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Inventories and company's financial performance

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ABSTRACT:
In recent times working capital management has emerged in both the academic literature and operational business. Several companies aim to optimize their working capital levels in a way that working capital wouldn't be tied into daily business. Effective working capital management for instance improves company's liquidity position and increases the return on investment ratios. Working capital management is involved in various stages of company's operations chain, from the procurement of raw materials through inventories to the sale of goods to the end customer. In a larger context, working capital management can be seen from the perspective of whole value chain or supply chain, in which working capital should be optimized in a supply chain level in a way that liquidity in whole supply chain improves and also return on investment ratio. Inventories are a key component of working capital that often tie significant amount of a company's working capital.

The purpose of this thesis is study relationship between value of stock and company's financial performance. The theoretical framework of the thesis is based on academic literature and academic research of working capital. The thesis aim to determine the statistical relationship between the value of inventory and several key indicators of company's performance, such as profitability and inventory turnover. In this thesis the data was collected from financial statements in seven industries and from two countries: Finland and United States of America. The data used in this study is between years 2011 and 2019. In order to achieve the research objectives, data from different industries and different countries was analyzed, and the correlation and regression between key variables was studied.

As a managerial implications of this thesis show the statistical relationship between the value of inventory to selected variables from seven different industries and between selected industries between Finnish and US companies. The results show, for example, that US companies have stronger positive statistical correlation between value of the inventories and business profitability than Finnish companies. In addition, based on the study, the values of inventories has increased an average during the period under review in both countries Finland and in the USA. The results also observe that in most industries studied, an increase in the value of inventory slows down inventory turnover.

KEYWORDS: Working capital, financial performance, inventories, EBIT, turnover, stock turnover

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TIIVISTELMÄ:
Käyttöpääoman hallinta on noussut viime vuosina esille sekä akateemisessa kirjallisuudessa että käytännön yritystoiminnassa. Useat yritykset pyrkivät optimoimaan käyttöpääomansa hallinnan siten, että liiketoimintaan sitoutuu mahdollisimman vähän käyttöpääomia. Tehokas käyttöpääoman hallinta esimerkiksi parantaa yrityksen likviditeettiä ja maksuvalmiutta sekä nostaa sijoitetun pääoman tuottoa. Käyttöpääoman hallinta liittyy yrityksen tuotantoketjun eri vaiheisiin, alkaen raaka-aineiden hankinnasta, varastoinnin kautta hyödykkeen myymiseen loppuasiakkaalle. Isommassa kontekstissa käyttöpääoman hallintaa voi ajatella yrityksen koko toimitusketjun tai arvoketjun näkökulmasta, jolloin käyttöpääomaa tulisi optimoida siten, että yrityksen koko toimitusketjun likviditeetin määrä kasvaa ja sijoitetun pääoman tuotto paranee. Varastot ovat keskeinen käyttöpääoman komponentti joka usein sitoo merkittävän määrän yrityksen käyttöpääomaa.

Tämän tutkielman tarkoituksena on selvittää varaston arvon yhteyttä yrityksen taloudelliseen suorituskykyyn. Tutkimuksen teoreettinen viitekehys nojaa käyttöpääomaa käsittelevään akateemiseen kirjallisuuteen sekä akateemisiin tutkimuksiin. Tutkimus pyrki selvittämään varaston arvon tilastollisen yhteyden useisiin yrityksen keskeisiin mittareihin kuten kannattavuuteen sekä varaston kierron nopeuteen. Tutkimuksessa käytettiin seitsemän eri toimialan tilinpäätöstietoja kahdesta eri maasta: Suomesta ja Yhdysvalloista. Tutkimuksessa käytetty aineisto on vuosilta 2011 – 2019. Tutkimustuloksen saavuttamiseksi data eri toimialoita ja maista analysoidaan ja tutkitaan korrelaatiota ja regressiota eri mittareiden välillä.

Tutkielman tulokset osoittavat varaston arvon tilastollisen yhteyden valittuihin mittareihin seitsemältä eri toimialalta sekä suomalaisten ja yhdysvaltalaisten yritysten väliltä valituilta toimialoilta. Tulokset osoittavat esimerkiksi yhdysvaltalaisilla yrityksillä olevan suurimpi positiivinen korrelaatio varaston arvon ja liiketoiminnan kannattavuuden välillä kuin suomalaisilla yrityksillä. Lisäksi tutkimuksen perusteella varaston arvo on keskimäärin noussut tarkasteltuna ajanjaksona sekä Suomessa että Yhdysvalloissa. Tutkimuksesta selvisi myös, että useimmilla toimialoilla varaston arvon kasvu hidastaa varaston kiertoa.

AVAINSANAT: Käyttöpääoma, taloudellinen suorituskyky, varastot, EBIT, liikevaihto, varaston kierto

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Abbreviations

IFRS = International Financial Reporting Standards
CCC = Cash Conversion Cycle
DIO = Days of Inventory Outstanding
DPO = Days of Payables Outstanding
DSO = Days of Sales Outstanding
SCM = Supply Chain Management
WACC = Weighted Average Cost of Capital
WCM = Working Capital Management
WIP = Work in Progress

1 Introduction

Inventories represent major share of firm's assets. More precisely, it can be considered as a semi-liquid asset because converting inventory into sales typically takes time (Wu, Muthuraman & Seshadri, 2017). At the same time firms are under continuous competition in global markets and aim to achieve even more favourable profits. Inventory is recognised as a one of the major working capital items or assets, in addition to account payables and account receivables. Several academic articles (e.g. Knauer & Wöhrmann, 2013) have highlighted that working capital management (WCM) is very important to a company's success.

Several studies have found a connection between working capital and firm's profitability. By lowering working capital level a company should achieve more profits. Thus, companies' should continuously follow-up their inventory levels and determine optimal inventory strategy. Different financing solutions for a single-company and among supply chain are able to support companies to determine optimal inventory strategy that enables companies' to keep their daily operations running (avoid stock-outs) with a smallest possible cost.

Companies usually have several major financial metrics that they follow-up. Some of the most common ones are revenues that show how much in currency company can sell its goods or products. The more company can sell in currency, e.g. in euros the higher the revenues for the company are. Another important aspect for company's financial situation is their ability to generate profit. Companies can not operate long if they are not financially solid. Companies can secure their financial situation with external finance (e.g. loans or bonds) but that is not sustainable solution in a long term. Thus companies need to operate in way that their operations are profitable. One of the most common metric that companies use to follow-up their financial situation is earnings before interest and taxes (EBIT).

This thesis focuses to understand relationship between value of stock to other major financial metrics: EBIT, turnover, total assets and stock turnover in several industries and in two countries in USA and Finland. This might help companies to understand how increase or decrease of this metrics affect to each other and overall to company's performance in a global competition field.

1.1 Research objectives and research questions

The main research objective for this master's thesis is to identify how to value of stock affect to other key variables: EBIT, total assets, stock turnover and turnover.

To be able to reach the research objective theory working capital management needs to be evaluated. Working capital managements theory includes the definition of working capital management, different optimization models, theory about working capital management and profitability and cash conversion cycle.

To reach the main research objective, working capital management theory and collaborative supply chain management practices needs to be studied and evaluated. Also data from seven industries and two countries needs to be studied and evaluated. To conduct this study, following research questions will be established:

1. Is there correlation between major financial aspects: stock, EBIT, turnover, total assets and stock turnover.
2. Is there any differences in correlation between Finland and USA?
3. Is there differences between industries in Finland and in the USA, in terms of regression between value of stock and other studied variables?

1.2 Limitations and restrictions

This thesis focuses to understand the relationship between major financial aspects. To achieve this target data needs to be gathered from different industries and in different countries.

To receive comparison between countries, two countries Finland and USA were selected to further analysis. The findings of this thesis are applicable only in Finland and in the USA, industries selected.

Seven different industries were selected. Definition in industries is based on NACE rev. 2 classification. The findings are applicable only in the industries selected and cannot be noticed as a universal truth applicable in all industries worldwide. Industries selected are:

1) Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (NACE rev. 2 classification: 16).
2) Manufacture of paper and products of paper (NACE rev. 2 classification: 17).
3) Manufacture of rubber and plastic products (NACE rev. 2 classification: 22).
4) Manufacture of other non-metallic mineral products (NACE rev. 2 classification: 23).
5) Manufacture of basic metals (NACE rev. 2 classification: 24).
6) Manufacture of computer, electronic and optical products (NACE rev. 2 classification: 26).
7) Manufacture of electrical equipment (NACE rev. 2 classification: 27).

Data was gathered for years between and including 2011 and 2019. Thus, the results and findings are applicable only within that time period. Globalisation changes business all the time so results based on that timeframe might not be applicable in any other time period.

1.3 Structure of the Thesis

This thesis is divided into eight chapters in order to provide clear and extensive structure. First structure is introduction chapter to the topic and defines research objectives and research questions. First chapter provides information of key concepts, limitation and restriction as well, in a way that reader would be familiar about the concept of this thesis.

Second chapter is theoretical chapter that provides comprehensive theoretical framework around the subject. Second chapter will focus on theory around working capital management. Inventories are one of the key assets in working capital and thus, working capital management theory will be introduced and discussed. The chapter will focus on, for instance, working capital optimization and working capital and firm' s profitability. In addition, also working capital financing solutions will be introduced.

After the theoretical chapters, the third chapter will introduce and present data and research methodologies related to the empirical part of the thesis. fourth chapter focuses on empirical findings based on the data. It shows empirical findings based on correlation analysis in Finland and in the USA and compares the findings. After that each industry is studied separately for Finnish companies and for US companies. Validity and reliability of the results is also discussed in this chapter.

Last chapter focuses on conclusions and concludes this thesis. The purpose of this chapter is to summarize theoretical and empirical findings into managerial implications and provide suggestions to new research in this field.

2 Working capital management and financing options

Working capital is money needed to run and finance company's daily operations (Krajewski et al. 2019: 530). Whereas supply chain management typically focuses on flows of goods and services, working capital management represents management of financial flows (Lind, Pirttilä, Viskari, Schupp & Kärri, 2012). Into key working capital assets include: accounts payables, accounts receivables and inventories. Accounts receivables and inventories represent tied-up capital and accounts payables decrease tied-up capital levels. Ding, Guariglia and Knight (2013) defined working capital as difference of company's current assets and current liabilities. Current assets include accounts receivables, inventories and cash, and current liabilities include accounts payables and other short-term debt. Working capital can also be representing the source and use of short-term capital. Also Chauhan (2019) notes that working capital decisions are in often considered as short-term financial decisions. That is because main components (payables, receivables and inventories) of WCM are related to short-term cycles .Working capital is often acknowledged as one of the key indicators to measure and control company's financial situation. Companies need cash to make the required payments. That is the reason why it is essential for companies to efficiently manage its short-term liabilities. (Jalal & Khaksari, 2019). Knauer & Wöhrmann (2013) state that managing company's working capital items (current assets and current liabilities) is very important to the success of company. Authors even highlight that working capital management is main task of day-to-day management. Working capital management is especially important in countries, such as China, where companies have limited access to long-term capital markets. Those companies need to focus on efficient short-term capital management, including WCM overall and some other objects such as trade credit. (Knauer et al. 2013) (Ding et al. 2013).

Working capital is widely noted in academic literature and corporate finance textbooks. At the end of 2011 working capital (defined in this study as receivables plus inventories) accounted 24 % of sales and above 18 % of assets (book value), total amount of working capital was 4,2 trillion dollars. Net operating working capital amounted to 2,5 trillion dollars and compared to working capital, it was adjusted by accounts payables.

High working capital levels means that company has invested its capital to working capital assets. Any investment into working capital assets generates cost of capital (Zeidan & Shapir, 2017). High working capital level is often correlated with higher additional financing expenses. In addition, companies do always have other opportunities where to invest. Thus, opportunity cost is closely associated with working capital.

Company have to always consider several trade-offs regarding working capital management. In addition optimal working capital level depends on several company-specific factors for instance as size, capital intensity, global engagement and output volatility (Ding et al. 2013). A common example of trade-off is between liquidity and profitability. Liquidity is requirement for company to guarantee that company is able to meet its short-term liabilities (Ding et al. 2013). As Enqvist et al. (2014) notes high investments into working capital, e.g. by terms of high inventories or cash discounts given for the customers might lead to decrease in firms profitability. On the other hand, high inventory levels might help to avoid costly stock-outs in firms operations. Commonly, literature has provided two opposite views of working capital management: one view observes that high working capital level may increase company's value because high working capital level makes possible to give e.g. trade discounts that may increase company's sales. Under second view, high working capital value requires financing that increases financing costs that in the end decrease company's value (Banos-Caballero, Garcia-Teruel & Martinez-Solano, 2014). However, as we see in below paragraphs, academical literature has actually found four different working capital schools. (Enqvist et al. 2014).

Working capital is commonly used to measure company's liquidity (Ding et al. 2013). Liquidity measures are used to provide information regarding company's liquidity (cash). In other words, liquidity ratios measure company's short-term financing situation and indicate how sufficiently company is able to cover its short-term liabilities. Ding et al. (2013) notes that working capital management requires to balancing between liquidity and profitability to maximize the value of the company. Two of the common working

capital and liquidity ratios that are used to measure company's liquidity are current ratio and quick ratio. Current ratio is calculated as current assets divided by current liabilities and quick ratio is divided by current assets minus inventory divided by current liabilities. More precise, in terms of mathematic, current ratio and quick ratio are calculated as

$$Current\ ratio = \frac{Current\ assets}{Current\ liabilities}$$

$$Quick\ ratio = \frac{cash + short - term\ securities + accounts\ receivables}{current\ liabilities}$$

Current ratio is a measure of short-term liquidity. That is because short-term liabilities and assets are converted to cash within 12 months. Compared to current ratio, quick ratio takes into account inventory. Both of these measures are static by their nature.

2.1 Definition of working capital management

2.1.1 Accounts payables

Accounts payables refer to payables that company needs to pay to e.g. its suppliers. If company receives a good or service but has not paid it, the sum will be accounted and booked as a accounts payable in its balance sheet. It can be said that accounts payables involve contracts with suppliers. In perspective of working capital management the higher accounts payable level benefits company because it already has received the goods or services but needs to pay it later. In other words, once company has purchased raw materials in credit it will be booked as a accounts payable in balance sheet. Credit can be made for the time service or good is made or even longer. Common metric how accounts payables can be calculated in working capital management context is days payables outstanding (DPO). DPO is correlated with company's operating cycle measure (CCC, cash-conversion cycle). (R. P. Boisjoly, Conine Jr. & McDonald IV., 2020).

2.1.2 Accounts receivables

In addition to accounts payables and inventories, also accounts receivables are considered as a major component of working capital. Accounts receivables involve contract with end customers. One of the key metrics how accounts receivables are calculated in working capital context is DSO i.e. days sales outstanding. DSO is created by selling finished goods inventory to end customer with credit extended. An example of this kind of extended credit can be for instance net 30 days that means that customer pays the received goods or services within 30 days. Accounts receivables are booked in company's balance sheet. (Boisjoly et al. 2020).

2.1.3 Inventories

Inventory is recognized as a one key working capital asset, in addition to account payables and account receivables. Several inventory measures, such as inventory turns and weeks of inventory are associated and reflected in working capital. If company is able to decrease its inventory levels by increasing inventory turns or reducing weeks of inventory, it will have a positive effect in working capital, because less capital is tied to finance inventories. (Krajewski et al. 2019: 530). Inventory in general is comprised of three components: raw material inventory, work-in-process (WIP) inventory and finished goods inventory (Boisjoly et al, 2020). Each of these inventories is associated with different supply chain stages (Bendig et al. 2018). Inventory is between accounts payables and account receivables. Once company purchases raw material with credit, it is recognized as account payables. After that, when the product is produced and after that as finished good, it is recognized as a inventory. Once a good is sold to the customer with credit, it is recognized as a accounts payable. In perspective of working capital management, inventory turnover is often calculated as a DIO, meaning days inventory outstanding. From working capital perspective, the shorter the DIO is for the company the better working capital ratio is has. However, in addition to purely working capital perspective companies should take into account e.g. safety margin in inventory to avoid possible costly stockouts.

Bougheas et al. (2009) studied that inventories have a notable negative effect on account receivables.

2.2 Working capital optimization

Generally, it can be said that research associated with working capital management consists of two opposite perspectives: from single-company perspective and from interorganizational or supply chain perspective. Single-company perspective is more extensive in financial literature and research, while interorganizational perspective has emerged recently to financial literature and research. (Wetzel & Hofmann, 2019).

A single-company perspective can be further divided into three categories how the research is categorized. First group has analysed what kind of strategies and practices companies have implemented to manage their working capital. Second research group has focused on analysing factors that affect the nature of working capital and what kind of outcome those factors have in working capital management. Examples of working capital determinants that second group have analysed are industry or size of the company. Third group has focused on analysing the connection between working capital management and company's profitability. Based on the three academic research groups, the single-company WCM perspective can be divided into three different working capital management schools: traditional WCM school, alternative WCM school and progressive WCM school. (Wetzel & Hofmann, 2019).

An interorganizational working capital management perspective has emerged recently. This perspective is often referred also as Supply Chain Finance (SCF). SCF perspective highlights that in working capital management should take into account also upstream and downstream supply chain partners and working capital should be optimized in supply chain or, in other words, interorganizational level. Some SCF research define that interorganizational working capital management in supply chains increase value for all the

participants. Interorganizational working capital management perspective can be also called Supply Chain Finance-oriented working capital management school. (Wetzel & Hofmann, 2019).

Different schools in WCM have different view on what kind of relationship corporate performance and investment into working capital assets have.

Especially smaller suppliers often accepted longer and unfavourable payment terms from their customers. This often worsens their financial situation because capital is tied into operations and thus, working capital levels are weaker. However, often weaker payment terms and payment delays are accepted by the terms of trade credit and can be compensated by various types of Supply Chain Finance instruments, such as factoring. (Bian et al. 2018).

As previously noted, working capital management is connected to short-term financing decisions, because main components (payables, receivables and inventories) of working capital management are short-term by nature. However, Chauhan (2019) found in his article that high or low working capital allocations often remain in same often over 15 years. This indicates that although main WCM components are short-term by nature, the WCM level is usually not short-term, more long-term activity. This finding is generality and dependent on industries company operates. Chauhan's article will be represented more in-depth in below paragraph but the author notes that for typical company working capital allocation is not short-term by nature, relative to other assets. Traditionally, literature assumes that optimal allocation of working capital is U-shaped. U-shaped curve is related to alternative WCM school that is introduced in below paragraph. (Chauhan, 2019).

