchers to conduct a study on the topic in an emerging market, but the small sample size and particularities of Saudi financial environment can make the generalization of the results limited.

Following Eljelly's (2004) paper there have been several studies concentrating on quite similar research settings, where the data is collected from companies active in emerging markets. For example, Raheman and Nash (2007) used listed companies in Pakistan in 1999-2004 (Karachi Stock Exchange) in their study of the association between the cash conversion cycle and profitability measured by net profit over total assets. They found a significant negative relation between these two measures, like the earlier research had predicted. The size of the company was found to have positive effect on profitability. Furthermore, the importance of a balance between liquidity (measured by current ratio) and profitability was emphasized in this study.

Mathuva (2010) conducted his analysis on a sample of companies from Nairobi Stock Exchange, using cash conversion cycle and sales profit as measures for WCM and profitability. The results are in line with the previous studies, except for the relation between DIO and profitability, which was found positive, thus interpreting a need for

higher inventory levels to ensure smooth production and on time delivery of goods and services.

There are other research papers addressing the topic area in the emerging markets and countries with developing or restricted financial systems (see e.g. Falope & Ajilore 2009; Mohamad & Saad 2010; Wasiuzzaman 2015), but since the scope of this study lies on Finnish companies, this literature review concentrates mainly on prior research made in related business and financial environments.

Lazaridis et al. (2006) based their study on the earlier research of Shin et al. (1998) and Deloof (2003), investigating a sample of 131 companies listed in the Athens Stock Exchange for the period of 2001-2004. The results were in accordance with the prior studies as well, in finding a statistically significant, negative relation between profitability, measured through gross operating profit, and the cash conversion cycle. They suggest that management should keep each operational working capital component (accounts receivable, inventories and accounts payable) to an optimum level to create profit for their companies.

The paper by Gill, Biger and Mathur (2010) sought to extend the findings by Lazaridis et al. (2006) by studying a sample of 88 American manufacturing firms listed on New York Stock Exchange for a period from 2005 to 2007, with the cash conversion cycle and gross operating profit as variables for working capital management and profitability respectively. The regression analysis method in their paper was weighted least squares model with cross section weight of five different manufacturing sectors. The empirical results confirmed the findings of earlier research regarding the negative relationship between the average days accounts receivable and profitability. (e.g. Lazaridis et al. 2006). Gill et al. (2010) found a weak positive correlation between CCC and profitability, yet the association between average days' accounts payable and inventories with profitability was not significant. No significant relationship between firm size and gross operating profit was found either. The findings of the paper suggest that shareholder value can be created by reducing the number of days for accounts receivable.

The working capital research have mainly focused on listed, larger companies over the 1990's and beginning of 2000's. Padachi (2006) and Garcia-Teruel et al. (2007)

contributed to the literature by studying the subject matter in small and medium sized companies. Padachi used a sample of 58 small manufacturing firms in Mauritius, between 1998 and 2003, to study the effect of working capital management on profitability. Like in many earlier papers, cash conversion cycle was used as a proxy for WCM and return on assets measured profitability. The results conclude that higher levels of inventory and accounts receivable along with lower amount of accounts payable are associated with lower profitability. There was a weak positive correlation between CCC and profitability, referring to situation when the cost of fixed assets is lower than benefits from larger inventories and early payment discounts related to increased sales. According to this study, smaller companies have generally less possibilities for long-term financing compared to larger companies. This leads to small companies financing their working capital by accounts payable, short-term bank loans and shareholders' equity.

Garcia-Teruel et al. (2007) were the first researchers to address the possible presence of endogeneity problems found in the earlier studies, by using instrumental variables in their panel data setting. They collected a financial report data of about 8 900 Spanish small- and medium sized firms, covering the period of 1996-2002 and regressed return on assets against cash conversion cycle and the cycle times of accounts receivable, inventories and accounts payable. Following other studies; size, sales growth and leverage were used as control variables. The data set was divided into 8 industry groups and the economic cycle was taken into consideration, using annual GDP growth as a measure. The results confirm the conclusions of earlier research (Jose et al, 1996; Shin et al, 1998; Wang, 2002; Deloof, 2003), stating that a strong negative correlation between profitability and the number of days' accounts receivable and days of inventory, also holds in the case of SME's in Spain. A weak association between ROA and accounts payable was found, but the result is robust to endogeneity problems and as such not significant. Unlike Deloof (2003), Garcia-Teruel et al. (2007) found out that cash conversion cycle affects the profitability of the company and not vice versa.

There have been only few papers investigating the impact of working capital management on company performance (i.e. profitability) in the Nordic countries. Enqvist et al. (2014) examined the working capital-profitability relationship using a sample of Finnish listed companies over an 18-year period (1990-2008), concentrating especially on the role of

business cycles. They utilized cash conversion cycle as a measure of working capital. Return of assets (ROA) and gross operating income were used as measures of profitability. They documented a negative relationship between the variables, largely mirroring the findings from other countries. The results also show that the negative effect of cash conversion cycle on profitability is enhanced during economic downturn, but there no significant effect during higher economic state. The findings indicate that investing in working capital processes and incorporating working capital efficiency into everyday management of a company is essential for its performance. Furthermore, the national economic policy should aim at boosting cash flows of firms thus possibly increasing the ability of companies to finance working capital internally, especially during lower economic cycles.

The first empirical study to address the issue on Swedish context was the paper by Yazdanfar et al. (2014). They contributed to the existing literature by using a seemingly unrelated regression (SUR) model to analyze a cross-sectional panel data covering almost 14 000 Swedish SME's in four industries, over the 2008-2011 period. Like earlier research on the field, the empirical evidence from Sweden also indicates that an optimal cash conversion cycle can help firms to improve their performance. Furthermore, the control variables used in the study, namely firm size and firm age, were found be related to profitability as well. Large, young SMEs with short CCCs are therefore more likely to be profitable. Industry affiliation was also found to affect firm profitability and no single policy to optimize cash conversion cycle levels can be suitable across industries.

The Norwegian evidence on the subject matter was presented by Lyngstadaas et al. (2016) in their study of over 21 000 small- and medium-sized enterprises, between 2010 and 2013. In their paper, fixed effects panel data regressions were applied and a two-stage least squares analysis was employed to control for endogeneity. In line with prior literature, they found a negative relationship between return on assets as a proxy for profitability and cash conversion cycle (and its separate components) as a measure for working capital management. In the lines of Banos-Caballero et al. (2014) a non-linear relationship between the components of CCC and ROA was detected. Regarding the control variables, debt was found to have negative effect on profitability, indicating that company performance decreases with increasing debt and in general increases in periods

of economic growth, probably benefiting from aggressive working capital management strategy. However, Lyngstadaas et al. (2016) also note that overly aggressive WCM policies may lead to lower profitability levels, as the opportunity costs rise. In practical terms companies may alienate potential customers with tight trade credits or face supply shortages due to low inventory levels. The authors came to similar results also when industry-specific effects were controlled for, thus the aggressive working capital policy in Norwegian firms was confirmed by this study.

3.2. Investment in working capital and financial constraints

A large amount of working capital management research examines individual components of operating working capital without connection to the financing challenges that the companies in different industries and of different sizes face. The importance of working capital management practices is underlined in industries with large working capital percentage of total assets, for example in manufacturing. The size of a company plays an important role in the overall management of working capital. Smaller companies tend to have more short-term debt, less equity and more fluctuating cash flows than larger enterprises, thus the optimal level of working capital affects company profitability in a faster cycle in small and medium sized companies. Small companies also face greater financial constraints, since their access to capital market is limited and likelihood of bankruptcy is higher than in larger companies. (e.g. Petersen et al. 1995; Niskanen et al. 2006; Banos-Caballero et al. 2010)

Hill et al. (2010) addressed the question in their paper by integrating the components of working capital management to investigate factors influencing the investment in operating working capital. The sample studied included over 21 000 firm-year observations for 3 343 companies from 1996 to 2006, collected from Compustat database. The empirical models in the paper related the working capital requirement (WCR) ratio to operating conditions and financing ability. The authors used WCR as dependent variable and found a strong relationship between net operating working capital and operating conditions, measured by sales growth, contribution margin and sales volatility. The variables describing the ability to finance working capital were; operating cash flow,

cost of external financing and capital market access along with market power and financial stress factor. The results indicate that sales growth, sales volatility, expensive external financing as well as financial distress cause firms to use more aggressive working capital management practices. The results also show that working capital behavior is influenced by financing constraints. Firms with greater internal financing capacity and better access to capital markets use more conservative working capital practices. This evidence emphasizes that operating and financing conditions should be considered when assessing working capital behavior, not just industry averages.