Several cross-sectional factors have been recognized to have an effect to working capital allocations. These factors include but is not limited to for instance following cross-sectional determinants: asset profile, sales profile, assets utilization, financing constraints

and perceived risk. Assets profile indicates that the differences in working capital allocations for companies in same industries indicate that their asset profile also differ. For sales profile academic literature indicate that high sales growth directs to higher allocations of working capital. The explanation is that high sales growth might require larger temporary inventories and flexibility on payment terms (slower DPO cycle). Also sales volatility that could have an effect to working capital levels. Asset utilization is one determinant because high working capital allocations may provide flexibility for a company to manage its overall assets. Also companies with high working capital may operate with smaller amount of cash holdings. Financing constraints are closely related to working capital allocations because companies with more financial constraints may use their working capital more efficiently. Traditional financing constraints are company's size and age. Perceived risk is also considered as a important determinant of working capital allocation because companies with high working capital allocation may be less riskier compared to other end. That is because literature has found operating leverage to be positively correlated with company's business risk. (Chauhan, 2019).

Chauhan (2019) studied working capital allocations in non-financial US companies, excluding utilities and real estate industries and divided those into different industry categories. The data included years between 1984 and 2014 and the metric studied was net operating working capital to total assets. Overall 228 companies survived during the whole analysis. Chauhan found systematic differences in working capital allocations between companies in different industries. Key finding Chauhan had was that, as opposed to general literature, working capital allocations tend to continue long time, often over 15 years. Literature often indicates that working capital allocations are short-term activities due to that WCM assets are in general short-term by nature, so Chauhan's study proves opposite. This kind of steadfastness makes impossible to use working capital as a tactical tool for create value for companies. Accordingly Chauhan findings recommends that companies should not tactically use WCM as a tool for create value for company. One reason for continuity in working capital allocations might be that companies face adjustments cost for changing their working capital allocations and thus, are not

enthusiastic to change their working capital allocations. Nevertheless, Chauhan observes that any adjustments costs should not prevent companies to change their working capital allocations. As well, adjustments costs are likely to rebalance over long time. (Chauhan, 2019).

2.2.1 Traditional school

Traditional school suggest that between investment into working capital assets and corporate performance is linear negative relationship. Simplistically this means that the higher working capital level a company has, the worse is the profitability of the company. Academic research related to traditional school of taught have used profitability measures such as ROE (Return on Equity) and ROA (Return on Assets) to measure profitability of the company. ROA is calculated as net income divided by total assets averaged over years. Higher ROA indicates higher assets efficiency so ROA can also be considered as measure of efficiency (Eroglu & Hofer, 2011). (Wetzel et al. 2019).

According to studies, e.g. Bian et al. (2018), associated with traditional WCM school of taught, propose that lower working capital level lowers financing costs (e.g. interest costs) and thus, have connection to profitability. Lower financing costs lead to higher net income. Other studies associated to traditional school indicate that high working capital levels potentially lead to rejecting other value-enhancing projects because capital is tied into WCM assets. (Wetzel et al. 2019).

2.2.2 Alternative school

Alternative school proposes that there is linear positive relationship between firm profitability and the level of working capital. Simplistically this means that the more company invest into working capital assets, the more profitable the company is.

Eroglu & Hofer (2011) studied relationship between lean production philosophy and company's profitability. Lean production philosophy aims to minimize waste in production operations, this includes inventory that in lean philosophy should be minimized.

Smaller inventory has correlation to lower working capital level, because capital is not tied up into inventory. Eroglu & Hofer found that at some point relationship between lean and company's performance become negative, this might be because of certain supply or demand characteristics. Anyhow, should be noted that their study has e.g. industry-specific limitations. According to Wetzel & Hofmann (2019) some other studies confirm Eroglu et al. (2011) result and indicate that higher inventory level reduces risk for e.g. stock-out's that might be harmful and costly for company's operations and sales. Other issue that support alternative WCM schools point-of-view is e.g. that grading extended payment term for customer may lead to stronger relationship with customer. (Eroglu et al. 2011) (Wetzel et al. 2019).

2.2.3 Progressive school

Progressive WCM school of taught is developed from traditional and alternative WCM schools basis. Traditional and alternative WCM schools suggest that both high and low working capital levels have a positive relationship to company's profitability. Progressive WCM schools perspective is that, working capital is an investment that keeps a company's operations on the track and every company needs to optimize and decide working capital level and manage the trade-off between too high tied-up capital level and too small working capital levels, which might be harmful for company's daily business. Therefore, progressive WCM school suggest that between profitability and working capital level in the company is inverted U-shaped relationship. (Wetzel et al. 2019).

For instance, Banos-Caballero et als. (2014) results in their study indicate that there is an inverter U-shaped relationship between company's profitability and working capital. It means that low working capital level is connecter to high profitability of company and high working capital level is connected to low profitability of company. U-shaped relationship between working capital and profitability indicates that optimal level of working capital exists and that the optimal level balances costs and benefits and that yields to maximal performance of company. (Banos-Caballero et al. 2014).

U-shaped relationship supports idea that at lower levels of working capital company should prefer possibility to increase working capital levels that may yield to higher sales and discounts received from suppliers related to early payments. On the other hand, in higher working capital levels company should target to lower it in order to decrease interest expenses and other financing costs related to high working capital level. High interest expenses and other financing costs are connected to e.g. higher possibility to bankruptcy. As a conclusion company should keep the working capital level as close to the optimal as possible in order to avoid destroying company's value. Some studies suggest that working capital is sensitive to company's access to the capital markets. Bonas-Caballero et al. observes that optimal level of working capital always exist but it is more likely that optimal level is lower for financially constrained companies than less constrained companies. So, in other words, optimal investment level into working capital depends on financing constraints. Low level of working capital is closely connected to lower need for external financing. Overall, Banos-Caballero et al. highlight that companies should target to the optimal level of working capital in order to avoid any costs that appear outside of the optimal working capital level. This kind of costs are e.g. additional financing costs or costs from lost sales. (Banos-Caballero et al. 2014).

2.2.4 Supply Chain Finance-oriented school

The supply chain finance-oriented WCM school is the newest WCM school. It is developed on the basis of other (traditional, alternative & progressive) WCM schools perspectives. SCF-oriented school proposes that working capital management affects directly to supply chain partners as well. In other words, SCF-oriented perspective acknowledges that working capital management should be managed in supply chain level, not just from single-company perspective. SCF-oriented school broadens especially progressive WCM view by accepting that between working capital level and profitability is U-shaped relationship but the scope is supply chain, not a single company.

The main difference between SCF-oriented school and other WCM schools is that SCF notices that working capital assets affect to cross-organizational financing relationships within supply chain. Wetzel and Hofmann point out that if a (focal) company make self-serving working capital improvements those are potentially made by an expense of other supply chain members. Studies related to SCF-oriented school have found e.g. that collaborative working capital management lowers financing costs on the value chain and also that average level of working capital is higher in upstream supply chain partners than in downstream. (Wetzel et al. 2019).

Trade credit is one of the most popular financing options in supply chains. In UK, over 80 % of business-to-business are conducted with trade credit (Yang, Zhuo & Shao, 2017).

2.3 Working capital and profitability

Idea that working capital management affects to company's profitability enjoy expansive acceptance in academic literature (Banos-Caballero et al. 2014) Several studies have recognized a connection between firms profitability and working capital management. For example, Knauer et al. (2013) note that empirical studies have in general found a connection between company's profitability and working capital management. As discussed above, four working capital oriented-schools have a different opinion what is the relationship like, but all agree that relationship between working capital and company's profitability exists. (Banos-Caballero et al. 2014).

Deloof studied relation between corporate profitability and working capital management in 2003. His sample included 1009 large Belgian non-financial companies between years 1992 and 1996. He found that companies can increase their profitability by reducing inventory levels and days of accounts receivable outstanding. He also found that less profitable companies wait longer to pay their invoices, i.e. days of accounts payables outstanding is longer for less profitable companies. Also, Aktas et al. (2015) have simial understanding while noting that high working capital might reduce the opportunities to invest in more profitable or value-enhancing projects. Academic literature has indicated

also opposite findings. Chauhan (2019) found that there be limited value addition from changing working capital allocations over different time periods, thus according to Chauhan, economic importance of relationship between working capital and company's profitability is limited. According to Banos-Caballero et al. (2014) it is found that keeping inventories high, indicating high working capital levels, may secure supply towards customers. (Chauhan, 2019) (Deloof, 2003).

In his study Deloof (2003) defined profitability as a gross operating income. Gross operating income (GOI) is calculated as

$$GOI = \frac{Sales - Cost\ of\ Goods\ Sold}{Total\ Assets - Financial\ Assets}$$

Deloof found that negative relation between WCM and profitability exist. Author noted that one reasonable explanation for negative relationship between profitability and days of accounts payables outstanding is that less profitable companies wait longer before they pay their invoices. He observers also that negative relationship between profitability and inventory levels can be caused by falling sales, yielding to lower profits and higher inventory levels. As a conclusion, Deloof (2003) found a significant negative statistical relationship between corporate profitability, defined as gross operating income, and the number of day's inventories, accounts payable and accounts receivable. Inference is that a company can create value for its shareholders by managing working capital more efficient way. Techniques for that are for example, reducing days of inventory outstanding and accounts receivable outstanding to reasonable minimum. (Deloof, 2003).

Enqvist et al. (2014) studied companies listed on the Helsinki Stock Exchange in period of 18 years, between 1990 and 2008. The aim of their study was to examine the effect of the business cycle on the link between working capital and corporate performance. According to authors of that study Finnish companies tend to react powerfully to the changes of business cycles, an example of that can be measured by terms of volatility in Helsinki Stock Exchange.

Tsuruta (2019) studied relationship between working capital management and firm's profitability in Japanese companies during global financial crisis (years between 2007 and 2010). As a comparison period they used years between 2003 and 2006. They defined working capital requirements (WCR) as the sum of account receivables and inventories minus account payables divided by total sales ((AR + Inventory - AP) / total sales). Tsuruta found that immoderate amount of working capital worsened company's performance. This was especially founded in large companies (over 300 employees). For small companies (less that 300 employees) Tsuruta did not find any statistically significant results. Reason for difference between large and small companies he find to be that smaller companies can adjust excess working capital by reducing levels of account receivables. So, in other words, adjustment speed of working capital is faster for smaller companies that larger companies, that have slow working capital adjustment speed, and that is why the negative effects on company's performance are minor. Ding et al. (2013) studied relationship between profitability and working capital management in Chinese firms. Data included over 116 000 Chinese companies between years 2000 and 2007. They did similar findings that smaller and younger companies are able to adjust their working capital levels more compared to larger companies. On the other hand, larger companies are likely to adjust their fixed assets investments (Ding et al. 2013) (Tsuruta, 2019).

Slow working capital adjustment speed indicates that larger companies act as liquidity providers for smaller companies. According to Tsuruta, this is the reason why smaller companies decrease their account receivable levels because they benefit from large companies that provide liquidity for smaller ones. His finding that large companies decrease payable levels to decrease excess working capital can be explained by that the large companies optimize their working capital levels often in short timeframe. He found also that this negative effect continues up to two years. However, it should be understood that Tsuruta's data included only Japanese companies and that is why the data is unbiased. (Tsuruta, 2019).

Aktas et al. (2015) studied relationship between working capital management and company's performance in study of US companies between years 1982 and 2011. Sample size was 15 541 companies in total. They noted that NWC to sales ratio was notable decreased from 1982 to 2011 in average. They found that an optimal level of working capital exists. They observe that companies whose working capital level differs from this optimal should increase or decrease their investments into working capital to improve their operative performance and also stock performance. Their finding was statistically significant and observed that positive excess of NWC is negatively correlated with company's performance, stock and corporate investments. However, positive excess of NWC is not statistically significant with company's risk. This finding indicates that if company reduces excess cash does not yield to increased company's risk. Companies should utilise their not utilised working capital more efficiently such to fund their growth investments. They also found that companies should focus on maximizing utility of companies' assets, especially to avoid holding too much cash and that way target to optimal level of working capital.

2.4 The cash conversion cycle

Cash is needed in any organization to cover short-term liabilities. Activities that bring cash are termed sources of cash. Activities that use cash are named uses of cash.

The cash-conversion cycle (CCC), or cash-to-cash cycle (C2C) consist of three components: Accounts payables, accounts receivables and inventory. CCC combines accounts payables cycle, accounts receivables cycle and inventory cycle. CCC is the lapse of time between purchasing raw materials for producing goods and collection of account receivables of finished goods. Investment into working capital is bigger if the lapse of time is longer in CCC. (Deloof, 2003). In other words, short CCC indicates that company is managing its working capital efficiently. Company can minimize CCC by efficient management of accounts receivables, accounts payables and inventory (Jalal et al. 2019). According to Deloof (2003) some studies have found that a company can create value for its shareholders by reducing length of CCC to a tolerable minimum. Enqvist, Graham & Nikkinen

(2014) point the same; efficient working capital management aims to reduce the length of CCC to reasonable minimum that optimize the levels that best corresponds to the requirements of the particular company. In practice, short CCC often indicates that payment towards suppliers' are lengthen while receivables are collected promptly. (Ding et al. 2013).

CCC is mathematically defined as

$$CCC = DIO + DSO - DPO$$

Where DIO correspond to days of inventory outstanding. DSO equals to days of sales outstanding and DPO equals to days of payment outstanding. DIO is calculated as average inventory outstanding divided by COGS that corresponds to cost of goods and services sold. COGS points direct costs associated to producing goods and services sold by a company. Formally DIO is defined as

$$DIO = \frac{Average\ inventory}{Cost\ of\ goods\ sold}$$

In other words, DIO is a measure for inventory management. The faster the inventory turnover is the better working capital efficiency it indicates because goods are not stored on the shelves long time. (Ding et al. 2013).

On the other hand, DPO is a measure of accounts payables. Is defines average number of days that a company waits before it pays invoices received. Practically DPO is calculated as:

According to Ding et al. (2013) high DPO is in terms of working capital management beneficial for the company. It indicates that company has negotiated good payment terms towards its suppliers'. On the other hand slow payment towards suppliers' can be also sign of problems in liquidity and working capital management.

Third component of cash-conversion-cycle, DSO, is a measure of account receivables. It defines average number of days that a company wait before receives monies from buyer, in other words, is able to clear its receivables. Practically, DSO is calculated as:

A high DSO indicates that company is not managing working capital efficiently. High DSO indicates that company is not collecting its receivables promptly. This might lead to short-term liquidity challenges, because of the longer cash conversion cycle (Ding et al. 2013).

Academic research has found that reducing CCC increases profitability of the company. In general can be said, that reducing of CCC means streamlining company's operations. In practice, shorter CCC improves profitability e.g. because lower CCC lowers costs related to inventory and credit sales (Jalal et al. 2019). Some of the constraints for streamlining operations are operating margin and cash flow considerations. It is also found that investments into working capital assets do not often cover the cost of capital. According to Zeidan et al. (2017) there are two possible reasons for this. First, there are no general accepted model to optimize working capital investments. And secondly, the difference between theory and actual decisions done by managers may be uncontrolled. (Zeidan & Shapir, 2017).

Jalal and Khaksari studied regarding cash cycle, around 42 250 firms from 79 countries. They found that there are notable deviations in cash cycles between industries. They found that companies in hi-tech and consumer industries have shorter cash cycle compared to companies in other industries. In other end of the scale, Jalal and Khaksari found that companies in manufacturing and healthcare industries have longest cash cycle. (Jalal & Khaksari, 2019).

Also from value chain perspective CCC is important metric because it connects purchasing activities with suppliers to sales activities with customers and also internal supply chain activities. Lind et al. (2012) analysed working capital management in value chain

in the years 2006-2008 in automotive industry and pulp and paper industry. They found that CCC was positive in each stage of value chain meaning that working capital was tied-up. Average CCC in automotive industry was 67 days for researched period. They found that difference in CCC in years 2006 and 2008 was small, observing that relation between working capital and sales is almost fixed. Although, the CCC level remained almost constant its components DPO and DSO changed notable, while DIO remained almost constant. Because the changes in DPO and DSO often offset each other, authors observed that the change in DIO is usually driver in CCC changes. Changes in DIO more on the inventory management and policy of production that purchase and sales. This was proved in findings in changes of DSO and DPO. (Lind et al. 2012).

2.5 Financing options

Several metrics that are critical to company's operations are closely related to working capital management. These metrics include previously introduced metrics such as DPO (account payables) that are connected to supplier operations in terms of contract negotiations, DIO that is connected to inventory operations (raw material inventory, work-in-process and finished goods inventory) and DSO that is related to end customer operations. All of these metrics are corresponded with each other and to cash conversion cycle (CCC) as well. This correlation is confirmed for instance in Boisjoly et al.'s study (2020). (Boisjoly et al. 2020).

According to Wu et al. (2019) it is typical for companies' to finance their inventory jointly by cash, trade credit and bank credit (Wu et al. 2019).

In inventory financing, inventory itself is often recognized as a pledge for the purpose to limit or lower risk level. Pledged inventory, however, is not guaranteed to keep its value over time. Inventory financing is important especially for small and medium sized companies (SME) by allowing them e.g. to improve cash flows. Generally, different inventory financing solutions are provided banks and financial institutions.

3 Data and research methodology

Data to this thesis was gathered from Orbis (Bureau van Dijk, a Moody's Analytics company) database. In addition to Orbis part of the data was validated e.g. from companies' annual reports. Orbis database has information on more than 365 million companies in worldwide. All of parameters used in this thesis: turnover, EBIT, working capital, total assets, stock and stock turnover were visible in Orbis database.

Sample to the empirical part was gathered in a sample between years from 2011 to 2019. Data was gathered from seven industries in total. NACE rev. 2 code 16 industry represents companies in manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials product sectors. NACE rev. 2 code 17 industry represents companies in manufacture of paper and products of paper products sector. NACE rev. 2 code 22 industry represents companies in manufacture of rubber and plastic products sector. NACE rev. 2 code 23 industry represents companies in manufacture of other non-metallic mineral products sector. NACE rev. 2 code 24 industry represents companies in manufacture of basic metals industry. NACE rev. 2 code 26 represents companies in manufacture of computer, electronic and optical products sector, while NACE rev. 2 code 27 represents companies in manufacture electrical equipment sector.

In this study five key financial variables were selected to statistical analysis. Those key variables are:

1) Value of stock (stock)
2) Earnings before interest and taxes (EBIT)
3) Total assets
4) Turnover
5) Stock turnover (inventory turnover)

Data was gathered from two countries, Finland and USA. From Orbis this selection was defined in location search step. In total data from 8910 companies was used of which 2947 companies were selected to further analysis. Industry was specified by utilizing NACE Rev. 2 metrics. Data was analyzed by using R-software and eviews-software.

There were some limitations that resulted that not all of the companies of those industries were selected to further analysis. First of all, only active companies were selected because non-active companies didn't have all sufficient data in place. Secondly, if company didn't have sufficient data for the reference period it wasn't included to study, thus from the USA mainly public listed companies were included to the study, whereas for Finnish companies the data was available also for the smaller ones. Below is statistics of companies studied. Total amount includes all companies (also non-active companies) that don't have any data, thus companies studied is not 100 % of all companies in industry. Analyzed data was between 15,68 % and 73,34 % of total sample, depending of industry.

	Companies in total	Companies studied	% of total
NACE: 16 Finland	3565	559	15,68 %
NACE: 16 USA	22	14	63,64 %
NACE: 17 Finland	299	135	45,15 %
NACE: 17 USA	30	20	66,67 %
NACE: 22 Finland	835	432	51,74 %
NACE: 22 USA	51	36	70,59 %
NACE: 23 Finland	1295	394	30,42 %
NACE: 23 USA	26	19	73,08 %
NACE: 24 Finland	217	83	38,25 %
NACE: 24 USA	185	63	34,05 %
NACE: 26 Finland	1048	417	39,79 %
NACE: 26 USA	588	433	73,64 %
NACE: 27 Finland	650	277	42,62 %
NACE: 27 USA	99	65	65,66 %

Table 1. Data sample by industry

The following empirical part of the thesis includes regression model. As a dependent variable value of stock was used. Value of stock indicates in euro-terms how much goods company has in its balance sheet. As a independent variables, EBIT, inventory turnover (stock turnover), total assets and turnover were used. EBIT describes earnings before interest and taxes, turnover describes how much company has sold its goods or services and total assets describes value of assets in balance sheet.

Inventory turnover is calculated as

$$Inventory\ turnover = \frac{Operating\ revenue\ (turnover)}{Stock}$$

It is a ratio that shows how many times inventory is sold or used and replaced during given time period. In this thesis the time period is one year. For instance, UPM-Kymmene Oyj had inventory turnover 6,43 in fiscal year 2018 it means that inventory is sold or used 6,43 times in year 2018. Descriptive statistics is presented in chapter 4.

Correlation test was made by using correlogram correlation method. In practice correlogram is a graphical output of correlation matrix. It shows the correlation value and highlights the most or least correlated variables.

4 Empirical findings

In this chapter five, the main findings of the empirical part are presented. First the chapter introduces descriptive statistics, correlation matrix (correlogram) and results of regression analysis, for Finnish companies and US companies respectively, and the findings are presented and analysed. Currency in all graphs and tables is EUR so companies operating in USD are converted into euros.

Data was gathered from seven industries, respectively. The studied industries are:

8) Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (NACE rev. 2 classification: 16).
9) Manufacture of paper and products of paper (NACE rev. 2 classification: 17).
10) Manufacture of rubber and plastic products (NACE rev. 2 classification: 22).
11) Manufacture of other non-metallic mineral products (NACE rev. 2 classification: 23).
12) Manufacture of basic metals (NACE rev. 2 classification: 24).
13) Manufacture of computer, electronic and optical products (NACE rev. 2 classification: 26).
14) Manufacture of electrical equipment (NACE rev. 2 classification: 27).

4.1 Empirical findings for all Finnish and US companies

Below is two correlograms, one for Finnish companies and one for US companies. All companies and all observations from reference period are grouped and visible in correlogram, countries separately. Correlogram analyses the relationship between two selected variables in a dataset. In two correlograms below all five key variables are analysed against each other. It shows how the variables move in relation to each other. Below correlograms are colour coded, the more red the square is the more there is negative

correlation against other variable and more blue the square is the more the is positive correlation between the variables. If the values is zero, then there is no linear relationship between the variables.

Below is correlogram for Finnish companies. It shows the correlation between variables and the data is collected from all studied industries and between years 2011 and 2019. Stock turnover has a very weak negative correlation with all other variables, it is so weak that there is almost none linear relationship between stock turnover and other variables. Stock has a very strong correlation to total assets (0,94) and turnover (0,92), but positive but weak correlation with EBIT. EBIT has weak but positive correlation with total assets and turnover. Total assets has very strong positive correlation (0,95) with turnover. Any strong negative correlations didn't occur and mainly there was positive correlation between variables meaning that if one variable grows or declines also other variables tend to move to the same direction.

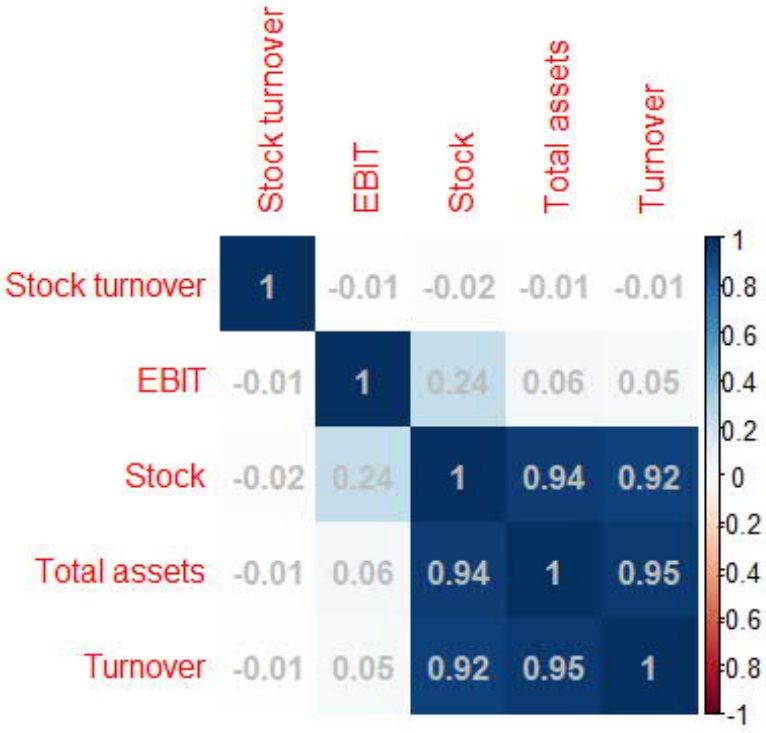

Table 2. Correlogram, Finland

Below is correlogram for US companies based on US data. It includes all studied seven industries and gathered between the reference period 2011 and 2019. Stock turnover has very weak positive correlation to total assets, turnover and EBIT, and very weak negative correlation to stock turnover. Stock and stock turnover don't almost have a linear relationship at all, because the correlation is so weak. This finding was almost aligned to Finnish data where stock turnover has also very weak, almost non-linear correlation to other variables. Stock has medium, 0,45, correlation to EBIT, but strong correlation to turnover (0,65) and total assets (0,64) meaning that if value of stock increase also company's turnover and total assets tend to increase; those variables have relatively strong relationship. In addition to previously mentioned, total assets have very strong (0,96) relationship with turnover and very strong relationship with EBIT. So if total assets increase also turnover and EBIT tend to increase, in practice this is logical because for most of the companies big value of total assets mean that company is big also in other metrics (correlation is causation). Turnover has a strong correlation (0,91) to EBIT, meaning that if turnover increases also EBIT tend to increase and vice versa.

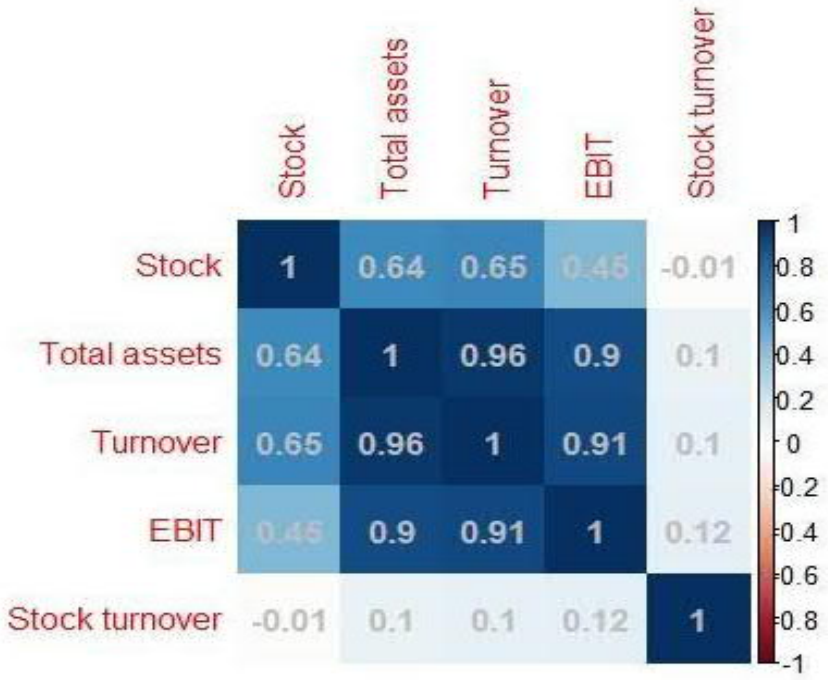

Table 3. Correlogram, USA.

Basic data is formatted to histograms. Histograms are based on year 2019 data. In histograms all variables studied (EBIT, turnover, total assets, stock turnover and value of stock) are presented in own histograms separately and also countries from where data was gathered, Finland and USA, were presented separately. Histograms following in below are frequency histograms meaning that in vertical column frequencies are visible (and also in top of each bin), there are also no caps between the bars. On the horizontal axis value values of interval are visible.

First histogram is inventory turnover histogram, describing Finnish companies in 2019. Stock turnover shows how many times company can sold and replace its inventory in a year. Width of the bin is 5 and metric is 1x (inventory turns in a year). Histogram is limited to 50 meaning that all values over 50 (inventory turns over 50 times in a year) are grouped to the last bin. Number of companies exceeding 50x inventory turns in a year is 88. Inventory turnover histogram is skewed on right, i.e. the tail is going off in the right. Majority of companies have inventory turnover between 0x – 15x in 2019.

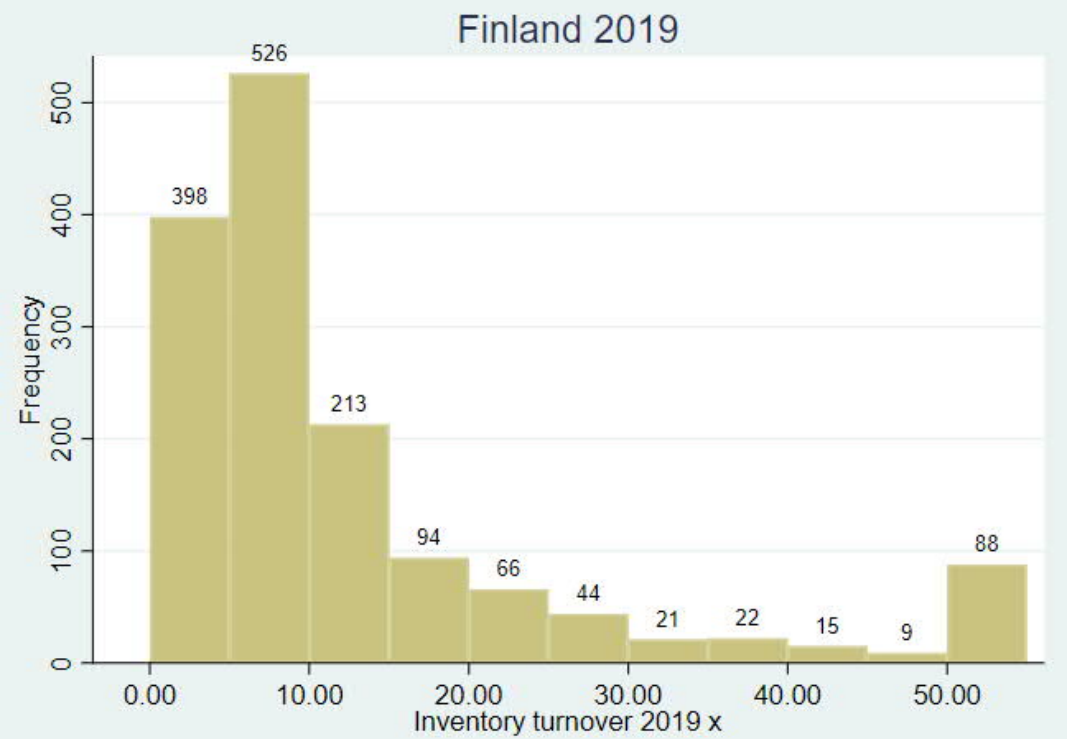

Table 4. Inventory turnover histogram, Finland (2019).

Inventory turnover histogram (USA, fiscal year 2019) is shown in below. Width of bin is same as in Finland (5) and histogram is limited to 50 (all values exceeding 50 are grouped into last bin). Number of companies in USA within examined industries in 2019 that have inventory turnover over 50 is 10 companies. As in Finland, also in the USA, histogram is skewed on right, meaning that it has a positive skew. The shape of US histogram is similar to Finnish histogram, most of the companies in studied industries had inventory turnover between 0-15x in 2019.

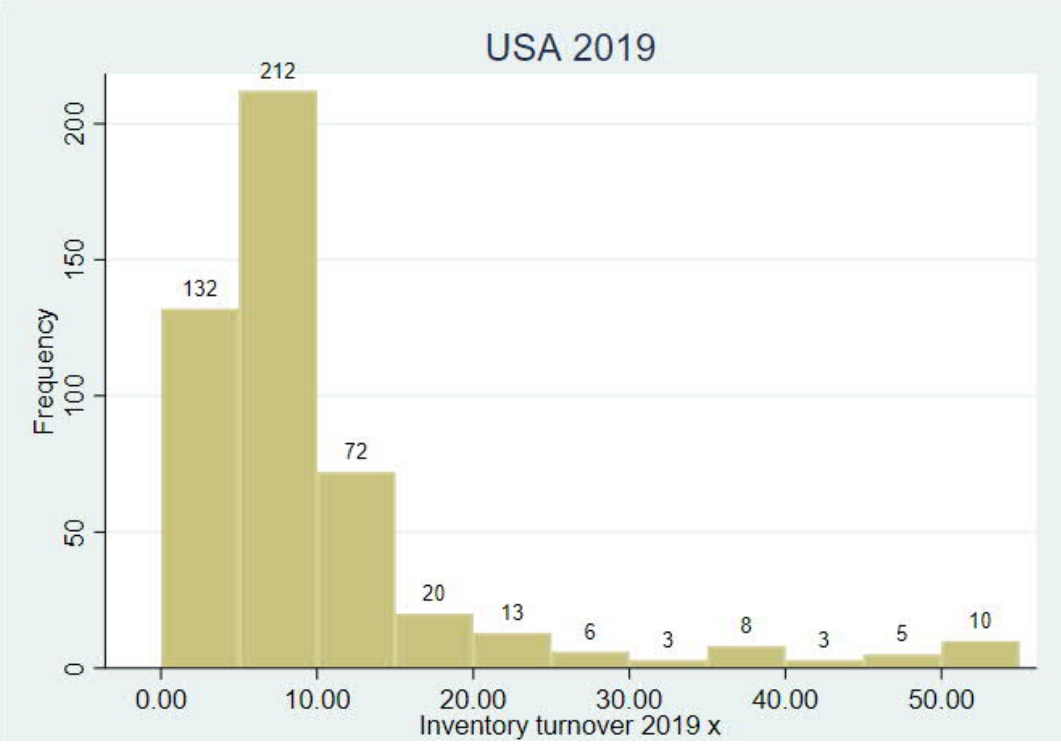

Table 5. Inventory turnover histogram, USA (2019).

EBIT histogram below represents frequencies companies are divided based on their EBIT levels. EBIT shows earnings before interest and taxes by a company. As we can see, most of the companies have EBIT between 0 and 1 MEUR, so based on their EBIT levels, most of the companies are relatively small. Width of a bin is 1 MEUR and all values over 20MEUR are grouped to the last bin. EBIT histogram for Finnish companies within the examined industries in 2019 is relatively asymmetric. There are few companies that have negative EBIT levels meaning that their operations are not profitable from EBIT point of view.

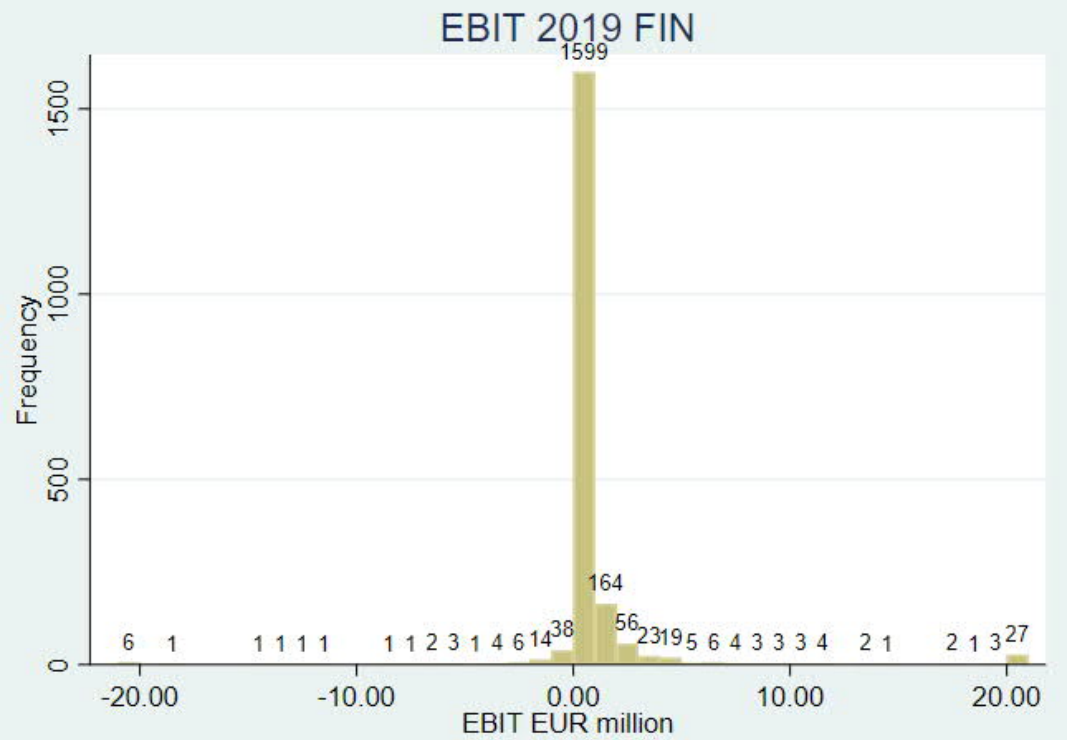

Table 6. EBIT histogram, Finland (2019).

EBIT histogram for US companies within the studied industries in 2019 is different compared to Finnish peers. First of all, width of the bin is 20 MEUR because the tails are much longer for the US EBIT histogram compared to Finnish EBIT histogram. Most of the companies are in 0 – 10 MEUR bin, number of companies in this bin are 169. In general it can be said that from EBIT point of view, US companies are bigger compared to Finnish peers. All of the companies that had EBIT more than 500 million euros in 2019 are grouped into last bin and number of those companies is 60.