Garcia-Teruel et al. (2010) analyzed the financing challenges of small and medium sized companies by comparing the use of trade credit in seven different European countries across industries. Their sample consisted of over 47 000 SMEs in Belgium, Finland, France, Greece, Spain, Sweden and UK for the period of 1996 to 2002. They followed the study of Petersen et al. (1997) and examined whether the particular characteristics of firms, such as availability of financial resources, creditworthiness, sales growth and price discrimination affect the decision on trade credit policies. Furthermore, the country and industry-specific effects were analyzed. Their results reveal that credit trade decisions taken by firms are strongly homogenous in European countries studied, although the level of trade credit varies between the countries. Companies with better capacity to obtain financing from the capital markets, in cheaper terms (i.e. larger companies), grant more trade credit to their customers than smaller SMEs. Firms also increase the credit they grant in the face of falling sales.

Regarding the accounts payable, the results indicate that the larger European SMEs, that have better creditworthiness and greater growth opportunities, also receive more financing from their suppliers in terms of trade credit. In contrast, less trade credit is used when the companies have other opportunities to obtain external financing at a lower cost. The same effect applies when their capacity to generate internal financing increases. As a conclusion, Garcia-Teruel et al. (2010) noted that trade credit terms vary between industries, but there is very little variation within industries in the European sample of SME's. The working capital policy decisions based on trade credit are affected by the same factors regardless of the country which they operate in. The differences are mainly explained by different terms of payment and possibly by the different financial market

structure across the countries. Since the countries in continental Europe (Belgium, France, Greece and Spain), have the highest levels of trade credit in use, they have been particularly concerned with the working capital practices.

Niskanen et al. (2006) derived largely similar results in their paper on trade credit policies of small companies in Finland. Their sample had 2 700 total annual observations in seven industries, over a three-year-period, in a bank-dominated financial environment. The result of their study indicates that creditworthiness and access to capital markets are the most important determinants of trade credit extended to sellers. The level of purchases correlates positively with the level of accounts payable. Therefore, larger and older firms and firms with strong internal financing are less likely to use trade credit in the Finnish example. In turn companies with high ratio of current assets to total assets use it more. The results suggest that financially constrained small companies in Finland use more trade credit as an alternative source of funding. Furthermore, a close relationship with lending banks increases loan availability.

Banos-Caballero et al. (2010) continued researching the earlier topic by Garcia-Teruel et al. (2007) of working capital management in SMEs, this time with a panel data sample of non-financial Spanish firms, 2001-2005, in seven industry groups. They developed a target adjustment model to assess the characteristics of firms that might explain the length of cash conversion cycle. The main result of their study states that these firms have a target length for cash conversion cycle, to which they try to converge. Small companies adjust their target CCC relatively quickly, which could be explained by the fact that staying close to optimal cash conversion cycle level keeps their financing costs under control. The target length of CCC is longer for older firms and companies with larger cash flows. Moreover, the small companies operate under greater financial constraints and usually have more difficulties in acquiring external funding in the long-term capital markets. Companies with better growth opportunities, higher leverage, ROA and investment in fixed assets, practice more aggressive working capital policy. Results seem to indicate that the cost of financing has a negative effect on firms' CCCs and better access to capital market might increase their investment in working capital. The results are only partly compatible with the previous studies, which, according to the authors is due to problems of endogeneity in the research settings and heterogeneity of the sample.

This paper underlines the importance of market imperfections for managing the CCCs in SMEs, which have an impact on the investment in working capital.

Ebben and Johnson (2011) analyzed relationships between cash conversion cycle and invested capital, liquidity, and performance of small U.S. manufacturing and retail firms over a three-year period. Significant relation between these four aspects was discovered, but on the contrary to the traditional belief of liquidity-profitability trade off (e.g. Eljelly 2004), they found evidence that companies with shorter cash conversion cycle are both more liquid and more profitable, requiring less invested capital. The results also indicate that small business owners/managers are reactive in their management style with respect to working capital items. The study highlights the importance of cash conversion cycle as a proactive management tool for small companies in general and especially when faced by financial difficulties.

Kieschnick et al. (2013) provided the first empirical study of the relationship between working capital management and shareholders' wealth in the United States. Using data collected from Compustat and Center for Research on Security Prices, of listed U.S. corporations from 1990 through 2006, they found significant evidence that an incremental dollar invested in net operating capital is worth less than an incremental dollar held in cash. In practical terms, the risk regarding accounts receivable is related to the collection times of invoices and to payment terms. The risk regarding inventories is whether the products are sold at all. This outcome is consistent with Autukaite and Molay's (2011) evidence for French firms as well as the empirical study of Ribeiro de Almeida and Eid (2013) in the Brazilian business environment. The outcome of the study by Kieschnick et al. (2013) suggests that the value of additional dollar invested in net operating working capital is worth less for shareholders when the company has a high debt ratio and bankruptcy risk and worth more when company has better access to capital markets and higher expectations for future sales growth.

Banos-Caballero et al. (2014) offered empirical evidence for the linkage between working capital management and market performance on a sample of around 250 listed companies in the United Kingdom for the period of 2001-2007. They applied similar research methods as in their previous paper by using a panel data model and employing general method of moments (GMM) estimation. The main contribution of their paper is the strong

support for a non-linear relationship between the two variables, market-to-book ratio representing the corporate performance and net trade cycle the effect of working capital management. Using quadratic model, they discovered an inverted U-shaped relation, which implies that there exists an optimal level on investment in working capital that balances costs and benefits and maximizes company performance. The concave relationship denotes that deviations from optimum level lead to either lost sales and lost discounts for early payments, or additional financing expenses. The study also analyzed whether the optimal working capital level is sensitive to financial constraints, such as cost of external financing, bankruptcy risk, level of cash flows and dividend payout ratio. The results predict a lower working capital optimum for financially constrained companies than the optimum for less constrained ones.

3.3. Industry differences in working capital management

Industry effect has been briefly discussed as a part of the overall research conclusion in most of the papers introduced earlier in this study. (e.g. Jose et al. 1996; Wang 2000; Shin et al. 1998; Garcia-Teruel et al. 2007; Yazdanfar et al. 2014.) There have been very few studies that concentrate solely in investigating the industry differences as such in the working capital management literature. However, operating working capital policies of for example manufacturing firms are markedly different from companies in service industry, because the former typically have substantial levels of inventory and the latter carries no inventory at all.

One of the pioneering papers in this topic has been the study by Hawawini et al. (1986) that examined a sample of 1 181 U.S. companies from 36 industries over a period of 19 years. They introduced a notion of *working capital requirement* (WCR) to measure firms' investment in working capital across industries. They argue that working capital requirement is determined by three basic variables; firm's technology, the degree of efficiency in its operating cycle and the level of sales. According to the large empirical evidence in their study, every industry has a benchmark value for WCR, to which firms adhere when setting their working capital investment policies.

Weinraub et al. (1998) looked at 10 different industry groups in a Compustat sample of 216 American companies over the years from 1984-1993. They measured the relationship between aggressive and conservative working capital practices by comparing current liabilities and total assets ratios. The conclusion of their study shows that there are significant differences in the asset management policies between industries and they stay stable over time. Regarding the degree of aggressive/conservative liability management, the results were similar, but with lower significance. The study also showed a high negative correlation between the two policies, thus relatively aggressive working capital asset management seems to be balanced by more conservative liability management policies.

Filbeck and Krueger's (2005) research was based on the annual ratings of working capital management published in CFO magazine from 1996 to 2000. They studied the key components of cash conversion cycle and turnover ratios in 32 different industries in a global list of public companies, that is updated annually by the CFO Working Capital Survey. Their findings support the idea that working capital ratios differ significantly between industries across time. In addition, these ratios change annually within industries, yet these changes are consistent enough for the performance ranking in question to remain stable over time. The authors point out that these changes may be partly explained by macroeconomic factors, such as changes in interest rates, rate of innovation, and competition. The focal point of their study however is that the industry in which the company operates determines the policies used in working capital management. The empirical evidence shows that different industries have different working capital needs and the management must act accordingly to face the challenges.