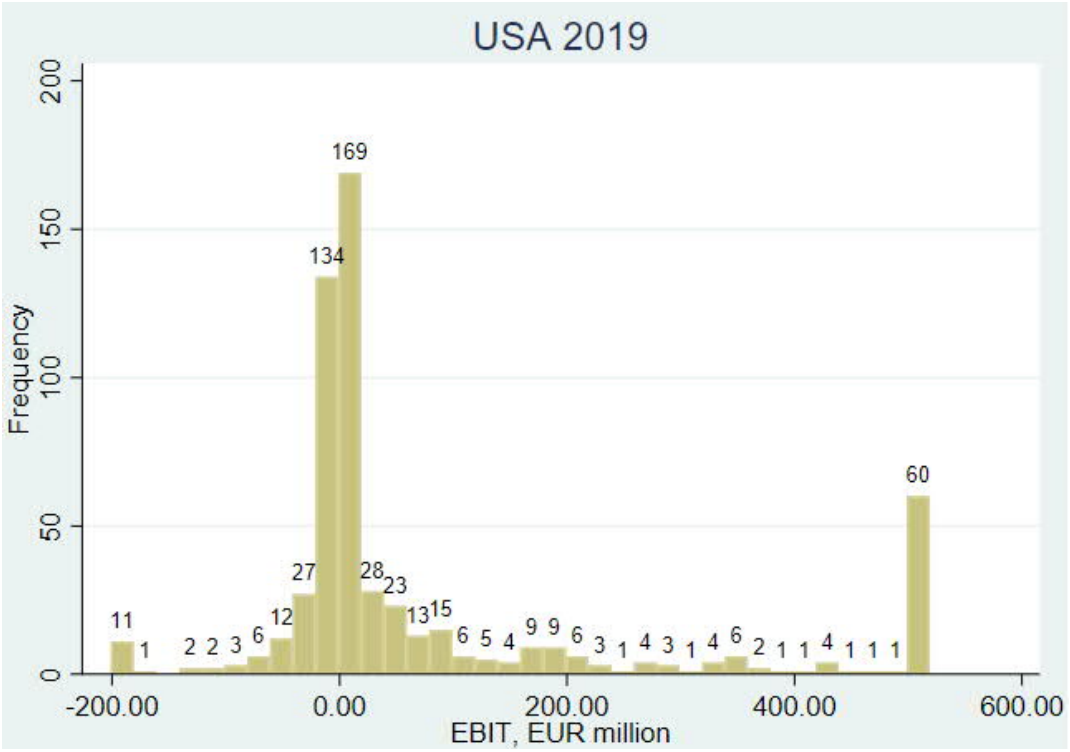

Table 7. EBIT histogram, USA (2019).

Stock histogram represent value of stock in EUR millions. Value of stock shows the value of owned stocks by the company. In below histogram is for Finnish companies (2019) in examined industries. Width of a bin is 20 MEUR. It is clearly visible that majority of companies have stock value between 0 and 20 million euros. Only very few companies have value of stock more than 20 MEUR. Finnish stock histogram (2019) has a very long tail on the right so it has a positive skew. Also based value of stock data it can be said that Finnish companies are relatively small in global scale.

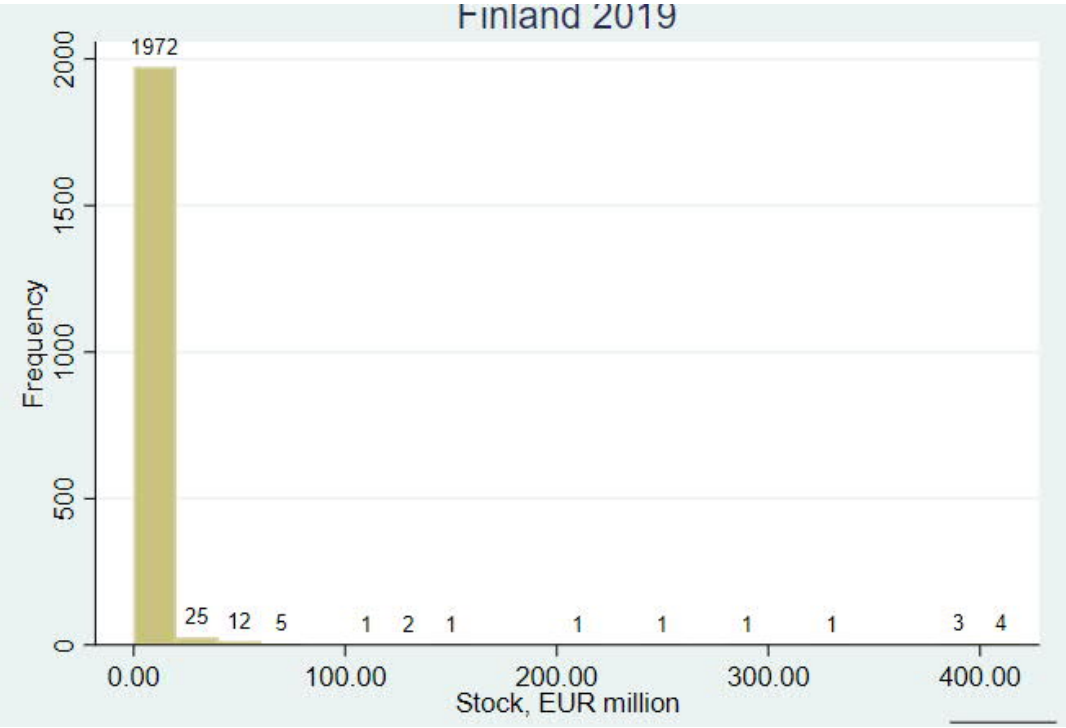

Table 8. Value of stock histogram, Finland (2019).

Value of stock histogram for US companies (2019) in studied industries has a positive skew and a long tail to the right, i.e. it skewed to the right. Width of a bin is 25 MEUR and majority of companies, 339 companies, had value of stock between 0 and 25 million euros. Companies those value of stock is more than 1000 million euros are grouped in last bin, number of those companies is 32. Based on the value of stock data it can be said that US companies are in average bigger compared to Finnish companies. As it was visible in correlograms if value of stock increases also value of turnover tend to increase, and turnover is often used as a metric of company's size.

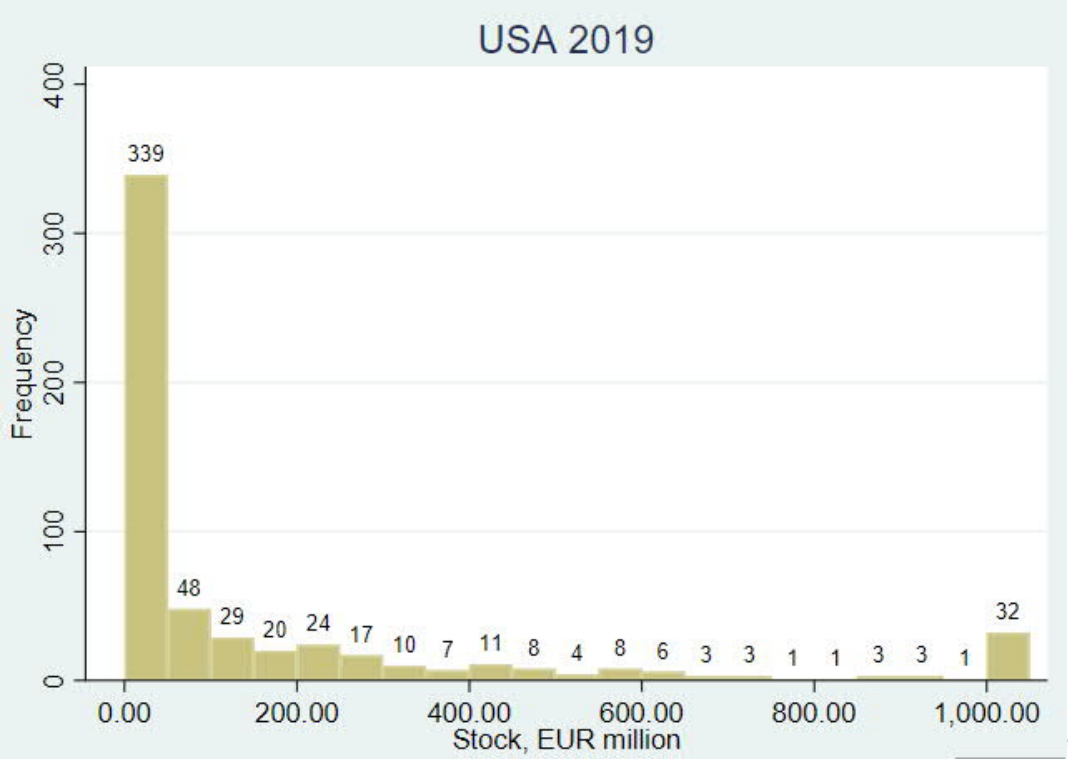

Table 9. Value of stock histogram, USA (2019).

Histogram in below describes value of total assets for Finnish companies in studied industries (2019). Total assets shows the value of assets owned by the company. Width of a bin is 50 MEUR and majority of companies, 1929 companies, have total assets between 0 and 50 million euros. Only very few companies of studied sample (4,8 %) have total assets more than 50 million euros. Histogram is skewed to the right. Those Finnish companies in studied industries that have total assets more that 1000 million euros are grouped into last bin, the number of those companies is 13. Findings from total assets histograms are well aligned to other histograms; Finnish companies are relatively small in general.

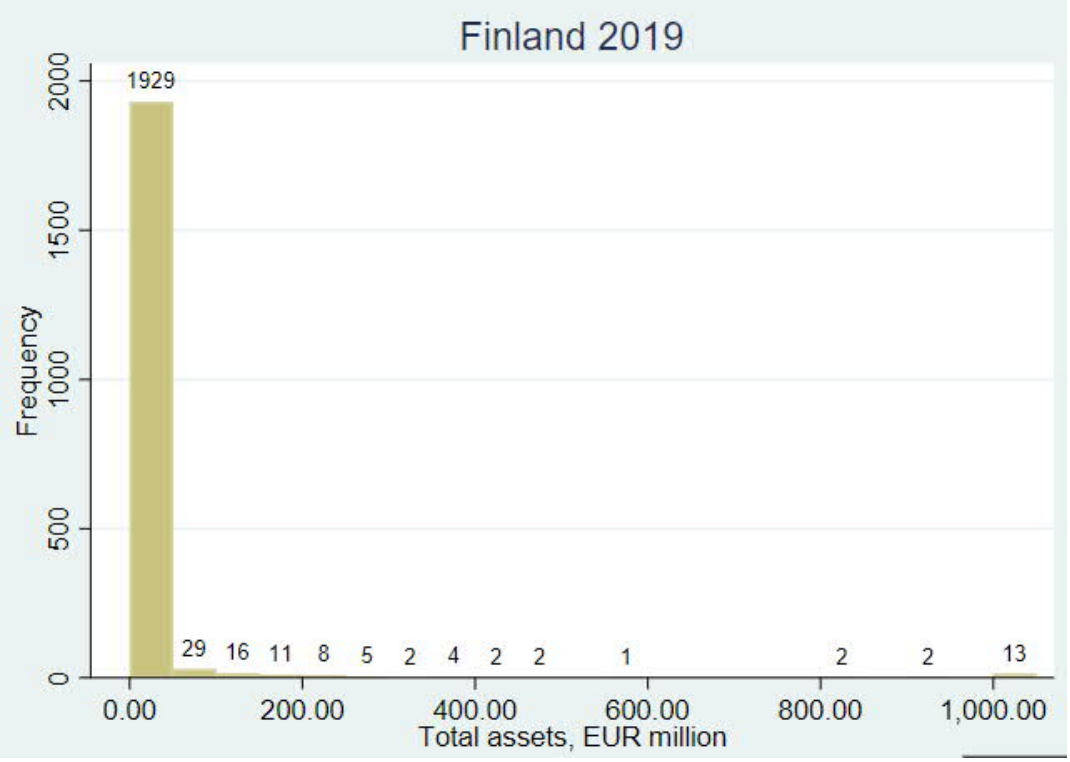

Table 10. Total assets histogram, Finland (2019).

Total assets histogram (in below) for US companies has similar long tail to the right and skewness as Finnish companies. Majority of the companies are in the first bin. Width of the bin is 500 million euros so the companies have in average more assets compared to the Finnish peers within same industries. Those US companies that have total assets more than 10 000 million euros are grouped into the last bin and the number of those companies is 37. Comparison to Finnish total assets histogram highlights previously findings that in studied data US companies are bigger compared to Finnish companies.

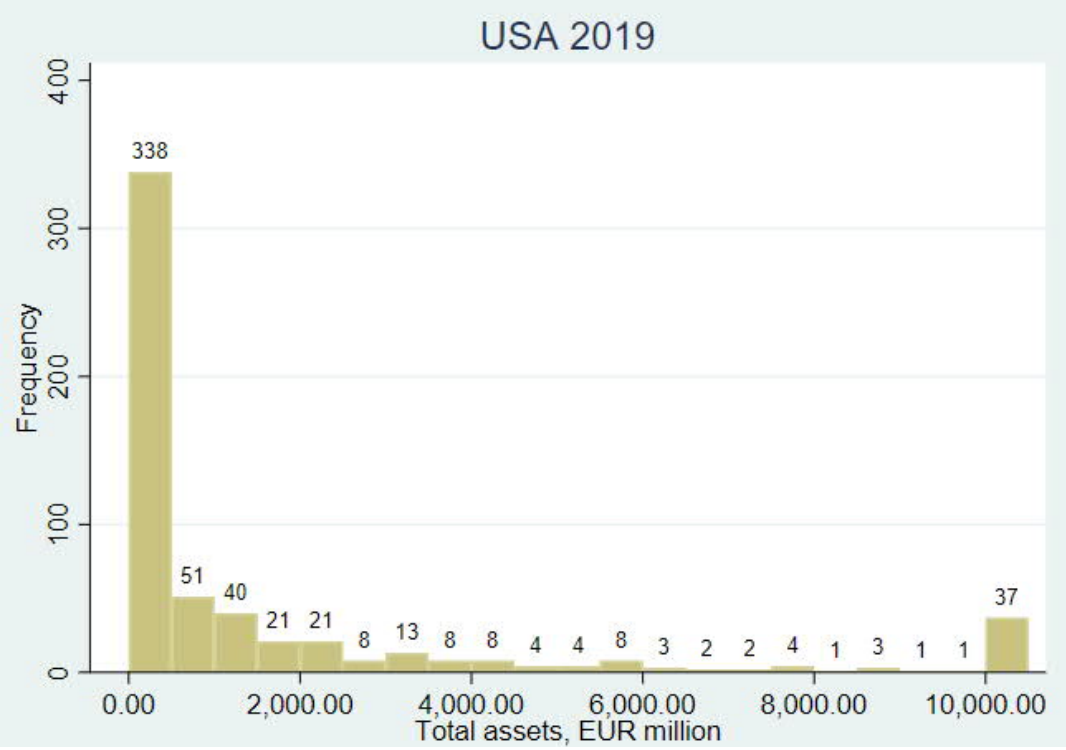

Table 11. Total assets histogram, USA (2019).

Last histogram is turnover histogram. Turnover, i.e. sales, shows how much revenues company receive from its operations. Histogram for Finnish companies has a positive skewness. Most of the companies are in the first bin (1848 companies or 94% of total sample) so have revenues between 0 and 50 million euros. Companies that have revenues more that 1000 million are grouped into last bin. 15 Finnish companies within studied sample have revenues more that 1000 million euros.

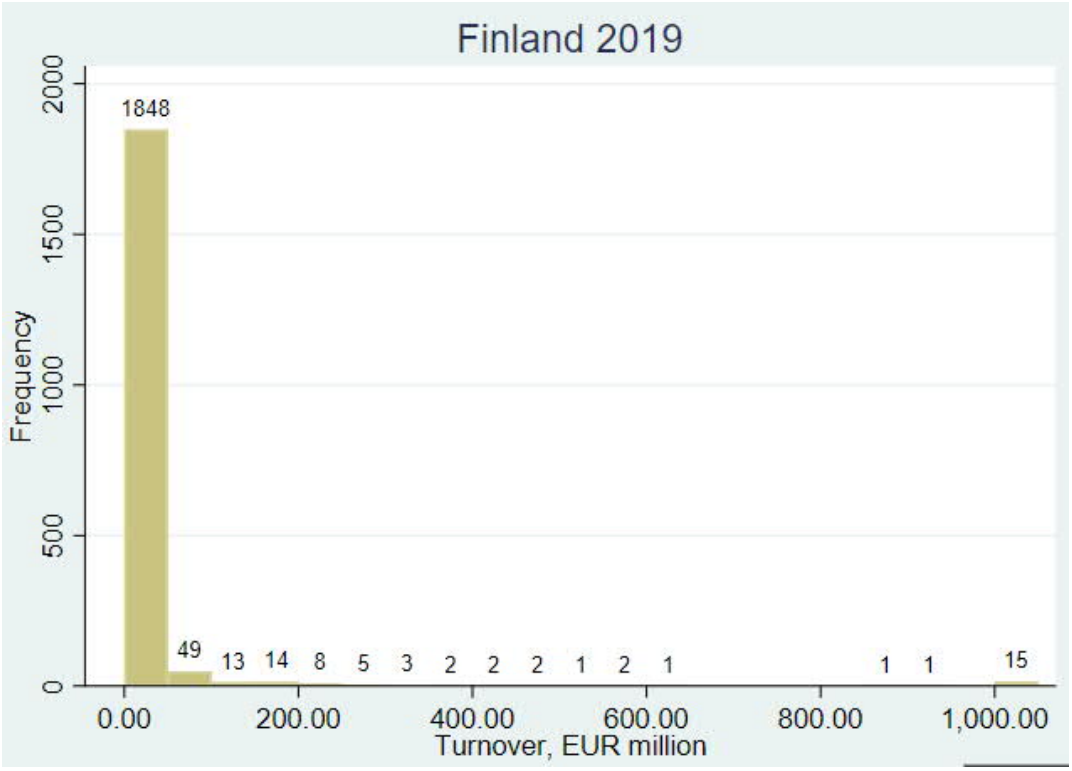

Table 12. Turnover histogram, Finland (2019).

Turnover histogram for US companies (below) has similar positive skewness to the right as Finnish peers. However, contrary to histogram for Finnish peers, width of the bin is different (100 million euros) and histogram is limited to 5 000 million meaning that all companies that have revenues more than 5 000 million euros are grouped to the last bin. Number of companies in US sample that have revenues more than 5000 euros is 49 (and 8,2% of total sample). Number of companies in first bin is 283 (and 48 % of total sample). Compared to Finnish peer it seems that US companies generate more revenues in average in studied population.