3.4. Other research on the field

The literature review in this study, like the actual research itself, has mainly concentrated on expressing the empirical evidence of the relationship between working capital management and corporate performance. This relationship has been studied mostly by quantitative methods, such as linear regression models, in the research settings. As can be seen from the examples given on prior research in the previous three sections, most of the papers at end of 1990's and beginning of 2000's, have used samples of listed, larger companies in U.S., European and Asian countries. However, in the past ten years, the abundance of studies made in countries, that differ from the western business and financial environments has been remarkable. The number research in small and medium-sized companies has also increased and industry differences has been taken in account in many of the studies described in literature preview. The latest studies have also questioned the linearity of the relationship between company profitability and the individual cycle items in working capital management, finding a concave association between the variables.

In the latest working capital research in Finland, there has been several publications that analyze the efficiency of working capital management in value chains of different industries, thus taking into consideration the inter-organizational accounting aspect, as well as financial supply chain management. In the doctoral dissertation by Monto (2013), five published papers of the subject matter are combined in attempt to develop a model for inter-organizational working capital management. (see e.g. Viskari, Pirttilä & Kärri 2011; Viskari & Kärri 2012.) Monto's research develops a model which show how working capital can be monitored through value chain on the corporation level and on the product level. It also offers practical mechanisms to managing working capital in collaboration between the different organizational functions. This study shares the theoretical framework with research by Grosse-Ryuken, Wagner & Yonke (2011), who stated that collaborative working capital management ensures sustainable relationships in the long term, when a balanced cash conversion cycle is a target for the entire supply chain.

As Knauer et al. (2013) argue in their survey paper, qualitative studies in the topic are rare in the literature so far. They would, however, help in advising companies in practical way on e.g. how to reduce the cash conversion cycle or in developing a pecking order of working capital instruments (e.g. factoring, inventory management). This would help firms in their everyday decision making considering the working capital management practices.

One example of a research towards this direction is a study by Ramiah, Zhao and Moosa (2013), that aimed to document the measures taken by Australian corporate treasurers in their working capital management practices to survive the global financial crisis during 2007-2008. Using qualitative techniques like interviews and a survey questionnaire they summarized certain measures adopted by working capital managers. The results show that most of the managers in 120 participants of the survey/interviews emphasized the importance of liquidity and credit risk control during the global financial crisis. More than half of them adopted more conservative policies in terms of stricter credit control, improvement in monitoring systems and more frequent review of their working capital practices. They also focused on risk control and shortening of the cash conversion cycle. In the face of liquidity challenges, firms tended to reduce expenditure and inventory levels as well as aiming to reduce debt.

Another qualitative study, made in Finnish context, is a recent paper by Talonpoika, Kärri, Pirttilä and Monto (2016) that focuses on developing strategies for financial working capital management and presenting a new measure; financial working capital cycle (FCC). Empirical data consists of 91 companies listed in Helsinki Stock Exchange between 2008 and 2012 and the variables in the comparative analysis are selected from the previous literature in financial working capital, which is much lower in volume than the research in operational working capital. As the result this study 11 possible strategies for financial working capital are presented, which are suitable for all companies regardless of their profitability, capital intensity or working capital requirements.

As this study is restricted to address the issues concerning operational working capital management in quantitative terms, the above look on the qualitative side of the research is given just as an example of variability and future prospects for the topic in question. In the following sections the main research questions and hypotheses of this study will be

introduced and the data and methods presented. Finally, the empirical evidence is introduced, and conclusions made in the last section of the study.

3.5. Research questions in this study

The aim of this study is to investigate the impact of working capital management on corporate performance, when financial constraints are taken into consideration accordingly. This study follows the lines of earlier study by Banos-Caballero et. al (2014), by using NTC as a proxy for working capital management and P/L-ratio as an expression of corporate performance. Furthermore, a non-linear function of the relationship between the factors is expected, as several recent studies have found evidence on a concave relationship between WCM and corporate performance, indicating that there exists an optimal level of investment in working capital. (e.g. Garcia-Teruel et al. 2007; Banos-Caballero et al. 2014; Yazdanfar et al. 2014; Lyngstadaas et al. 2016.) Thus, the first three hypotheses of this paper can be defined in the following terms:

H1 There is an inverted U-shaped relation between working capital management and corporate performance.

H2 Company size influences corporate performance positively.

H3 Leverage influences corporate performance negatively.

Banos-Caballero et al. (2014) along with other researchers have further argued that financial distress has a definitive impact on company's working capital levels and their relation to the overall profitability. They found out that the optimal working capital level for companies suffering from financial constraints (e.g. low cash flow, small size, high financing costs, low interest coverage and high bankruptcy risk) is lower than for companies with less financial trouble. Thus, the hypothesis for the second part of the empirical study is as follows:

H4 The optimal working capital level for companies with more financial constraints is lower than for companies with less financial constraints.

In the next sections these hypotheses will be tested, and empirical evidence presented.

4. DATA AND METHODOLOGY

Section 4.1. concentrates on specifying the model and variables used in this study, mirroring them to the earlier research, in particular to the article by Banos-Caballero et al. (2014). The two statistical regression models used are presented and the basis for variable selection discussed. Section 4.2. lays out the data and summary statistics, shortly explaining values and ranges of the variables used. Section 4.3. displays the basics of the methodology used in the study, namely correlation analyses, panel data method and least squares estimation.

4.1. Specification of the model and variables

This study is conducted in two parts, based on the example presented in the earlier paper by Banos-Caballero et al (2014). *First*, the possible non-linearity of the relationship between working capital management and corporate performance is examined. In order to test the expected functional form (concave, inverted U-shape) a quadratic model is used. This is done by regressing the dependent variable, P/L-ratio against the independent variables NTC and its square (NTC^2) and using company size, leverage and ROA as control variables.

The choice of the variables in this study are based on previous research, such as the papers by Deloof (2003), Garcia-Teruel et al. (2007) and Banos-Caballero et al. (2014) along with the latest studies by Yazdanfar et al. (2014) and Lyngstadaas et al. (2016). The variables were derived from the financial data in Orbis-database. As many of the variables were not readily available in final form in Orbis, they were calculated according to the equations given in prior research papers and these equations are explained in more detail below.

The calculation of corporate performance was defined by Banos-Caballero et al. (2014) by the following equation:

(16)   Q = (market value of equity + book value of debt) / book value of assets

However, the above described basis for the corporate performance is not used in this study, because the sample is of non-listed companies, that do not have market values. Instead, measures of accounting profitability, more precisely P/L-ratio is used in this study. P/L-ratio is calculated the following way;

(17)   P/L = (net profit+depreciation and amortization) / sales * 100

Banos-Caballero & al. (2014) mention in their article that they have derived similar results in their research using accounting-based profitability measures as when using market to book-values. (Banos-Caballero & al. 2014, 335). Many other researchers, such as Deloof (2003) and Garcia-Teruel et al. (2007) have used the accounting-based profitability measures instead of market values as proxies for corporate performance in their papers as well.

As mentioned earlier, the independent variable, net trade cycle, comes from the equation presented by Shin et al. (1998), namely;

(18)   NTC = (accounts receivable + inventories – accounts payable) * 365 / sales.

In line with the Banos-Caballero et al. (2014) this study employs the natural logarithm of sales as a proxy for company *size*. According to previous studies, company size influences both the working capital level and profitability, and these studies have suggested a positive relationship between company size and corporate performance. In other words, larger companies have better access to different modes of financing, whereas smaller companies tend to use accounts payable and trade credit as a source of short time funding. Thus, the earlier (in section 3.5.) stated hypothesis; *H2 Company size influences corporate performance positively* will be tested using regression model 1, explained later in this section.

Another control variable, *leverage*, is the ratio of total debt over total assets and it is expected to have a negative relationship with P/L-ratio, indicating that the corporate performance deteriorates as the relative amount of debt increases. The third hypothesis, namely, *H3 Leverage influences corporate performance negatively* will be tested accordingly by regression model 1.

ROA is used as the third control variable and is expected to have positive relationship with corporate performance. This relationship can be seen as natural, since both return on assets and P/L-ratio are used as profitability measures in many of the earlier studies. In this case ROA is chosen as a control variable to follow the example set by the Banos-Caballero et al. (2014). One may argue about the added value of including ROA as a control variable, but in this study the explanatory power (R^2) of the model is increased by incorporating ROA in the model. Because of all that was explained above, the first regression model can be specified in the following way.

Regression model 1:

(19) $P/L_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + ROA_{i,t} + \varepsilon_{i,t}$

Where:

P/L = (net profit+depreciation and amortization) / sales *100

NTC = (accounts receivable + inventories – accounts payable) * 365 / sales

SIZE = natural logarithm of sales

LEVERAGE = total debt / total assets

ROA = EBIT / total assets *100

ε = error term

When $\beta_1 > 0$, (the coefficient for NTC is positive) and $\beta_2 < 0$, (the coefficient for NTC^2 is negative), the expected inverted U-shaped relation between corporate performance and working capital as well as the first hypothesis; *H1 There is an inverted U-shaped relation between working capital management and corporate performance* can be confirmed.

Secondly, the companies in the sample are divided into groups according to the financial constraints that they face. To test whether the optimal working capital level of more financially constrained companies differs from that of less constrained ones, regression model 1 is extended with dummy variables for financial constraints (DFC). Regression model 2 tests the fourth hypothesis, namely *H4 The optimal working capital level for*

companies with more financial constraints is lower than for companies with less financial constraints.

Regression model 2:

(20) $P/L_{i,t} = \beta_0 + (\beta_1 + \delta_1 DFC_{i,t})NTC_{i,t} + (\beta_2 + \delta_2 DFC_{i,t})NTC^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + ROA_{i,t} + \varepsilon_{i,t}$

Where all other variables are as explained in regression model 1 and DFC is dummy variable describing the financial constraints of the company according to following proxies:

CASH FLOW = P/L after tax / total assets

SIZE = natural logarithm of sales

EXTERNAL FINANCING = financial expenses / total debt

INTEREST COVERAGE =   EBIT / financial expenses

Z-SCORE = 1,77 * (cash flow/operating revenue-ratio) + 14.14 * liquidity ratio + 0,54 * solvency ratio

ε = error term

By construction, the expression - $\beta_1/2\beta_2$ measures the optimal working capital level of less financially constrained companies. Furthermore, the optimum of more financially constrained companies comes from $-(\beta_1 + \delta_1)/2(\beta_2 + \delta_2)$. The dummy variable selection and definitions are based on the study of Banos-Caballero et al. (2014), unless a noted differently.

Cash Flow is defined as the ratio of earning before interest and taxes plus depreciation over total assets and the companies with cash flow above the sample median are assumed to be less likely to face financial constraints.

Size is often seen as inverse proxy for financial constraints, because smaller firms face more challenges in obtaining external financing and have more costs related to attaining

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credit. In this study size is calculated as the natural logarithm of sales and the companies above the sample median are considered to be less likely to face financial constraints.

Cost of external financing is expressed by the ratio of financial expenses to total debt and it captures the benefits of having choices in financing the company operations. The companies with cost of external financing above the sample median are more likely to be financially constrained.

The bankruptcy risk is also taken into consideration by adding two more financial constraint-dummies, interest coverage and Z-score. *Interest coverage* is calculated by the ratio of earnings before interest and taxes over financial expenses. The greater this ratio, the less problems the company would have in repaying its debt and the EBIT would cover the interest payment. Therefore, companies that have an interest coverage ratio below the sample median are more likely to be financially constraint.

Finally, the *Z-score* is considered to influence company's access to credit and may limit its investment opportunities. The z-score used in this study was developed by Erkki K. Laitinen and it replaces the z-score by Altman (1968), that was used in the study of Banos-Caballero et al. (2014). Thus, companies with below-median (low) z-score are expected to be financially constrained, while above-median (high) z-score companies face less financial constraints. The calculation of Laitinen's z-score is expressed in more detail after the regression model 2, presented earlier in this section.

In their article, Banos-Caballero et al. (2014) used four more proxies for financial constraints, namely Dividends (non-dividend paying/dividend paying), Dividend Payout Ratio (measured by dividends/net profit) and Whited and Wu Index (a linear combination of cash flow, dividend payer dummy, leverage, firm size, industry sales growth and firm sales growth). In this study these criteria for financial constraints are left out, since the sample includes only non-listed companies and therefore the dividend information was not readily available in Orbis, where all other variables were collected from.

4.2. Data and summary statistics

As mentioned briefly above, the data in this study was collected from the Orbis-database. The sample consists of companies in machining section (NACE code 2562) of metal industry in Finland, for the period from 2011 to 2015. Companies with missing values for any variables, cases with obvious errors in the accounting data and extreme values were excluded from the sample. This results in a total of 122 companies, over five-year period, implying total of 610 observations. All statistical analyses were made using EViews9-statistical software.

Table 1 presents the summary statistics for the dependent, independent and control variables in the regression model 1.

Table 1. Summary statistics (n=610)

	Mean	Median	Standard deviation	Min	Max
P/L RATIO	9,262	8,613	8,254	-64,988	37,257
NTC	65,675	63,106	39,269	-57,508	234,076
AR	46,355	41,752	25,452	1,274	129,573
INV	42,513	34,343	32,038	1,320	224,441
AP	23,082	18,272	17,377	1,239	166,630
SIZE	3,227	3,225	0,540	1,799	5,037
LEV	70,470	69,537	25,529	198,390	14,705
ROA	6,424	5,860	12,008	-58,033	51,941

P/L RATIO represents the corporate performance; NTC the net trade cycle; AR the accounts receivable; INV the inventories; AP the accounts payable; SIZE is the size of a company; LEV is the leverage and ROA the return on assets.

As can been seen from Table 1, the average P/L-ratio for the sample is 9,262, while the median is 8,613. The mean NTC for the companies in the sample is 65,675 days and median 63,106 days. The components of the NTC, namely accounts receivable (AP), inventories (INV) and accounts payable (AP) are also described in the table 1, as they will be used later to define the optimal level of working capital investment. On average debt finances 70,47% of total assets and the mean return of assets is 6,42%, median being 5,86%. The scatter plot graphs of the variables in the sample show few outlier-cases in

the data set, but there seems not to be clear and systematic heteroscedasticity in the sample, so the results of the following regression models can be considered reliable in that sense.

4.3. Methodology

The methodology section discusses the definitions of correlation analyses and addresses the issues around multicollinearity and serial correlation in basic terms. The panel data method and least squares estimation are also introduced in the following two sections.

4.3.1. Correlation analyses

The study of correlations is important in regression analyses in general, since regression models are sensitive to high correlation between the variables. When the correlation between the independent variables is too high, the results of the regression analyses can be badly biased. (Metsämuuronen, 2009.)

Correlation coefficients can vary numerically between -1.0 and 1.0. The closer the correlation is to 1.0, the stronger the relationship between the two variables. A correlation of 0.0 indicates the absence of a relationship. There can, however, be a strong non-linear association between the variables, although the correlation coeffient might be zero. A correlation can only indicate the presence or absence of a relationship, not the nature of the relationship. Correlation analysis does not express causality between the variables, it just presents dependence of one variable to another. The Pearson correlation coefficient is probably the most used measure of correlation and is be used in this study as well. The results of the correlation analysis are presented in the section 5.1.

For correlations, the effect size is called the coefficient of determination and is defined as $r2$. The coefficient of determination (tolerance) can vary from 0 to 1.00 and indicates that the proportion of variation in the scores can be predicted from the relationship between the two variables. In another words, the basic assumption of linear regression

model is that the variables are not correlated, and the variance is stable. In the case of *multicollinearity*, two independent variables have linear dependence, which can lead to incorrect standard errors and t-values. To test for multicollinearity, analysis of variance inflation factor (VIF) is conducted. VIF is an opposite measure to tolerance, which is also used to account for multicollinearity. The VIF may be calculated for each independent variable by doing a linear regression of that variable on all the other independent variables, and then obtaining the R^2 from that regression. The VIF is $1/(1-R^2)$.

Regression model is less multicollinear the smaller the VIF value is. When there is no multicollinearity at all, the VIF value equals 1. The VIF has a lower bound of 1 but no upper bound and the opinion differs on the critical value of VIF. However, it has also been discussed that a high VIF value does not automatically reduce the reliability of regression results. In the case of control variables or dummy variables having high VIF-values and the other independent values remaining under the critical level, the dropping of the control variable might cause more problems as the control effect would be lost. Moreover, the VIF-values may also be high in the case of raising the independent variable to a power as would be the case in the regression model presented in this study. (e.g. Allison, 1999; Wooldridge, 2003). The VIF-values concerning this study are stated in the section 5.1.