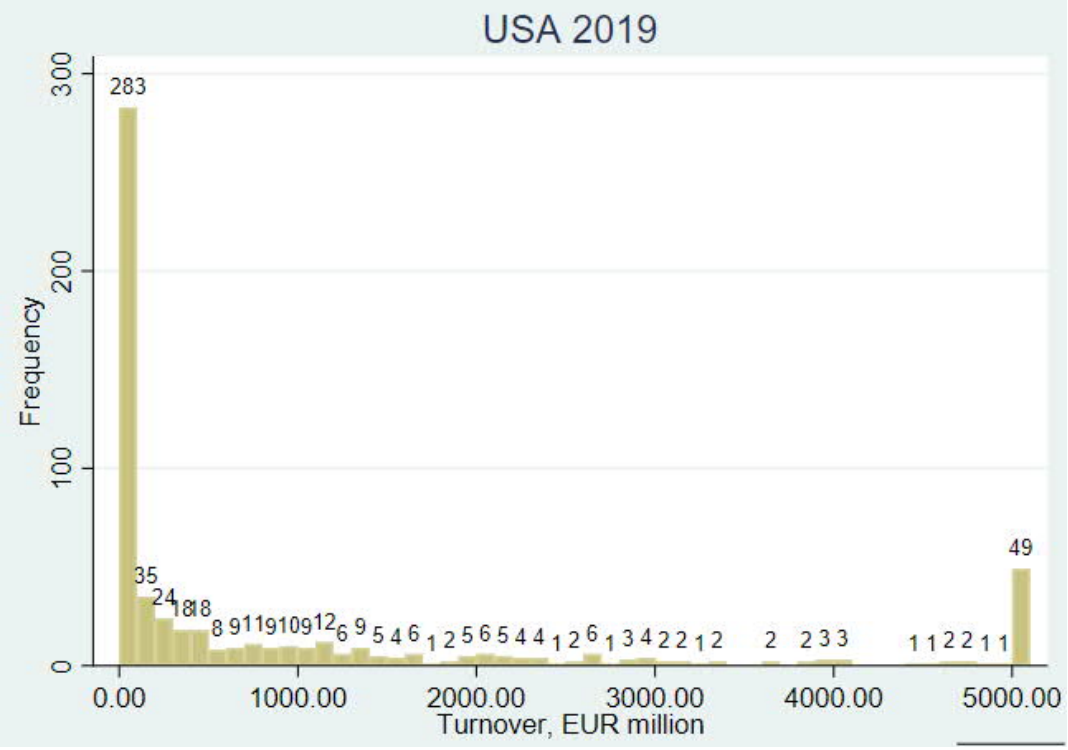

Table 13. Turnover histogram, USA (2019).

4.2 Industry 16 – manufacture of wood and of products of wood

Sample in industry NACE Rev. 2: 16 – manufacture of wood and of products of wood and cork, expect furniture; manufacture of articles of straw and and plainting materials consists of 3587 companies of which 573 companies were selected to review, 559 companies from Finland and 14 companies from the United States of America. Rest of the companies did not have data available or were no longer in operation.

Between period 2012 and 2019 average inventory turnover (in rounds) for Finnish companies is higher compared to US companies. In 2011 inventory turnover was higher for US companies compared to Finnish companies. In 2019 average inventory turnover for Finnish companies was 20,05x and for US companies 9,95x. Lower average inventory turnover for US companies may indicate e.g. that they have overstock but also lower possibility to shortages if inventory overall is saleable.

Table 14. Average stock turnover in Finland and USA, period 2011-2019, industry 16.

As seen from below graph between 2011 and 2019 the ratio of inventory to total assets was relatively stable throughout the period under review for Finnish companies. In 2011 the ratio of average inventory to totals assets was around 16,76 % and 2019 around 19,97 %. It also should be noted that the absolute values in both parameters have increased meaning that in this industry in Finland companies have more inventory and assets in 2019 compared to 2011. Values have increased since 2014 to 2019. There were some decrease from 2011 to 2013, however the ratio of inventory to total assets was around 19,45 % so in-line to e.g. ratio in 2019.

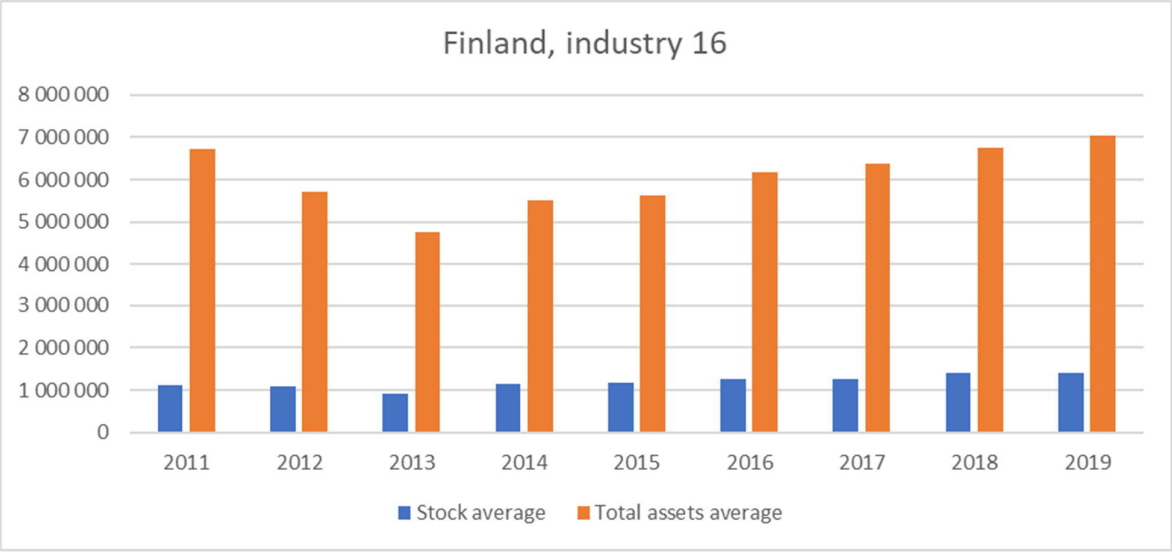

Table 15. Stock average and total assets average, industry 16, Finland.

For US companies the ratio of inventory to total assets has slightly increased from 5,85 % in 2011 to 7,68 % in 2019. As in Finland also in the USA the absolute values of both variables have increased during the period under review. Compared to Finnish companies the ratio of inventory to total assets in US companies in this industry is lower meaning that inventories represent smaller share of total assets than in Finland.

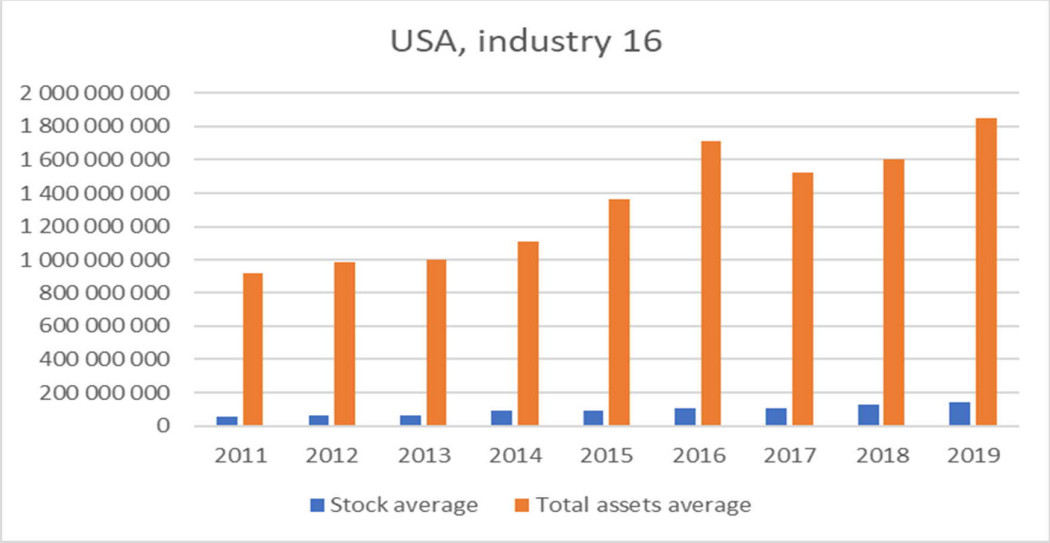

Table 16. Stock turnover and total assets in average, industry 16, USA

Below is statistics for Finnish companies in manufacture of wood and products of wood industry between studied years 2011 - 2019. Data has in total 4021 observations. Value of stock is dependent variable. R-squared is 0,915. Stock has statistically significant regression to EBIT, total assets and turnover with 99% confidence level. In practice that means that if company increases its value of stock also EBIT, total assets and turnover increases. Stock is part of total assets so this finding might indicate that stock represents considerable share of total assets in this industry. However, although stock positive regression to EBIT, the regression is not as big as between stock to total assets or to turnover. Theory supports this evidence because if value/amount of stock increases it usually slows stock turnover so company is not handling its working capital as efficiently as possible, i.e. there is a lack of WCM efficiency. Once value of stock increases it is logical that also turnover increases. Otherwise company is not selling its stock or sells it with discount. Stock has also negative regression to stock turnover with 99% confidence interval, meaning that it value of stock increases then stock turnover decreases.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 10/30/20 Time: 01:20
Sample: 2011 2019
Periods included: 9
Cross-sections included: 559
Total panel (unbalanced) observations: 4021

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	175834.6	26586.36	6.613716	0.0000
EBIT	0.129726	0.015460	8.390889	0.0000
STOCK_TURNOVER	-2354.384	592.1191	-3.976200	0.0001
TOTAL_ASSETS	0.090156	0.002228	40.46361	0.0000
TURNOVER	0.059880	0.001935	30.94149	0.0000

R-squared	0.914875	Mean dependent var	1338618.
Adjusted R-squared	0.914790	S.D. dependent var	5110877.
S.E. of regression	1491903.	Akaike info criterion	31.27025
Sum squared resid	8.94E+15	Schwarz criterion	31.27808
Log likelihood	-62863.83	Hannan-Quinn criter.	31.27302
F-statistic	10790.40	Durbin-Watson stat	0.440667
Prob(F-statistic)	0.000000		

Table 17. Regression statistics, industry 16, Finland.

Scatter plot for Finnish companies (dependent variable: stock, other variables: EBIT, total assets and turnover). It can be seen that if value of stock increases, total assets and turnover for the company tend to increase much more than EBIT. It can also be seen that majority of companies are close to origin, showing that companies in Finland in this industry are relatively small. Based on the scatter, if the company increases its value of stock, EBIT tend not to increase as much.

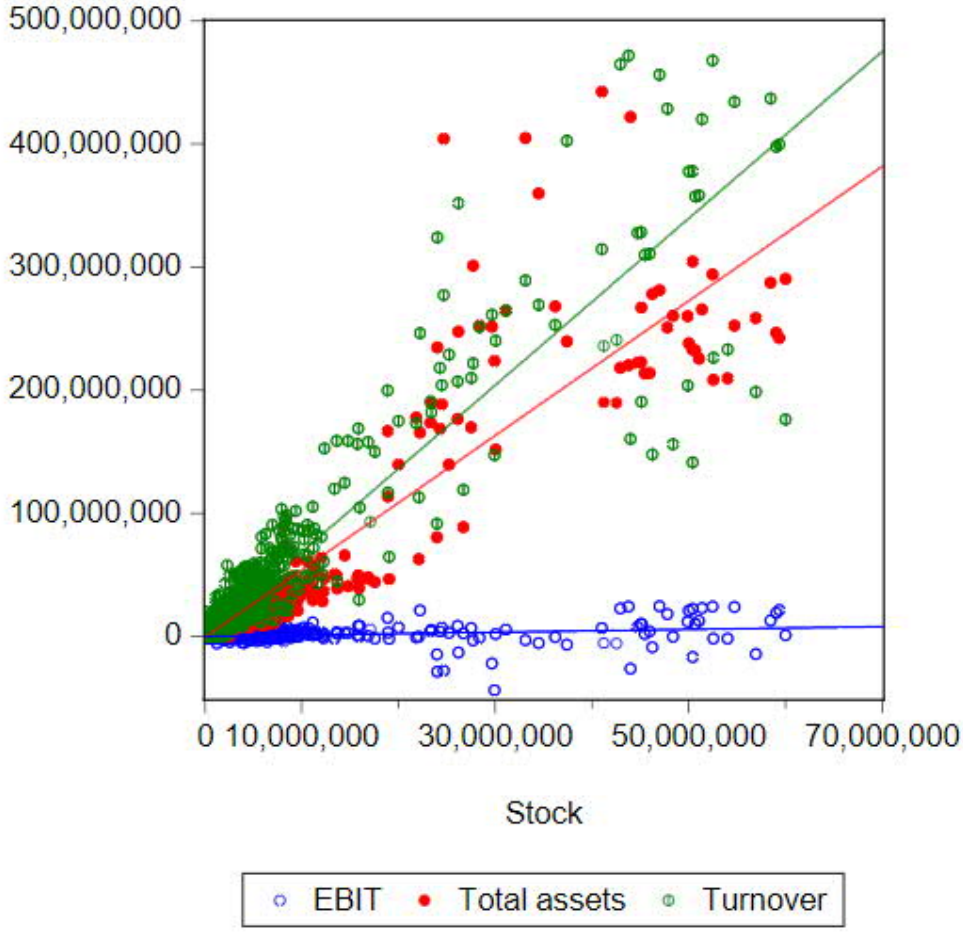

Table 18. Stock scatter, industry 16, Finland.

Below is statistics for the USA in manufacture of wood and products of wood industry between 2011 and 2019. Data has 98 observations. R-squared is 0,960. Results show that stock has statistically strong positive regression with turnover where coefficient is 0,1265. This data for US companies also show that stock has statistically negative regression with total assets. Regression between stock and turnover and between stock and total assets are with 99 % confidence interval. Turnover tend to increase if value of stock increases because company needs to sell its inventory in order to be profitable. In this data stock didn't have statistically significant regression to EBIT, that might indicate that EBIT levels decrease or remain in same level if value of stock increases with 99% confidence interval. Stock did have negative regression with EBIT in 95 % confidence interval where coefficient was -0,1359. Stock did have also negative regression with stock turnover with 90 % confidence interval.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 10/30/20 Time: 01:27
Sample: 2011 2019
Periods included: 9
Cross-sections included: 14
Total panel (unbalanced) observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8284915.	4918795.	1.684338	0.0955
EBIT	-0.135875	0.037067	-3.665625	0.0004
STOCK_TURNOVER	-380465.1	216555.2	-1.756897	0.0822
TOTAL_ASSETS	-0.016594	0.002387	-6.952524	0.0000
TURNOVER	0.126564	0.003696	34.23915	0.0000

R-squared	0.960111	Mean dependent var	1.24E+08
Adjusted R-squared	0.958395	S.D. dependent var	1.44E+08
S.E. of regression	29341931	Akaike info criterion	37.27661
Sum squared resid	8.01E+16	Schwarz criterion	37.40849
Log likelihood	-1821.554	Hannan-Quinn criter.	37.32995
F-statistic	559.6146	Durbin-Watson stat	1.738386
Prob(F-statistic)	0.000000		

Table 19. Regression statistics, industry 16, USA.

Scatter from US data (below) has similar effect to Finnish scatter. If the value of stock increases turnover and total assets tend to increase more than EBIT. Based on the scatter there seems to be some correlation between stock and total assets. This is logical because stock is accounted as part of total assets. Also statistical regression model found a relationship between stock and total assets in USA in this industry.

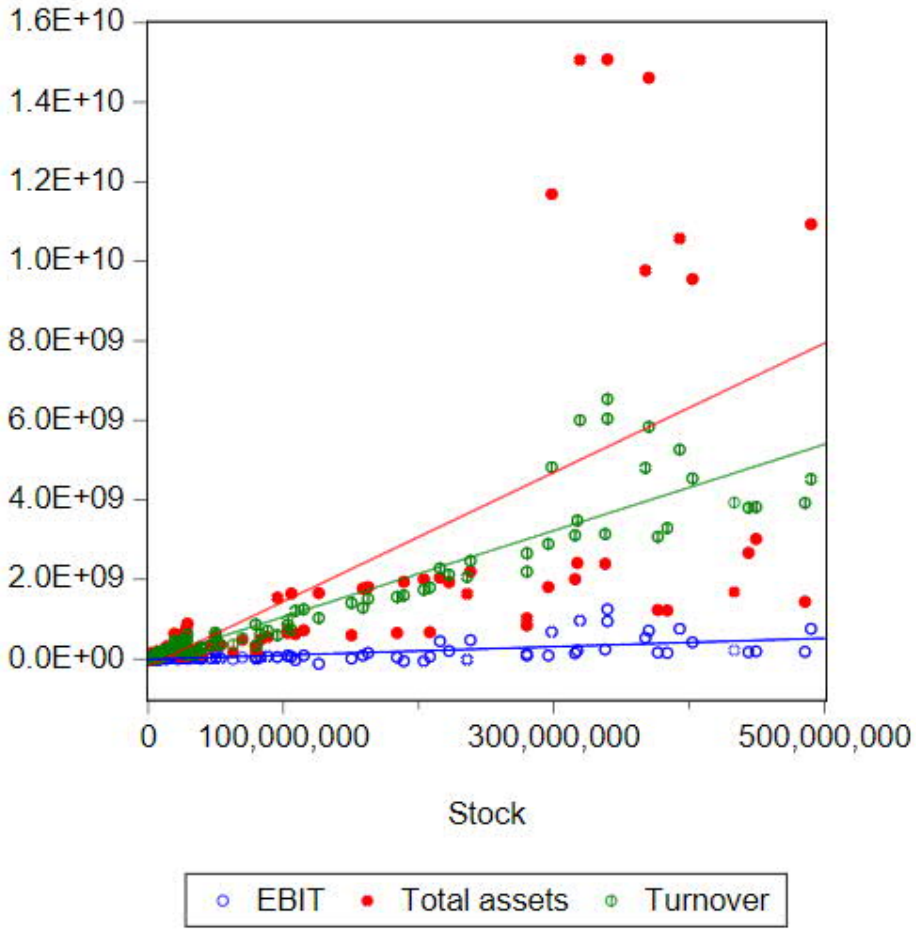

Table 20. Stock scatter, industry 16, USA.

4.3 Industry 17 – manufacture of paper and paper products

Sample of industry manufacture of paper and paper products (NACE Rev. 2. classification: 17) consists of 329 companies of which 155 companies were selected to further review (135 companies from Finland and 20 companies from the USA). Rest of the companies did not have the data available or were no longer in operation.

Inventory turnover in average was higher for Finnish companies compared to US peer during the whole reference period between 2011 and 2019 indicating better working capital management in terms of inventories. Average inventory turnover fluctuated relatively much in both countries within this industry. In Finland decreasing trend can be seen between 2016 and 2019 whereas in the US trend can be seen to be increasing between years 2017 and 2019. In this data there is no clear evidence why the trend has opposite in recent years in Finland and in the US. In 2019 the average inventory turnover in Finland was 12.9x and in the US 12,1x. Highest inventory turnover average in Finland was 18,0x in 2012 and highest figure in the US was 12,1 in 2019. Although trend has been opposite during recent years, it can be said that Finnish companies are more efficient compared to US companies in terms of stock turnover during the reference period. However, it should be noted that US companies are stock listed i.e. bigger in average compared to Finnish data where majority of the companies are not stock listed.