Serial correlation, in turn, is the relationship between a given variable and itself over various time intervals. Serial correlation is typical in repeating patterns, when the level of variable effects its future value. It influences t-statistics and the estimated regression coefficients can be badly biased. Serial correlation is detected in this study by Durbin-Watson-statistic. This statistic can vary between 0 and 4 and its' size depends on the number of independent variables in the model as well as the number of observations. Generally speaking, the value of Durbin-Watson-statistic should be in between 1 and 3. (e.g. Pearson, 2010.) The values of the Durbin-Watson-statistic concerning this empirical study are discussed in section 5.2.

4.3.2. Panel data method and least squares estimation

The special characteristic for *panel data* is that it combines two dimensions; the cross-sectional units (i = 1,2,3…N) such as companies, countries or individuals, as well as periods in time-series (t= 1,2,3…T). Panel data can be thought of as combining the features of cross-sectional data and time series data and consisting of repeated observations on the same elements through time (Dougherty, 2007, 67). It presents advantages over ordinary time series or cross section data, because it allows larger number of observations and in certain circumstances also allows to control for unobservable factors that might otherwise make the regression estimation biased.

The basic assumption in most applications of least squares regression is, that there cannot be any omitted variables that are correlated with the included explanatory variables. However, when there is an unobservable variable that varies across one dimension of the panel (e.g. company) but not across the other (e.g. time), *fixed effects regression* can be used. It allows any correlation between the mentioned variables and thus is consistent method for analyzing a panel data sample. (e.g. Pearson 2010; Startz 2015; Wooldridge 2013.)

Banos-Caballero et al. (2014) used the two-step general method of moments (GMM)-estimation as the main regression method in their paper but tested the results with ordinary least squares (OLS) and the two-stage least squares (2SLS) methods as well. They derived the same results in all three settings, although the GMM-estimation allowed them *"to control for unobservable heterogeneity and potential endogeneity problems"* (Banos-Caballero et al. 2014: 337). As this study followed the example of Banos-Caballero et al. (2014), least squares-estimation method with fixed effects was used. This choice was evident after several trials on the method; the GMM-method requires more in-depth knowledge of econometrics and statistical methods that was possible to attain in the scope of this master's thesis. Furthermore, the panel least squares-estimation follows the basic assumptions of ordinary least squares and the EViews statistical software that was used to conduct the estimations is specially developed to make panel data regressions easier.

The following basic assumptions for least squares estimation, namely multivariate normality, no or little multicollinearity, no serial correlation and homoscedasticity are addressed in sections 4.3.1 and 5.1. The fifth and possibly the most important assumption for a least-squares regression is that the model is linear in the coefficients and the error term. In fact, the defining characteristic of linear regression is this functional form of the parameters rather than the ability to model non-linear functions. *Linear models can in fact be nonlinear by including nonlinear variables such as polynomials and transforming exponential functions.* (e.g. Wooldridge 2013; Startz 2015)

This is the case in the model used in this study as well. Since we are interested in finding out if the non-linear relationship between working capital management and corporate performance exists, the net trade cycle and its components are raised to power and added to the basic regression model. The conclusion of the functional form of the relationship are based solely on the model provided by Banos-Caballero et al. (2014), implying that the non-linearity can be confirmed when the coefficients of NTC (and its separate components) is positive and NTC^2 negative as well as statistically significant at 5%.

5. EMPIRICAL FINDINGS

In the fifth chapter, the empirical results of this study are presented. In section 5.1. the correlations between the variables are explained and multicollinearity testing is discussed. The following section, 5.2., concentrates on the main research questions of this study. First, the panel least squares estimation is used in testing the three hypotheses that define the relationship between corporate performance and working capital management. Secondly, the same method is applied to find out, if the optimal working capital level is sensitive to financial constraints.

5.1. Study of correlations

As noted earlier in section 4.3. the study of correlations aims at identifying the correlations between all variables and their statistical significance. Table 2 introduces the Pearson correlation coefficients of the independent variables used in the regressions.

Table 2. Correlation matrix (n=610)

	P/L	NTC	AR	INV	AP	SIZE	LEV	ROA
P/L	1,0000							
NTC	-0,0486	1,0000						
AR	0,0423	**0,4940**	1,0000					
INV	**-0,7978**	**0,7326**	-0,0660	1,0000				
AP	**-0,1615**	**-0,1994**	**0,2557**	0,0725	1,0000			
SIZE	**-0,1998**	**0,1459**	**0,1941**	**0,1415**	**0,2246**	1,0000		
LEV	**-0,3767**	**-0,0935**	-0,0450	**0,0814**	**0,3045**	-0,0375	1,0000	
ROA	**0,6603**	**-0,0895**	-0,0273	**-0,2084**	**-0,2270**	-0,0259	**-0,4503**	1,0000

P/L represents the corporate performance; NTC the net trade cycle;
AR the accounts receivable; INV the inventories; AP the accounts payable;
SIZE is the size of a company; LEV the leverage; ROA the return on assets.
Bold text indicates significance at 5% level.

As can be seen in Table 2 above, there are statistically significant correlations between corporate performance and the individual components of the NTC. Corporate performance (P/L) correlates strongly and negatively with inventories (INV) and accounts payable over sales (AP). Size as a control variable correlates positively with NTC and its' determinants, but quite unexpectedly size has a negative correlation with corporate performance. As expected, leverage (LEV) has negative correlation with both corporate performance and NTC and correlates positively with inventories (INV) and accounts payable (AP). ROA and corporate performance have a strong positive correlation as can be expected, yet the correlation with the rest of the variables is quite weakly negative and significant in relation to NTC, INV, AP and LEV.

The strongest correlation can be detected between the corporate performance and inventories (-0.7978), which could imply that inventories is the strongest factor determining the level of NTC in this study.

All correlation coefficients between the independent variables in this sample are small and under 0.8, which has been suggested to be the maximum value for multicollinearity. (Metsämuuronen 2006: 578.) Multicollinearity is also tested by calculating the VIF-values for the independent variables. The VIF-values for independent variables in this sample vary between 2.78 and 6.53. Although the highest value is more than 5.0, that is often regarded as upper limit for VIF and would suggest there is multicollinearity present in the sample. However as discussed earlier in section 4.3.1. Allison (1999) argues that by dropping a control variable with slightly higher VIF-value can create more damage to the model than the benefits that it provides (e.g. when kept in the model). The fact that one of our independent variables is raised to power could also be a reason for a higher VIF-value, so all independent variables in this study are considered without great risk for high multicollinearity and kept in the model.

5.2. Regression analyses

The following two sections concentrate on the empirical results and analysis of the two regression models. First, the outcome of regression model that explains the effect of net

trade cycle and its' components on P/L-ratio (corporate performance), will be presented. The first three hypotheses will be tested as a result of the regression model 1.

Secondly, the companies with more financial constrains will be compared to firms with lesser financial challenges in terms of an optimal working capital level. This will be done by adding financial constraint-criteria to the regression model and testing the results by equation presented by Banos-Caballero et al. (2014) in their research that is used as the basic theoretical framework for this study.

5.2.1.   Results of regression model 1

The estimation results of the regression model 1, on Table 3 are expressing the impact of net trade cycle on corporate performance, as proxied by the P/L-ratio, are presented and discussed in this section. Net trade cycle and its components as well as their quadratic forms are regressed on the P/L-ratio to find out what the impact of working capital management is on corporate performance in this sample and test hypothesis 1. Control variables of size, leverage and ROA are used accordingly to test hypothesis 2 and 3. Table 3 in the following page lays out the results of regression model 1.

Table 3. The results of the regression model 1, estimating the NTC- P/L-ratio relation (n=610)

Dependent variable = Corporate performance = P/L-ratio

Independent variables	Expected direction	β	p-value	β	p-value	β	p-value	β	p-value
NTC	+	2,781	0,1102						
NTC^2	-	-0,392	0,7098						
AR	+			**4,078**	0,0390				
AR^2	-			0,651	0,6000				
INV	+					**8,275**	0,0006		
INV^2	-					**-5,922**	0,0007		
AP	-							-6,871	0,0583
AP^2	+							**11,145**	0,0018
SIZE	+	**0,681**	0,0278	**0,595**	0,0486	**0,696**	0,0169	**1,425**	<0,0001
LEV	-	**0,025**	0,0128	**0,022**	0,0239	**0,021**	0,0378	**0,023**	0,0275
ROA	+	**0,509**	<0,0001	**0,503**	<0,0001	**0,505**	<0,0001	**0,050**	<0,0001
R-Squared adj.		0,3849		0,4009		0,3888		0,3881	
Durbin-Watson statistic		1,6538		1,7324		1,6538		1,6021	
F-statistic		88,23		90,08		88,09		95,61	

The dependent variable is the corporate performance as P/L ratio; NTC the net trade cycle divided by 100 and NTC^2 its square; AR the accounts receivable divided by 100 and AR^2 its square; INV the inventories divided by 100 and INV^2 its square; AP the accounts payable divided by 100 and AP^2 its square; SIZE is the size of a company; LEV the leverage; ROA the return on assets.
Adjusted R-Squared is the goodness of fit measure for the model. Durbin-Watson statistic is a test for auto-correlation of the residuals in the model. F-statistic measures the model's goodness of fit based on F-test.
Bold text indicates significance at 5% level.

The results of the regression analyses on Table 3, show that there is indeed a non-linear relation between the NTC and P/L-ratio, because the coefficient of NTC is positive ($\beta_1 > 0$) and the coefficient of NTC^2 ($\beta_2 < 0$) is negative, pointing out that deviations of the optimal NTC either up- of downwards reduce the corporate performance (P/L-ratio). The

coefficients for net trade cycle variables allow us to determine the turning point in the relationship between corporate performance and working capital management, by calculating the inflection point by - $\beta_1/2\beta_2$, as presented by Banos-Caballero et al. (2014). With the data in this study the turning point would be at 35,45 days. However, in this sample the results of the regression are not statistically significant since the p-value for NTC is 0,1102 and for NTC^2 0,7098 respectively. We can thus state the following;

H1 There is an inverted U-shaped relation between working capital management and corporate performance.

H1 is rejected.

The estimated regression coefficients for size as a control variable are statistically significant regarding NTC and all its' determinants (AP, INV and AR). Size has the strongest positive effect on corporate performance when accounts payable is regressed on P/L-ratio, and weakest with accounts receivable on P/L-ratio. In all cases the impact is positive and statistically significant at least at 5% level. The second hypothesis can be verified as follows:

H2 Company size influences the corporate performance positively.

H2 is confirmed.

The previous research on the subject predicted that leverage has a negative effect on corporate performance, but the result with this data show a positive relationship between leverage and corporate performance. The impact of leverage in the relationship between NTC and all its' separate determinants on P/L ratio is weak (coefficient values in between -0.021 and -0.025), but statistically significant in all cases at 5% level. With these results we can thus reject the third hypothesis as follows:

H3 Leverage influences the corporate performance negatively.

H3 is rejected.

5.2.2.	Results of regression model 2

The second regression model estimates the impact of financial constraints on the relation of net trade cycle and corporate performance. In this regression, five different financial constraint criteria are used, and the sample is divided in two groups with the help of dummy variables, that differentiate the companies in more and less financially constrained. The squared values are used to indicate the possible non-linearity of the relationship as explained earlier in the study. The results of the regression model 2 are presented in Table 4 on the next page.

Table 4. The results of the regression model 2, estimating the impact of financial constraints on net trade cycle-corporate performance relation (n=610).

Dependent variable = Corporate performance = P/L-ratio

Financial constraints criteria

Independent variables	Cash flow grouping β	Size grouping β	External financing cost grouping β	Interest coverage grouping β	Z-score grouping β
NTC	-0,276	**4,468**	**7,111**	**3,983**	-2,661
	(0,8861)	(0,0095)	(0,0003)	(0,0399)	(0,1646)
NTC*DFC	4,136	**-9,965**	**-8,838**	**-5,114**	**8,998**
	(0,0752)	(<0,0001)	(<0,0001)	(0,032)	(<0,0001)
NTC^2	0,883	-1,298	**-4,326**	-1,380	1,225
	(0,4467)	(0,2405)	(0,001)	(0,2333)	(0,3187)
NTC^2*DFC	-0,597	**5,184**	**7,813**	**4,483**	-2,340
	(0,7728)	(0,0025)	(<0,0001)	(0,0271)	(0,1379)
SIZE	**0,867**	**1,821**	**0,907**	**0,750**	0,096
	(0,0052)	(<0,0001)	(0,0039)	(0,0158)	(0,7511)
LEV	**0,025**	-0,004	**0,015**	**0,022**	**0,062**
	(0,0129)	(0,6855)	(0,0154)	(0,0311)	(<0,0001)
ROA	**0,445**	**0,479**	**0,509**	**0,533**	**0,455**
	(<0,0001)	(<0,0001)	(<0,0001)	(<0,0001)	(<0,0001)
R-Squared Adj.	0,3988	0,4226	0,4067	0,3879	0,4469
Durbin-Watson statistic	1,6496	1,6633	1,6595	1,6246	1,6821
F1	**3,18**	**24,44**	**22,54**	**4,62**	**21,53**
F2	**0,08**	**9,25**	**24,18**	**4,91**	**2,22**

The dependent variable is the corporate performance as P/L ratio; NTC the net trade cycle divided by 100 and NTC^2 its square; DFC is a dummy variable that equals 1 for companies more likely to be financially constrained and 0 otherwise.

SIZE is the size of a company; LEV the leverage; ROA the return on assets.

Adjusted R-Squared is the goodness of fit measure for the model.

Durbin-Watson statistic is a test for auto-correlation of the residuals in the model.

F1 is a F-test for the linear restriction under the following null hypothesis: $(\beta_1 + \delta_1) = 0$

F2 is a F-test for the linear restriction under the following null hypothesis: $(\beta_2 + \delta_2) = 0$

Bold text indicates significance at 5% level.

As explained earlier in section 4.1. the expression - $\beta_1/2\beta_2$ measures the optimal working capital level of less financially constrained companies and the optimum of more

financially constrained companies comes from $-(\beta_1 + \delta_1) / 2(\beta_2 + \delta_2)$. By calculating these equations, we can find out if the optimal working capital level of more financially constrained companies is lower than the optimum for less constrained companies. When the equation $-(\beta_1 + \delta_1) / 2(\beta_2 + \delta_2) < -\beta_1/2\beta_2$ holds for the results that are statistically significant, the hypothesis 4 can be confirmed. The results of the equations are calculated on Table 5:

Table 5. Test equation for hypothesis 4.

	Optimal working capital level for less financially constrained companies		
GROUPINGS	$-\beta_1 = -NTC$	$2\beta_2 = 2NTC^2$	$-\beta_1/2\beta_2$
Cash Flow	0,276	1,766	0,156
Size	-4,468	-2,595	1,722
External Financing Cost	-7,111	-8,652	0,822
Interest Coverage	-3,983	-2,760	1,443
Z-score	2,661	2,451	1,086

	Optimal working capital level for more financially constrained companies		
GROUPINGS	$-(\beta_1 + \delta_1) = -(NTC*DFC)$	$2(\beta_2 + \delta_2) = 2(NTC^2*DFC)$	$-(\beta_1 + \delta_1) / 2(\beta_2 + \delta_2)$
Cash Flow	-4,136	-1,194	3,464
Size	9,965	10,368	0,961
External Financing Cost	8,838	15,626	0,566
Interest Coverage	5,114	8,965	0,570
Z-score	-8,998	-4,680	1,923

	Test equation
GROUPINGS	$-(\beta_1 + \delta_1) / 2(\beta_2 + \delta_2) < -\beta_1/2\beta_2$
Cash Flow	REJECTED
Size	CONFIRMED
External Financing Cost	CONFIRMED
Interest Coverage	CONFIRMED
Z-score	REJECTED

As can be seen from the results of the equation (Table 5), the expected outcome of the test holds in three cases out of five. The results suggest that the optimal working capital level of more financially constrained companies is lower than the optimum for less constrained companies, when size, external financing cost and interest coverage are taken into consideration. In other words, larger companies, that have lower external financing costs and better interest coverage are likely to have their working capital level at a higher optimum than their more financially constrained counterparts. These results support the findings of Banos-Caballero et al. (2014) and justify the use financial constraint-criteria in future studies of working capital management. However, the regression results are statistically significant with just one of the financial constraint criteria, namely external financing cost-grouping. This result would indicate that companies with lower external financing cost have higher level of optimal working capital. The other two criteria; cash flow and z-score fail both the test equation and the statistical significance. This being the case, we can state the following result on the test of hypothesis 4.

H4 The optimal working capital level for companies with more financial constraints is lower than for companies with less financial constraints.

H4 is rejected.