Table 21. Average stock turnover in Finland and USA, period 2011-2019, industry 17.

Stock to total assets ratio for Finnish companies has been relatively stable, just over 10% over the reference period. Although there has been some volatility between the years, value of stock in absolute figures has been relatively stable. Also value of total assets has been relatively stable over the reference period. As a conclusion it can be seen that companies in this industry haven't been increasing their value of stock levels over the reference period.

Table 22. Stock average and total assets average, industry 17, Finland

Value of stock in average to value of total assets in average has been relatively stable also for the US companies over the reference period. Value of stock in average to value of total assets in average ratio has been for US companies just below 10 % so slightly lower than for Finnish peers. Absolute values of average stock level and for total assets have increased during the reference period. Average stock value ended up in 2019 to 566,4 million euros whereas for Finnish companies it was around 29,7 million euros at the end of 2019.

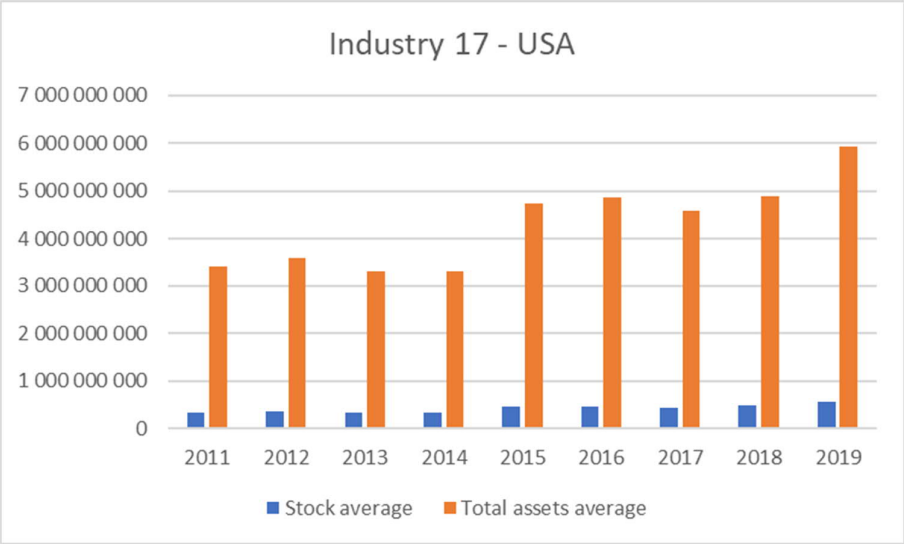

Table 23. Stock average and total assets average, industry 17, USA.

Below are results for statistical regression analysis for Finnish companies. In total there was 922 observations that formed the results. Dependent variable was value of stock and r-squared is 0,9937. Based on data there was strong regression between stock and EBIT (coefficient: 0,0524), stock and total assets (coefficient: 0,0326) and between stock and turnover (coefficient: 0,0896) with 99 confidence interval. This finding indicates that for Finnish companies in industry 17 between years 2011 and 2019 is value of stock increases also EBIT, total assets and turnover tend to increase. Value of stock has a negative regression with stock turnover with 90 % confidence interval.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/23/20 Time: 19:57
Sample: 2011 2019
Periods included: 9
Cross-sections included: 135
Total panel (unbalanced) observations: 922

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-152362.2	623238.4	-0.244469	0.8069
EBIT	0.052435	0.005669	9.249219	0.0000
STOCK_TURNOVER	-38445.95	19833.50	-1.938435	0.0529
TOTAL_ASSETS	0.032582	0.002542	12.81796	0.0000
TURNOVER	0.089606	0.003428	26.13655	0.0000

R-squared	0.993718	Mean dependent var	35590058
Adjusted R-squared	0.993690	S.D. dependent var	1.97E+08
S.E. of regression	15686714	Akaike info criterion	35.97993
Sum squared resid	2.26E+17	Schwarz criterion	36.00611
Log likelihood	-16581.75	Hannan-Quinn criter.	35.98992
F-statistic	36263.26	Durbin-Watson stat	1.264608
Prob(F-statistic)	0.000000		

Table 24. Regression statistics, industry 17, Finland.

Below scatter is for Finnish data. It shows that most of the Finnish companies in this industry are close to origin so relatively small. If the value of stock increases then also total assets and turnover tend to increase relatively linearly.

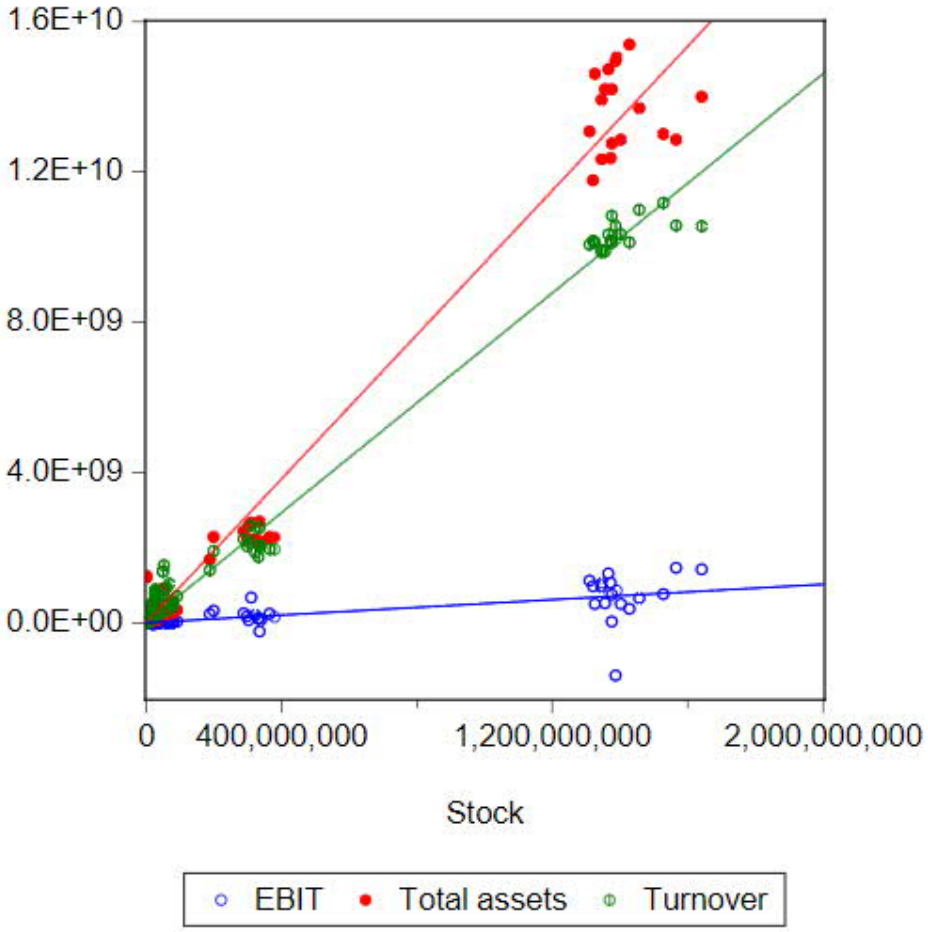

Table 25. Stock scatter, industry 17, Finland.

Statistical regression data for US companies in industry 17 consists of total 171 observations. Dependent variable is value of stock and r-squared is 0,9757. Based on the analysis value of stock has statistically strong positive relationship with total assets (coefficient 0,0167) and turnover (coefficient: 0,0922) with 99 % confidence interval. Value of stock has statistically negative regression to stock turnover with 99 % confidence interval meaning that if value of stock increases stock turnover tend to decrease that leads to slower efficiency in terms of working capital efficiency.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/23/20 Time: 20:08
Sample: 2011 2019
Periods included: 9
Cross-sections included: 20
Total panel (unbalanced) observations: 171

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	83789283	14652594	5.718393	0.0000
EBIT	-0.073743	0.031294	-2.356492	0.0196
STOCK_TURNOVER	-4706095.	1128036.	-4.171935	0.0000
TOTAL_ASSETS	0.016658	0.003412	4.882222	0.0000
TURNOVER	0.092168	0.006925	13.30970	0.0000

R-squared	0.975732	Mean dependent var	4.68E+08
Adjusted R-squared	0.975147	S.D. dependent var	5.65E+08
S.E. of regression	89111123	Akaike info criterion	39.47747
Sum squared resid	1.32E+18	Schwarz criterion	39.56933
Log likelihood	-3370.324	Hannan-Quinn criter.	39.51474
F-statistic	1668.549	Durbin-Watson stat	0.758389
Prob(F-statistic)	0.000000		

Table 26. Regression statistics, industry 17, USA

From the US scatter below it is visible that is value of stock increases total assets and turnover increases the most. Amount of EBIT increases as well but not as much as total assets and turnover. These findings are similar to Finnish scatter from the same industry.

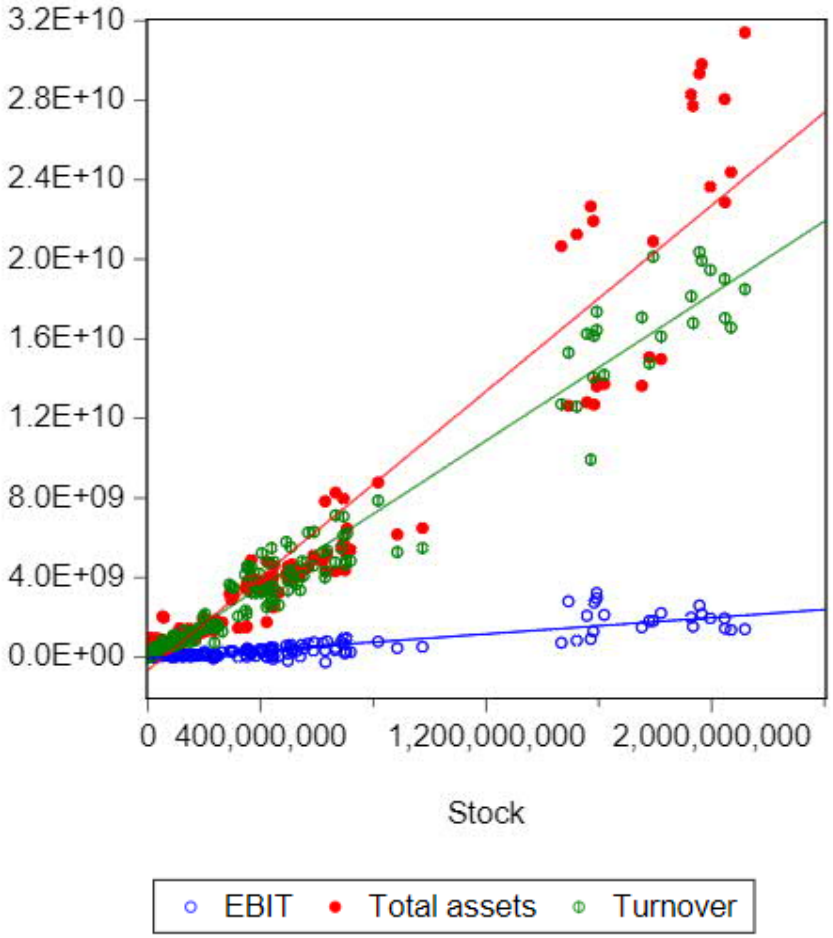

Table 27. Stock scatter, industry 17, USA.

4.4 Industry 22 – industry rubber and plastic

Sample in manufacture of rubber and plastic products -industry (Nace. Rev. 2: 22) consists of 871 companies in total. 432 companies from Finland and 36 companies from the United States of America were selected to further review.

Inventory turnover in average has been better in Finland compared to the USA. Especially during the years 2017-2019 inventory turnover has been higher in Finland compared to the USA. In 2019 Finland stand in around 14x and USA just below 8x. However, it should be noted that both have been in decreasing trend from 2017 to 2019. Stock turnover overall in average has fluctuated during the reference period.

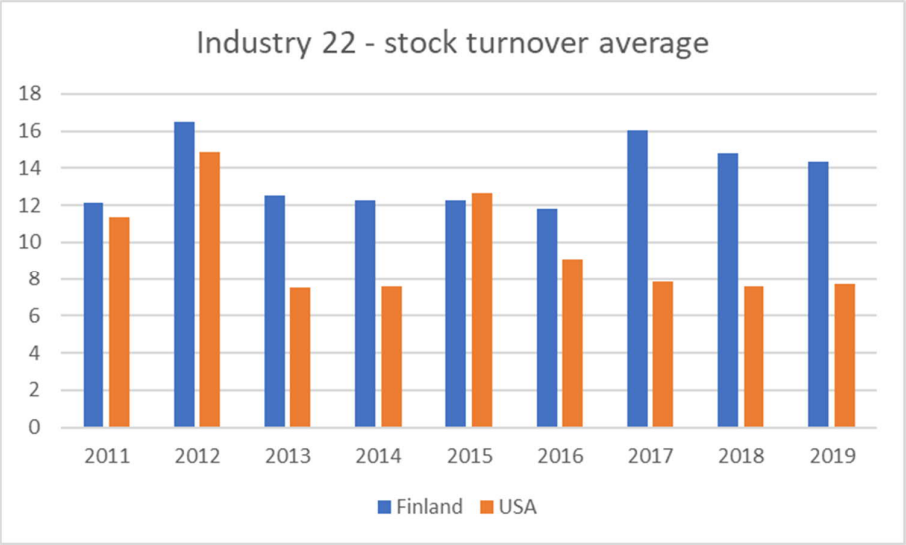

Table 28. Average stock turnover in Finland and USA, period 2011-2019, industry 22.

Data from Finnish companies between years 2011 and 2019 shows that value of inventory to value of total assets has increased during the sample period. In absolute values both of the indicators, values of inventory and value of total assets, increased during the reference period. In the USA total value of inventory to value of total assets has decreased during the reference period. However, as in Finland, also in the USA absolute values of both indicators have increased during the reference period.

Table 29. Stock average and total assets average, industry 22, Finland.

For US companies the value of stock ratio to total assets has been decreasing during the reference period. Main reason for that is significant increase in value of total assets in average. However, also value of stock in average has increased during the reference period. In 2019 value of inventory to value of total assets ratios was 12,48 %.

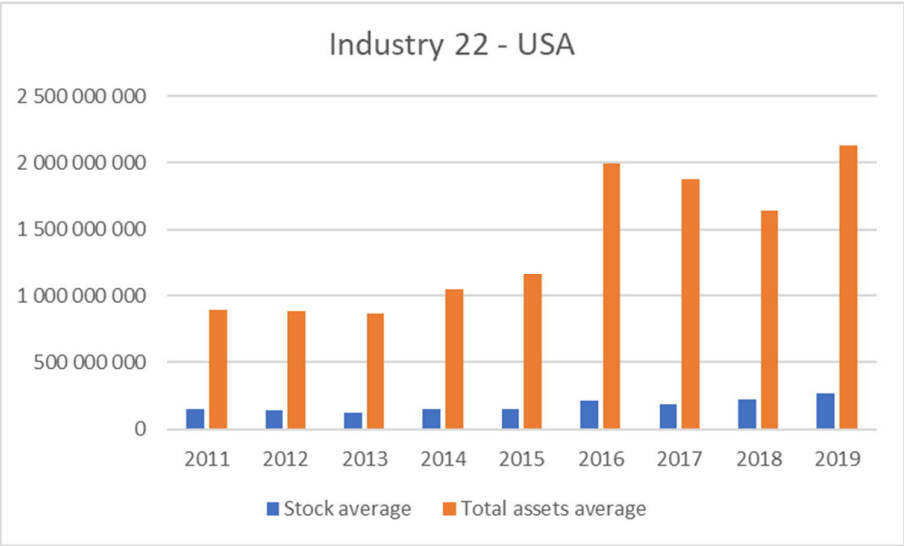

Table 30. Stock average and total assets average, industry 22, USA.

Below is statistic for Finnish companies in industry 22. It is formed from 3071 observations. R-squared is 0,992. Value of stock as a dependent variable has strong positive regression with EBIT (coefficient: 0,048), with total assets (coefficient : 0,141) and with turnover (coefficient: 0,017). This finding shows that in rubber and plastic industry if value of stock increases also EBIT, total assets and turnover tend to increase. All of those findings are at 99 % confidence interval. Stock and stock turnover have strong but negative regression showing that if the value of inventory increases then stock turnover tend to decrease. This result is at 90 % confidence interval.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/09/20 Time: 23:22
Sample: 2011 2019
Periods included: 9
Cross-sections included: 432
Total panel (unbalanced) observations: 3071

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	130660.6	34978.05	3.735504	0.0002
EBIT	0.048045	0.006471	7.424242	0.0000
STOCK_TURNOVER	-3407.076	932.2473	-3.654691	0.0003
TOTAL_ASSETS	0.141427	0.001744	81.09369	0.0000
TURNOVER	0.017193	0.001159	14.82881	0.0000

R-squared	0.992261	Mean dependent var	2673518.
Adjusted R-squared	0.992251	S.D. dependent var	20138526
S.E. of regression	1772720.	Akaike info criterion	31.61555
Sum squared resid	9.64E+15	Schwarz criterion	31.62537
Log likelihood	-48540.68	Hannan-Quinn criter.	31.61908
F-statistic	98283.30	Durbin-Watson stat	0.911088
Prob(F-statistic)	0.000000		

Table 31. Regression statistics, industry 22, Finland.

Below scatter is based on Finnish data. It shows that most of the Finnish companies are close to origin in terms of value of stock, value of total assets or turnover, so Finnish

companies in this industry are relatively small. Scatter clearly show that if the value of stock increases then also company's turnover and total assets increase more than EBIT.