6. CONCLUSION

The objective of this study was to find empirical evidence for the impact of working capital management on corporate performance, in particular, within the group of companies in the machining sector of metal industry in Finland. The sample for the empirical testing was collected from the Orbis-database, the time span being between 2011-2015. The analysis was made using a panel data model and employing least squares estimation method in EViews-statistical software. In contrast to most of the previous research on the topic, the main aim was to study the functional form of the above-mentioned relation as well as to find out, if financial constraints influence the relationship. In the next two sections the main findings of this study will be reviewed, and some practical implications suggested. The final chapter lays out the limitations of the study and puts forward ideas for future research.

6.1. Impact of working capital management on corporate performance

The relationship between working capital management and corporate performance was examined by regressing the net trade cycle and its' individual components; accounts receivable, inventories and accounts payable to company profitability measure; P/L-ratio. This was done by using a quadratic model to find out if the expected non-linear relation exists with the sample chosen for this study, namely the small to medium-sized subcontracting companies in the machining sector of metal industry in Finland. The control variables used in the least-squares regression model were company size calculated by the natural logarithm of sales, leverage as a ratio of total debt over total asset and finally return on assets (ROA) calculated as a ratio of earnings before interest and taxes over total assets.

Three hypotheses were introduced in the first part of the study. The first hypothesis indicated that there is an inverted U-shaped relation between working capital management and corporate performance. The results of the statistical analysis show an inverted U-shaped (concave) relationship between the investment in working capital and

profitability of the company, when the quadratic model is explained in terms of earlier research by Banos-Caballero et al. (2014). In other words, there seems to exist an optimum level of working capital, which means that before the calculated turning point the company performance is enhanced by the additional of investment in working capital and after reaching the optimum, aggressive working capital decisions tend to decrease the profits for the company and costs of taking the risk are greater. However, with the sample chosen for this study, the result was not statistically significant, thus the first hypothesis was rejected.

The next two hypotheses were based on the earlier research on the impact of size and leverage in the working capital management-corporate performance-relationship. The second hypothesis argued that company size influences the corporate performance positively. This effect has been verified in most of the prior research papers. The same result applies to this study as well. Size related positively with NTC and all its' individual components. It had the strongest positive effect on corporate performance when accounts payable was regressed on P/L-ratio, and weakest with accounts receivable on P/L-ratio. In all cases the impact was positive and statistically significant at least at 5% level, thus the second hypotheses could be confirmed. From the angle of this study, the positive impact of size on corporate performance is quite easily understood. The bargaining power of a bigger company is usually better than of its' smaller counterpart. In the context of subcontracting, the main partner usually expects its' subcontractors to be of "reliable size". Too small of a company might have difficulties in raising for example production output to a needed level and the risk of failing the entire contract can thus be bigger. Small firms also have more challenges in raising enough working capital to make leaps in the production that would eventually increase sales and enhance profitability.

The third hypothesis was based on the assumption by the previous research that leverage has a negative effect on corporate performance, but the result with this data showed surprisingly a positive relationship between leverage and corporate performance and hypothesis 3 was rejected. There may be different reasons to this outcome, but one reason for the positive influence of higher leverage on the corporate performance might be that in a smaller company the infusion of debt from external sources might raise the operational performance of the company to a new level, increase the sales and cash flow

in the company, thus increasing the corporate profitability. This assumption works if the company does not take too big of a risk in acquiring the money from outside sources and the cost of doing so, does not overlap the benefits. In the same token, small companies tend to be more conservative and risk avoiding when it comes to lending money from external sources and leverage does not affect the profitability as much, when the debt-asset-ratio does not grow too large to begin with.

6.2. Financial constraints and optimal working capital level

The effect of the financial constraints that the companies are faced with and the level of optimal working capital investment was studied in the second part of the empirical section. The fourth hypothesis argued that the optimal working capital level is higher for the companies with lesser financial constraints and lower for companies with more financial constraints. The financial constraints were added to the regression equation by classifying the companies by particular dummy variables, as measures of financial challenges. The results indicated that the optimal working capital level of more financially constrained companies is lower than the optimum for less constrained companies, when size, external financing cost and interest coverage are taken into consideration. In other words, larger companies, that have lower external financing costs and better interest coverage are likely to have their working capital level at a higher optimum than their more financially constrained counterparts. The result was statistically significant with just one variable, namely external financing costs, which implied the fourth hypothesis to be rejected as well.

Although the statistical significance was inadequate in this sample to confirm the hypothesis, one could argue that size, lower financing costs and better interest coverage are important factors in determining the optimal level of investment in working capital. They are factors that alleviate the managements' pain in decision making over how much to invest in working capital in order to boost production and increase sales as well as get benefits from early payments yet avoiding high financing costs. When the company's' internally generated funds are at a good level and access to external financing is in order,

there are better choices in managing working capital and staying close to the optimal level. On the other side, the overly debted firms with high financing costs and low interest coverage tend to stay in the "vicious circle" until they can raise enough internal funds or manage working capital optimally to lower the financing risk in the eyes of the lender. In any case, working capital management has profound effects on company profitability, and decision makers in companies of any size should carefully evaluate the practices related to working capital in the day to day operations of the company. As the 2017/2018 Working Capital Study by PwC concludes:

> *"In fact, businesses often place an overreliance on finance to solve working capital problems when many of the underlying drivers are operational rather than financial." (PwC 2018)*

6.3. Limitations of the study and suggestions for future research

This study was limited to a relatively small section of one industry, namely machining sector in metal industry in Finland. As the original sample itself was quite small and further diminished since not all the needed information was available on all companies, the final sample consisted of 610 firm year observations. Sample being relatively small and collected of non-listed companies might also have had some implications on the quality of the actual statistical testing. Some of the variables in this study were different (or omitted) compared to those of the original research setting by Banos-Caballero et al. (2014). In the future research setting the choice of the variables should be taken into consideration more profoundly. There is a vast amount of research on the topic that uses NTC and CCC as proxies to study the subject, however the three individual components, receivables, inventories and payables should be analyzed separately as well. Furthermore, when studying non-listed SMEs, it is important to evaluate, where the data is collected from. In this case, Orbis-database may not have been the best choice for collecting data, since there were lot of missing values in the sample companies. This may be a result of different accounting practices between the countries and also of the fact that in small companies the accounting standards might not be as high as in listed companies.

The procedures described in the earlier research was however followed as closely as possible and the results of this study provide a view in small to medium sized companies in machining sector, that mainly operate as subcontractors to larger corporations and use their own subcontractors in the value chain as a whole. It would be interesting to combine qualitative aspects into the quantitative research base to find out how profitability and company performance in the value chain is affected by the working capital management decisions in different parts of the value chain. Another interesting area of future research would be to compare companies in similar industries and sectors in the different Nordic countries, where the lending and political institutions are in most parts comparable. For practical use, more in-depth analysis and comparison of different management practices or even tools would be of interest to be used in actual working capital management decisions, especially in small and medium sized companies.

REFERENCES

Allison, P. D. (1999). *Multiple regression: A primer.* Sage Publications, London. ISBN 0-7619-8533-6.

Altman, E. I. (1968). Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy. *The Journal of Finance* 23:4, 589-609.

Autukaite, R. & E. Molay (2011). Cash holdings, working capital and firm value: Evidence from France. *Working paper, International Conference of the French Finance Association (AFFI)* [online] [cited 07.02.2017] Available at SSRN: https://ssrn.com/abstract=1836900 or http://dx.doi.org/10.2139/ssrn.1836900

Banos-Caballero, S., P. J. Garcia-Teruel & P. Martinez-Solano (2010). Working capital management in SMEs. *Accounting & Finance* 50:3, 511-527.

Banos-Caballero, S., P. J. Garcia-Teruel & P. Martinez-Solano (2014). Working capital management, corporate performance, and financial constraints. *Journal of Business Research* 67:3, 332-338.

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

Deloof, M. (2003). Does working capital management affect profitability of Belgian Firms? *Journal of Business Finance & Accounting* 30:3-4, 573-588.

Dougherty, C. (2007). *Introduction to econometrics.* 3rd edition. Oxford University Press, Oxford. ISBN 978-0-19-928096-4

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

Eljelly, A.M.A. (2004). Liquidity-profitability tradeoff: An empirical investigation in an emerging market. *International Journal of Commerce & Management* 14:2, 48-61.

Enqvist J., M. Graham & J. Nikkinen (2014). The impact of working capital management on firm profitability in different business cycles: Evidence from Finland. *Research in International Business and Finance* 32: 1, 36-49.