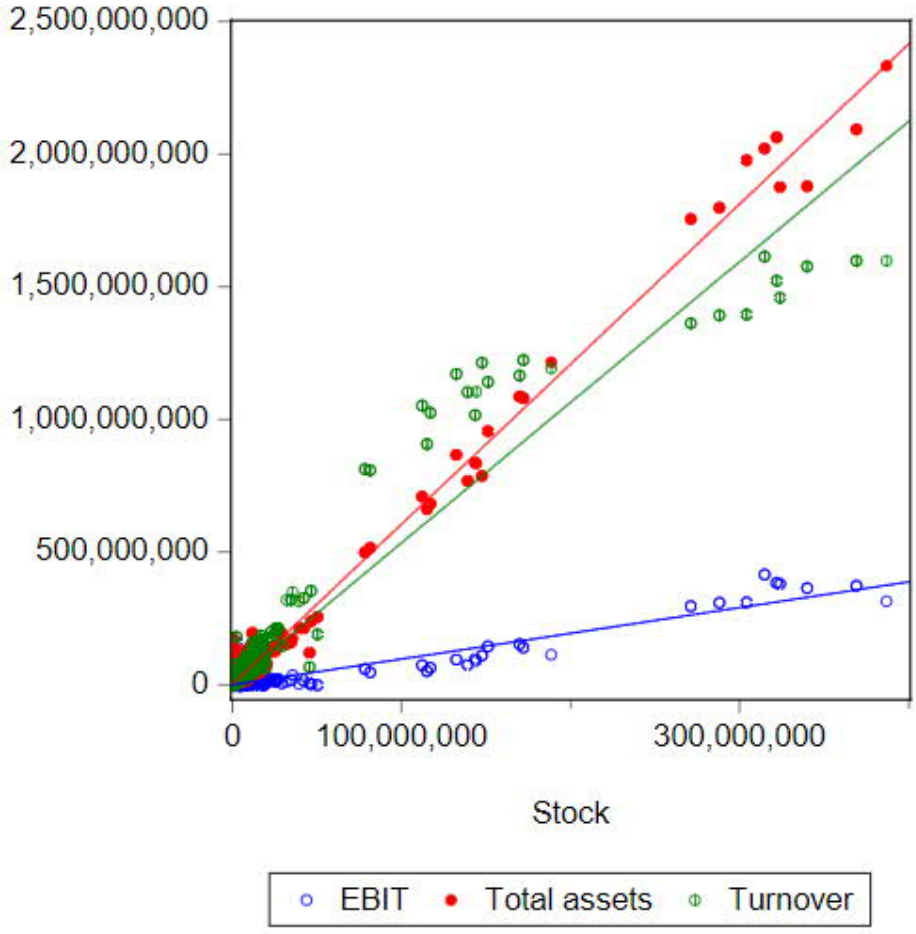

Table 32. Stock scatter, industry 22, Finland.

Regression model for US companies in industry 22 consists of 273 observations. Dependent variable is stock and r-squared is 0,9716. Based on this data, value of stock has a positive strong regression with total assets (coefficient: 0,0173) and with turnover (coefficient: 0,1421). These finding are with 99 % confidence interval. From statistical point of view there was no significant statistical findings between value of stock and EBIT or with value of stock and stock turnover.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/10/20 Time: 00:08
Sample: 2011 2019
Periods included: 9
Cross-sections included: 36
Total panel (unbalanced) observations: 273

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6582693.	6179565.	-1.065236	0.2877
EBIT	-0.016137	0.011349	-1.421830	0.1562
STOCK_TURNOVER	-198649.5	288223.3	-0.689221	0.4913
TOTAL_ASSETS	0.017250	0.002583	6.678913	0.0000
TURNOVER	0.142088	0.003617	39.28384	0.0000

R-squared	0.971595	Mean dependent var	2.08E+08
Adjusted R-squared	0.971171	S.D. dependent var	4.79E+08
S.E. of regression	81289427	Akaike info criterion	39.28308
Sum squared resid	1.77E+18	Schwarz criterion	39.34918
Log likelihood	-5357.140	Hannan-Quinn criter.	39.30961
F-statistic	2291.749	Durbin-Watson stat	0.539292
Prob(F-statistic)	0.000000		

Table 33. Regression statistics, industry 22, USA.

Scatter from US data for industry 22 (below) shows that if the value of stock increases turnover and total assets tend to increase much more than EBIT.

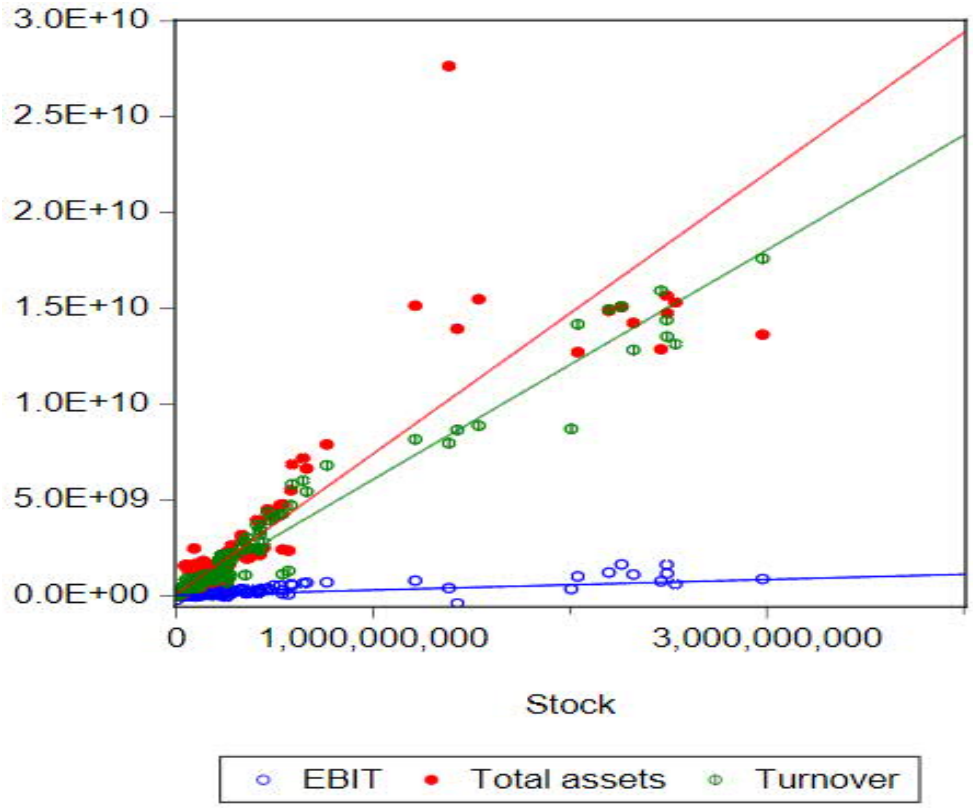

Table 34. Stock scatter, industry 22, USA

4.5 Industry 23 – manufacture of vehicles, trailers and semi-trailers

Sample of manufacture of vehicles, trailers and semi-trailers (NACE Rev. 2 classification: 23) consist of 1295 Finnish companies and 26 companies registered in the USA (1321 companies in total). From this sample 394 Finnish companies and 19 US companies were selected to further review. Rest of the companies were no longer active or didn't have sufficient data.

In industry 23 stock turnover in average has been clearly higher for Finnish companies compared to US during the reference period. Only exception is year 2011 when stock turnover in average was higher for US companies. For US companies trend has been relatively stable, around 9x – 10x between 2012 and 2019. For Finnish companies trend has been slightly increasing between 2013 and 2019 (around 20x – 23x).

Table 35. Average stock turnover in Finland and USA, period 2011-2019, industry 23.

In Finland the absolute value of inventories in this industry has increased during the reference period 2011-2019. Also value of the inventory to value of total assets has increased during the sample period. At the end of 2019 the ratio was 13,59 %.

Table 36. Stock average and total assets average, industry 23, Finland.

For the US companies absolute values for value of stock and total assets have increased during the reference period. The ratios has been relatively stable. At the end of 2011 it was 11,07 % and at the end of 2019 it was 9,51 %. Overall during the reference period it has been close to 10 %.

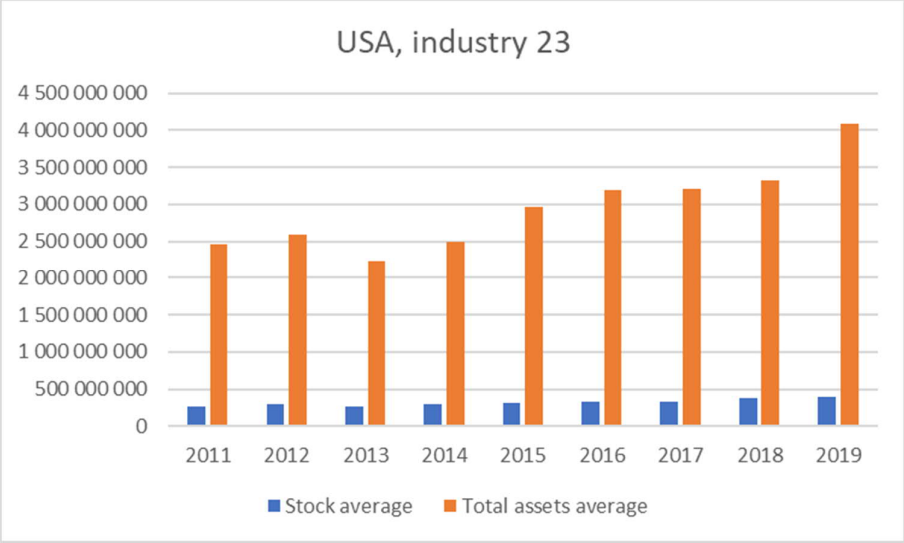

Table 37. Stock average and total assets average, industry 23, USA.

Below is statistics of Finland between years 2011 and 2019 in manufacture of vehicles, trailers and semi-trailers industry. It consists of 2777 observations. R-squared is 0,844. Stock is dependent variable and its regression was measured against other variables. Value of stock has significant statistical positive regression with turnover (coefficient: 0,1219) and positive statistical regression with EBIT (coefficient: 0,1387) and total assets (coefficient: 0,0168) with 99 % confidence interval. Value of stock has also negative regression with stock turnover meaning that if values of stock increases stock turnover tend to decrease.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/07/20 Time: 12:41
Sample: 2011 2019
Periods included: 9
Cross-sections included: 394
Total panel (unbalanced) observations: 2777

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26878.60	44051.31	0.610166	0.5418
EBIT	0.138717	0.015686	8.843353	0.0000
STOCK_TURNOVER	-3137.064	767.2073	-4.088940	0.0000
TOTAL_ASSETS	0.016882	0.002604	6.481777	0.0000
TURNOVER	0.121867	0.002465	49.43782	0.0000

R-squared	0.844016	Mean dependent var	1357685.
Adjusted R-squared	0.843791	S.D. dependent var	5191002.
S.E. of regression	2051654.	Akaike info criterion	31.90799
Sum squared resid	1.17E+16	Schwarz criterion	31.91867
Log likelihood	-44299.24	Hannan-Quinn criter.	31.91184
F-statistic	3749.768	Durbin-Watson stat	0.290399
Prob(F-statistic)	0.000000		

Table 38. Regression statistics, industry 23, Finland.

Below scatter based on Finnish data shows that if value of stock increases then turnover for the company and total assets tend to be bigger compared to the EBIT.

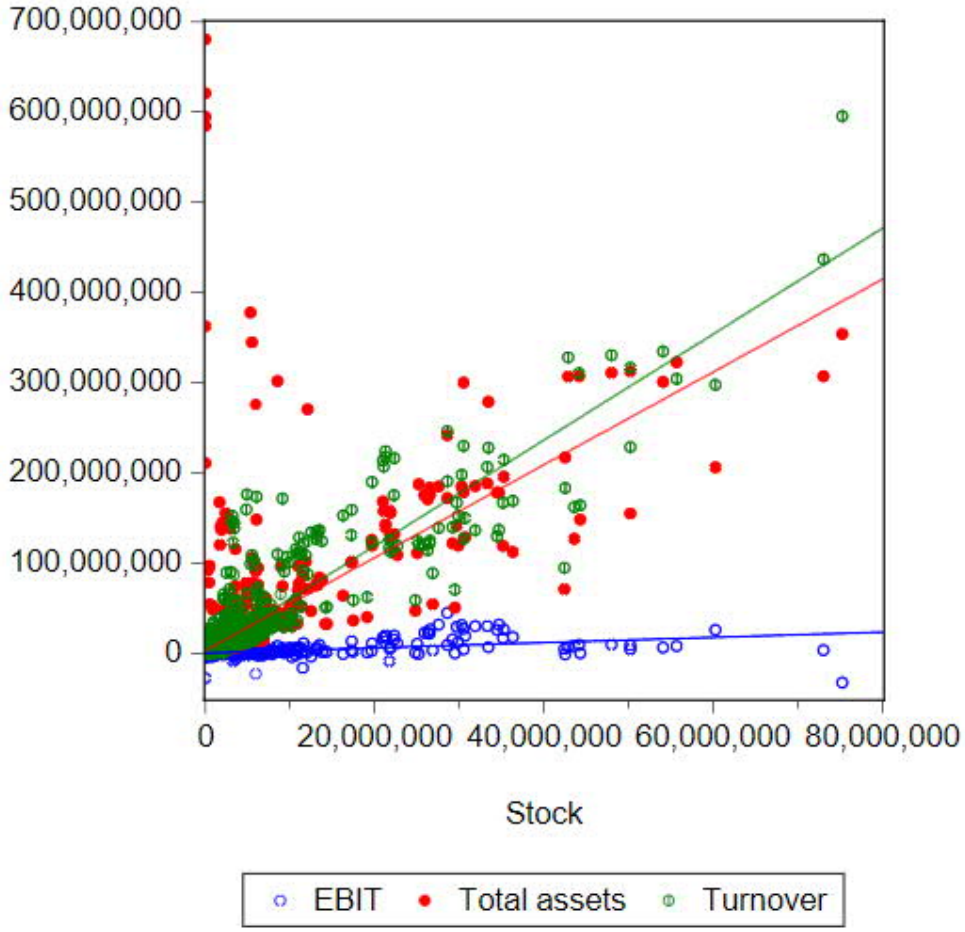

Table 39. Stock scatter, industry 23, Finland.

For US data there was 144 observations in total between years 2011 and 2019. Dependent variable is stock and r-squared is 0,9942. Value of stock has a statistically positive regression with turnover (coefficient: 0,1216) and total assets (coefficient: 0,0276) with confidence interval 99 %. Stock has statistically negative regression with EBIT (coefficient: -0,1388) with confidence interval 99 %. Between stock and stock turnover there was no statistically significant findings.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/07/20 Time: 12:51
Sample: 2011 2019
Periods included: 9
Cross-sections included: 19
Total panel (unbalanced) observations: 144

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1139111.	6918694.	-0.164643	0.8695
EBIT	-0.138760	0.025753	-5.387997	0.0000
STOCK_TURNOVER	-449987.5	255193.6	-1.763318	0.0800
TOTAL_ASSETS	0.027628	0.006725	4.107994	0.0001
TURNOVER	0.121643	0.011750	10.35274	0.0000

R-squared	0.994157	Mean dependent var	3.48E+08
Adjusted R-squared	0.993989	S.D. dependent var	7.84E+08
S.E. of regression	60786658	Akaike info criterion	38.71774
Sum squared resid	5.14E+17	Schwarz criterion	38.82086
Log likelihood	-2782.678	Hannan-Quinn criter.	38.75965
F-statistic	5912.669	Durbin-Watson stat	1.119930
Prob(F-statistic)	0.000000		

Table 40. Regression statistics, industry 23, USA.

Scatter below shows that in USA sample in industry 23 if value of stock increases then value of total assets and turnover tend to increase more than EBIT.

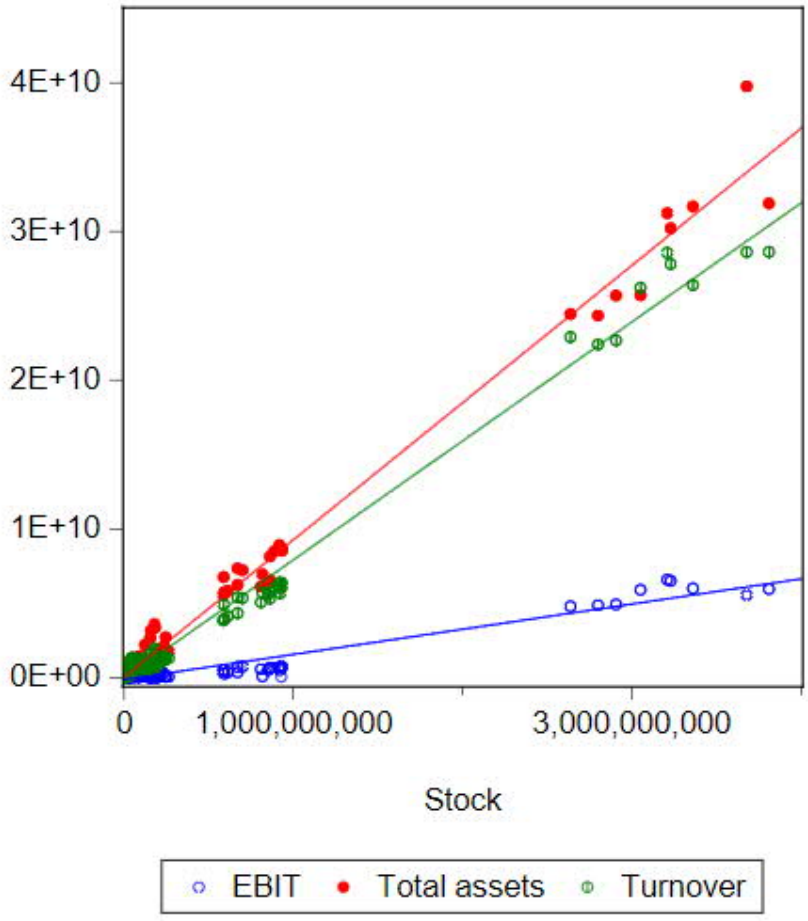

Table 41. Stock scatter, industry 23, USA.

4.6 Industry 24 – manufacture of basic metals

Sample in manufacture of basic metals industry (NACE Rev. 2. classification: industry 24 – manufacture of basic metals) consist of 217 companies from Finland and 185 companies from the United States of America (in total 402 companies). Of this sample 83 companies from Finland and 63 companies from the USA were selected to further review. Other companies didn't have sufficient data available.

Stock turnover in average has been bigger for Finnish companies compared to US peers during the reference period. However, the trend for Finnish companies has been decreasing whereas for US companies the trend has been increasing. At the end of 2019

inventory turnover in average for Finnish companies was 13,87x and for US companies it was 10,53x.

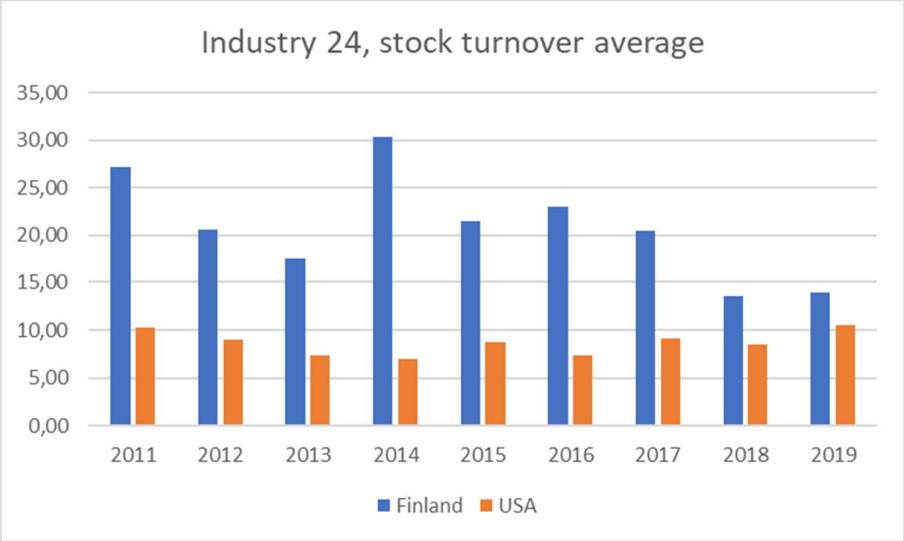

Table 42. Average stock turnover in Finland and USA, period 2011-2019, industry 24.