Falope O. & O. Ajilore (2009). Working capital management and corporate profitability: Evidence from panel data analysis of selected quoted companies in Nigeria. *Research Journal of Business Management* 3:3, 73-84.

Farris, M.T. & P. D. Hutchison (2002). Cash-to-cash: The new supply chain management metric. *International Journal of Physical Distribution & Logistics Management* 32:4, 288-298.

Fazzari S. M. & B. Petersen (1993). Working capital and fixed investment: New evidence on financing constraints. *Rand Journal of Economics* 24, 328-342.

Filbeck. G. & T. M. Krueger (2005). An analysis of working capital management results across industries. *Mid-American Journal of Business* 20:2, 11-18.

Garcia-Teruel P. J. & P. Martinez-Solano (2007). Effects of working capital management on SME profitability. *International Journal of Managerial Finance* 3:2, 164-177.

Gentry, A., R. Vaidyanathan and H. W. Lee (1990). A weighted cash conversion cycle, *Financial Management* 19:1, 90-99.

Gill, A., N. Biger & N. Mathur (2010). Relationship between working capital management and profitability: Evidence from the United States. *Business and Economics Journal* 10, 1-9.

Gitman, L. J. (1974). Estimating corporate liquidity requirements: a simplified approach. *The Financial Review* 9, 79-88.

Grosse-Ruyken, P.T., S. M. Wagner & R. Jönke (2011). What is the right cash conversion cycle for your supply chain? *International Journal of Services and Operations Management* 10:1, 13-29.

Hawawini, G., C. Viallet & A. Vora (1986). Industry influence on corporate working capital decisions. *Sloan Management Review* 27:4, 15-24.

Hill, M.D., G.W. Kelly & M. J. Highfield (2010). Net operating working capital behavior: a first look. *Financial Management* 39:2, 783-805.

Jose, M. L., C. Lancaster & J. L. Stevens (1996). Corporate returns and cash conversion cycles. *Journal of Economics & Finance* 20:1, 33-46.

Kieschnick, R., M. LaPlante & R. Moussawi (2013). Working capital management and shareholders' wealth. *Review of Finance* 17:5, 1827-1852.

Knauer, T. & A. Wöhrmann (2013). Working capital management and firm profitability. *Journal of Management Control* 24:1, 77-87.

Laitinen, E. K. & T. Laitinen (2004). *Yrityksen rahoituskriisin ennustaminen*. Jyväskylä, Talentum media.

Lazaridis, I. & D. Tryfonidis (2006). Relationship between working capital management and profitability of listed companies in the Athens Stock Exchange. *Journal of Financial Management & Analysis* 19:1, 26-35.

Lyngstadaas, H. & T. Berg (2016). Working capital management: evidence from Norway. *International Journal of Managerial Finance* 12:3, 295-313.

Mathuva, D. (2010). The influence of working capital management components on corporate profitability: a survey on Kenyan listed firms. *Research Journal of Business Management* 4:1, 1–11.

Metsämuuronen, J. (2009). *Tutkimuksen tekemisen perusteet ihmistieteissä*. Gummerus, Jyväskylä. ISBN 952-5372-18-9.

Mohamad, N. & N. Saad (2010). Working capital management: The effect of market valuation and profitability in Malaysia. *International Journal of Business and Management* 5:11, 140-147.

Monto, S. (2013). Towards an interorganizational working capital management. *Acta Universitatis Lappeenrantaensis 513*, Dissertation Lappeenranta University of Technology, Lappeenranta.

Mullins, J.W. & R. Komisar (2009). *Getting to plan B: Breaking through to a better business model*. Harvard Business Press, Boston, USA.

Niskanen, J. & M. Niskanen (2006). The determinants of corporate trade credit policies in a bank-dominated financial environment: the case of Finnish small firms. *European Financial Management* 12:1, 81-102.

Nobanee, H., M. Abdullatif & M. AlHajjar (2011). Cash conversion cycle and firm's performance of Japanese firms. *Asian Review of Accounting* 2, 147–156.

Padachi, K. (2006). Trends in working capital management and its impact on firm's performance: An analysis of Mauritian small manufacturing firms. *International Review of Business Research Papers* 2:2, 45–58.

Pearson, R.W. (2010). *Statistical persuasion: How to collect, analyze, and present data…accurately, honestly, and persuasively*. Sage Publications, Los Angeles. ISBN 978-1-4129-7496-7.

Petersen, M.A. & R. G. Rajan (1997). Trade credit: theories and evidence, *Review of Financial Studies* 10, 661-691.

PwC (2015). Bridging the Gap. Annual Global Working Capital Survey. [online] July 2015 [cited 13.11.2016]. Available at World Wide Web: https://www.pwc.com/gx/en/business-recovery-restructuring-services/working-capital-management/working-capital-survey/2015/assets/global-working-capital-survey-2015-report.pdf

PwC (2018). Pressure in the System. Working Capital Study. Region in focus: The Nordics. [online] July 2018 [cited 8.10.2018]. Available at World Wide Web: https://www.pwc.dk/da/publikationer/2018/pwc-working-capital-studi-nordics-2017-18.pdf

Raheman, A. & M. Nasr (2007). Working capital management and profitability - Case of Pakistani firms. *International Review of Business Research Papers* 3:1, 279-300.

Ramia, V., Y. Zhao & I. Moosa (2014). Working capital management during the global financial crisis: The Australian experience. *Qualitative Research in Financial Markets* 6:3, 332-351.

Ribeiro de Almeida J.R. & W. Eid (2014). Access to finance, working capital management and company value: Evidences from Brazilian companies listed on BM&FBOVESPA. Journal of Business Research 67, 924-934.

Richards, V. D. & E. J. Laughlin (1980). A cash conversion cycle approach to liquidity analysis. *Financial Management* 9:1, 32-38.

Shin, H.-H. & L. Soenen (1998). Efficiency of working capital management and corporate profitability. *Financial Practice and Education* 8:2, 37-45.

Shulman, J. & R. Cox (1995). An integrative approach to working capital management. *Journal of Finance* 42, 32-38.

Startz, R. (2015). *EViews Illustrated, for version 9*. IHS Global Inc. USA.

ISBN: 978-1-880411-30-8

Talonpoika A., S. Monto, M. Pirttilä & T. Kärri (2014). Modifying the cash conversion cycle: revealing concealed advance payments. *International Journal of Productivity & Performance Management 63:3, 341-353.*

Talonpoika A., T. Kärri, M. Pirttilä & S. Monto (2016). Defined strategies for financial working capital management. *International Journal of Managerial Finance* 12:3, 277-294.

Virkkala, Ville (2015). *The Effect of Working Capital on Profitability in computer and Electrical Equipment Industry* [online]. Helsinki: The Aalto University publication archive, 2015 [cited 16.10.2018]. Available at World Wide Web: <URL: https://aaltodoc.aalto.fi/bitstream/handle/123456789/19749>

Viskari, S. & T. Kärri (2012). A model for working capital management in the inter-organizational context. *International Journal of Integrated Supply Management* 7:1-3, 61-79.

Viskari, S., M. Pirttilä, & T. Kärri (2011). Improving profitability by managing working capital in the value chain of pulp and paper industry. *International Journal of Managerial and Financial Accounting* 3:4, 348-366.

Wang, Y. (2002). Liquidity management, operating performances, and corporate value: Evidence from Japan and Taiwan. *Journal of Multinational Financial Management* 12:2, 159-169.

Wasiuzzaman, S. (2015). Working capital and firm value in an emerging market. *International Journal of Managerial Finance* 11:1, 60-79.

Weinraub, H. J. & S. Visscher (1998). Industry practice relating to aggressive conservative working capital policies. *Journal of Financial and Strategic Decisions* 11:2, 39-46.

White, G.I., A. C. Sondhi & D. Fried (1997). *The analysis and use of financial statements*. 2nd edition, John Wiley & Sons, USA.

Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach.* 5th edition, Cengage Learning, Boston. ISBN 9781111531041.

Yazdanfar D. & P. Öhman (2014). The impact of cash conversion cycle on firm profitability. An empirical study based on Swedish data. *International Journal of Managerial Finance* 10:4, 442-452.

Yazdanfar D. & P. Öhman (2016). The impact of trade credit use on firm profitability: empirical evidence from Sweden. *Journal of Advances in Management Research* 13:2, 116-129.