For Finnish companies both, values of inventory in average and total assets have been stable during the reference period. There are some fluctuations but nothing major. At the end of 2011 the ratio was 15,12 % and at the end of 2019 17,43 %.

Table 43. Stock average and total assets average, industry 24, Finland.

For the USA companies value of total assets has increased steadily during the reference period. Also absolute values of inventories are increased. The value of stock to total assets ratio is lower for US companies compared to Finnish peers. At the end of 2011 it was 11,44 % and at the end of 2019 11,81 %.

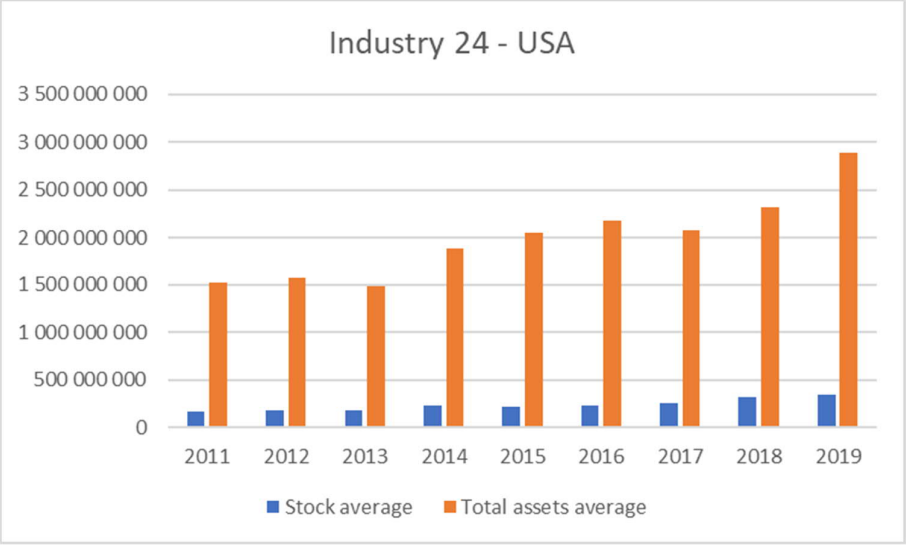

Table 44. Stock average and total assets average, industry 24, USA.

There was in total 573 observations for Finnish companies between year 2011 and 2019. Dependent variable is stock and r-squared is 0,8545. There was no significant statistical findings between stock and EBIT and between stock and stock turnover. Between stock and total assets there was statistically significant regression (coefficient: 0,1519) and also between stock and turnover (coefficient: 0,0378) with confidence interval 99 %.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/17/20 Time: 13:56
Sample: 2011 2019
Periods included: 9
Cross-sections included: 83
Total panel (unbalanced) observations: 573

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	882050.3	1210758.	0.728511	0.4666
EBIT	0.135512	0.047655	2.843617	0.0046
STOCK_TURNOVER	-23858.85	21467.17	-1.111411	0.2669
TOTAL_ASSETS	0.151917	0.007226	21.02389	0.0000
TURNOVER	0.037819	0.003563	10.61322	0.0000

R-squared	0.854530	Mean dependent var	20022871
Adjusted R-squared	0.853505	S.D. dependent var	65635483
S.E. of regression	25121733	Akaike info criterion	36.92505
Sum squared resid	3.58E+17	Schwarz criterion	36.96302
Log likelihood	-10574.03	Hannan-Quinn criter.	36.93986
F-statistic	834.1447	Durbin-Watson stat	0.263823
Prob(F-statistic)	0.000000		

Table 45. Regression statistics, industry 24, Finland.

Based on the scatter for Finnish companies in below, if value of stock increases then turnover and value of total assets tend to increase more than EBIT. This finding is aligned with similar data in other industries.

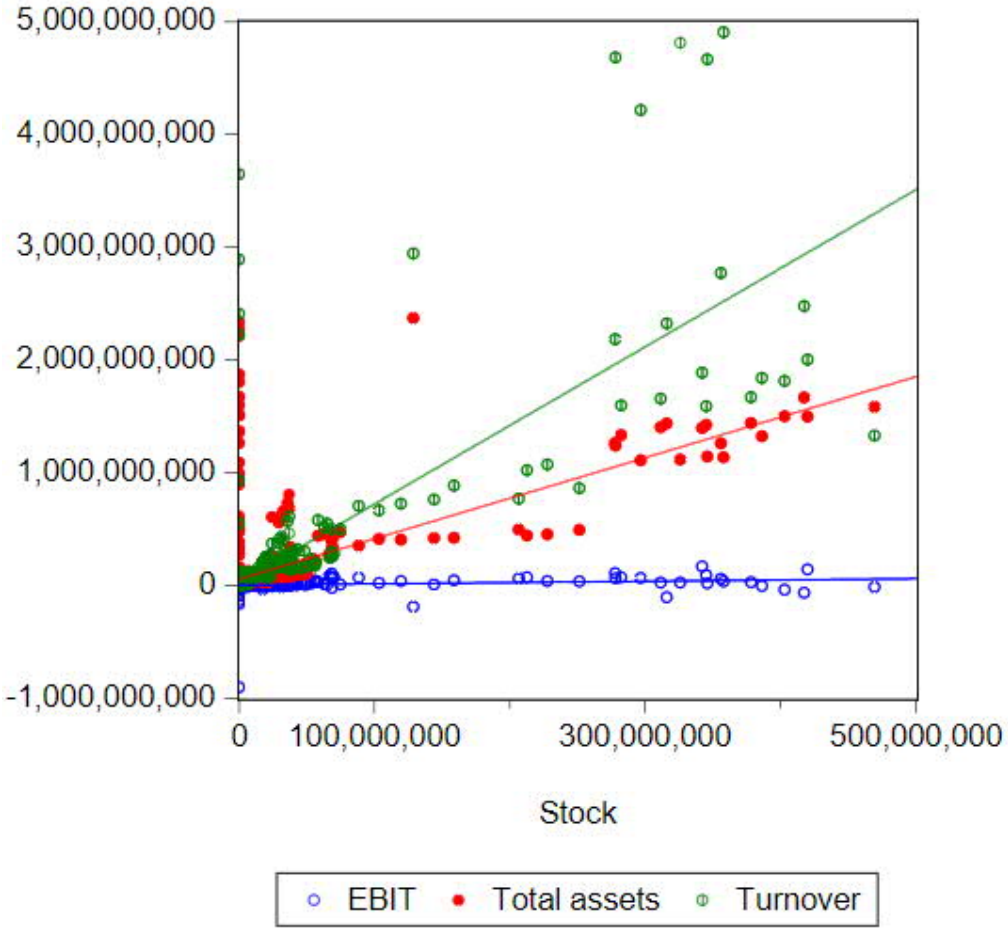

Table 46. Stock scatter, industry 24, Finland.

For US data below there was in total 442 observations in industry 24. Dependent variable is stock and r-squared is 0,9265. There was no statistically significant finding between stock and EBIT nor stock and total assets. Between stock and turnover there is statistically significant positive regression (coefficient: 0,1453) with confidence interval 99 %. Between stock and stock turnover there is negative regression with confidence interval 99 %.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/17/20 Time: 14:46
Sample: 2011 2019
Periods included: 9
Cross-sections included: 63
Total panel (unbalanced) observations: 442

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	39836093	10095030	3.946110	0.0001
EBIT	0.040732	0.023971	1.699262	0.0900
STOCK_TURNOVER	-2694304.	678018.9	-3.973789	0.0001
TOTAL_ASSETS	-0.001904	0.002192	-0.868594	0.3855
TURNOVER	0.145297	0.003223	45.08695	0.0000

R-squared	0.926529	Mean dependent var	3.13E+08
Adjusted R-squared	0.925856	S.D. dependent var	5.29E+08
S.E. of regression	1.44E+08	Akaike info criterion	40.41919
Sum squared resid	9.06E+18	Schwarz criterion	40.46548
Log likelihood	-8927.642	Hannan-Quinn criter.	40.43745
F-statistic	1377.722	Durbin-Watson stat	0.341416
Prob(F-statistic)	0.000000		

Table 47. Regression statistics, industry 24, USA.

Scatter for US based companies indicates that the larger the value of stock is then total assets and turnover tend to increase more than EBIT.

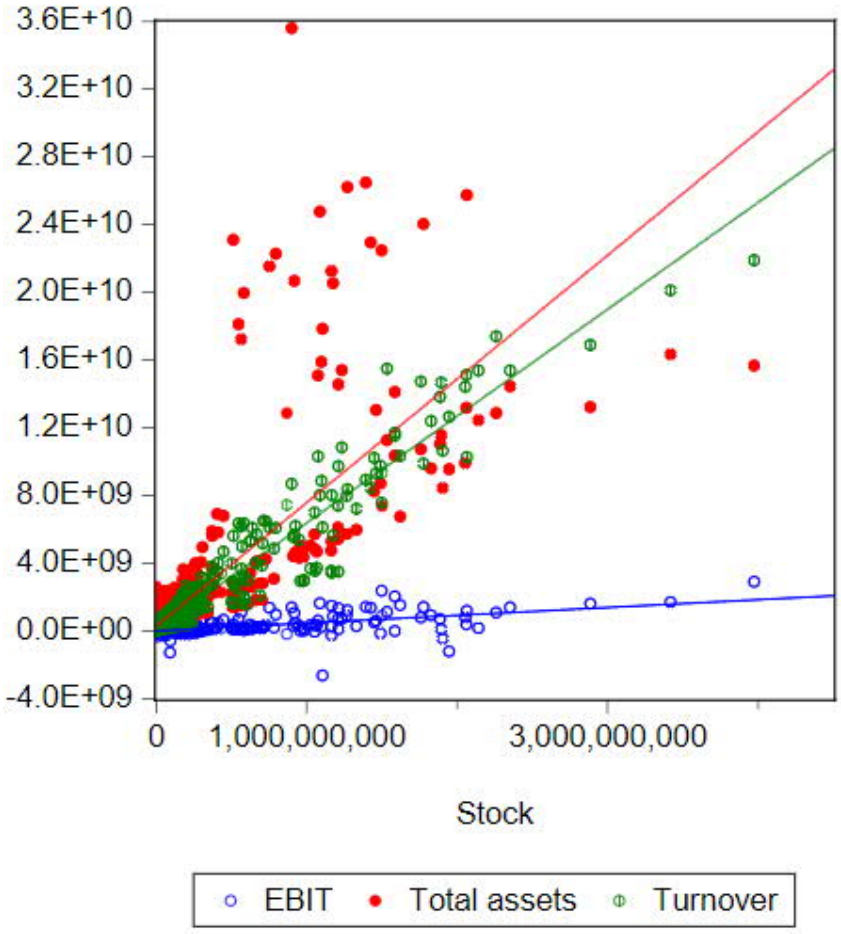

Table 48. Stock scatter, industry 24, USA.

4.7 Industry 26 – manufacture of computer, electrical and optical products

Sample of manufacture of computer, electrical and optical products consist of 1048 Finnish companies and 588 companies from the USA (i.e. 16632companies in total). From this sample 417 Finnish companies and 433 companies from the USA were selected to further analysis.

In Finland the stock turnover in average is more efficient compared to US peers. During the reference period only exception is 2014 when stock turnover in average was 13,83x

in the USA and 12,53x in Finland. During other years in reference period stock turnover in average has been higher in Finland compared to the USA. However, between 2011 and 2015 the difference in this ratio has not been very high between the countries. From 2016 to 2019 stock turnover in average has been higher in Finland compared to the USA indicating that companies in Finland in this industry have been e.g. more efficient in terms of working capital perspective in stock.

Table 49. Average stock turnover in Finland and USA, period 2011-2019, industry 26.

In Finland total value of inventories to total assets ratio was slightly higher compared to US peers during the reference period. In 2019 the total value of inventory to total assets ratio in Finland around 6,67 %. In the USA the total value of inventory to total assets ratio at the end of 2019 was 5,24 % so slightly lower compared to Finland. However, in both countries the value of inventory to total assets ratio is low compared to any other industry reviewed in this thesis.

Table 50. Stock average and total assets average, industry 26, Finland.

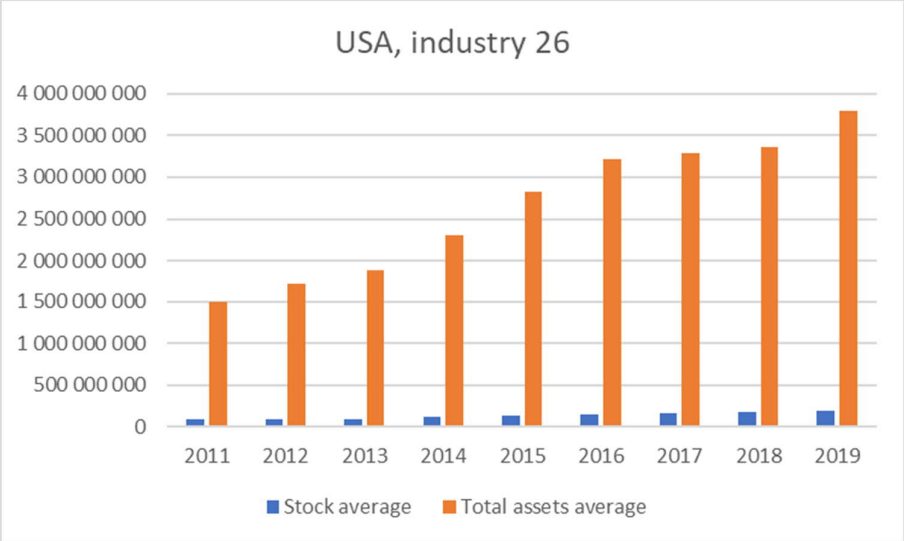

Table 51. Stock average and total assets average, industry 26 USA.

From statistical point of view it is visible that in Finland stock has statistically significant positive correlation to EBIT (coefficient: 0,1023) and to total assets (coefficient: 0,062) with confidence interval 99%. Stock did not have statistical significant findings to other variables, stock turnover and turnover. This finding in Finland within manufacture of computer, electrical and optical industry indicates that companies can speed up their sales in way that they don't necessary need to increase their inventories, if they are more efficient in terms on inventory turnover. That way they might be able also to release tight capital in their operations.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/07/20 Time: 13:41
Sample: 2011 2019
Periods included: 9
Cross-sections included: 417
Total panel (unbalanced) observations: 2705

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1055203.	558107.0	1.890682	0.0588
EBIT	0.102332	0.007227	14.16043	0.0000
STOCK_TURNOVER	-13669.85	11473.22	-1.191457	0.2336
TOTAL_ASSETS	0.062863	0.000816	77.00227	0.0000
TURNOVER	-0.000852	0.001155	-0.737736	0.4607

R-squared	0.956018	Mean dependent var	10554371
Adjusted R-squared	0.955953	S.D. dependent var	1.31E+08
S.E. of regression	27489353	Akaike info criterion	37.09834
Sum squared resid	2.04E+18	Schwarz criterion	37.10925
Log likelihood	-50170.51	Hannan-Quinn criter.	37.10229
F-statistic	14672.21	Durbin-Watson stat	1.314568
Prob(F-statistic)	0.000000		

Table 52. Regression statistics, industry 26, Finland.

From below graph we can see that if value of stock increases then also other variables increase. Amount of total assets increase most, then total assets and EBIT as a third.

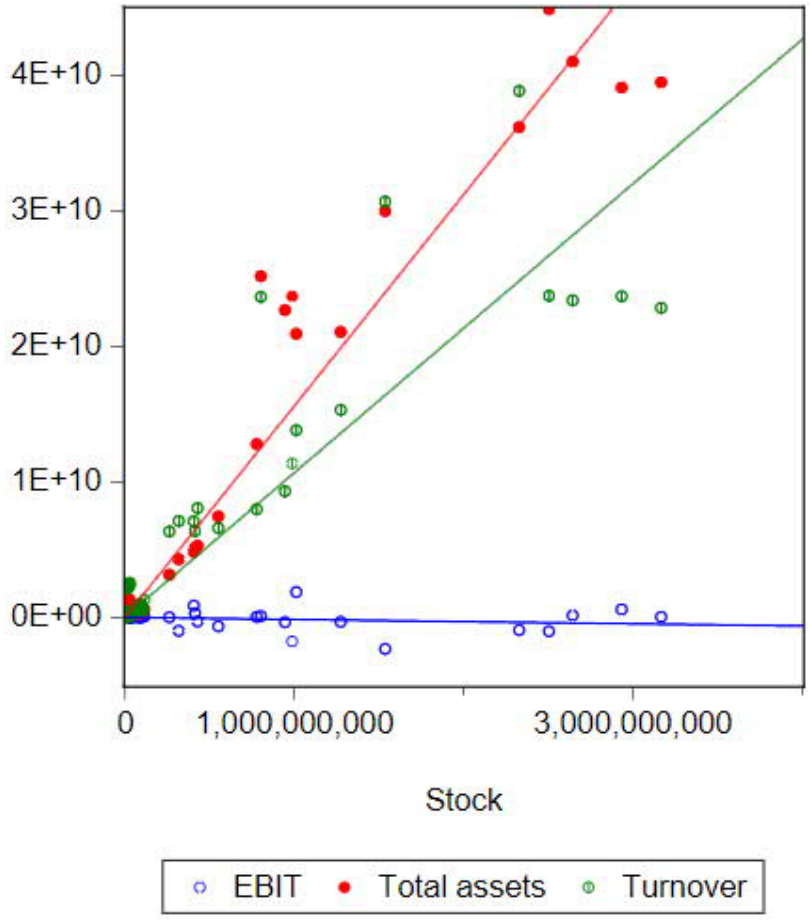

Table 53. Stock scatter, industry 26, Finland.

In the USA statistically significant positive regression was visible between stock and total assets (coefficient: 0,0229) and between stock and turnover (coefficient: 0,0321) with 99 % confidence interval. In practice this indicates that if the companies within this industry increase their sales or total assets also value of the stock increases. Stock did also have statistically significant but negative regression to EBIT (coefficient: -0,1459) and inventory turnover with 99 % confidence interval. This finding points out that if companies increase their value of inventory it leads to worse inventory turnover. In practice this indicates that there should be room for efficiency improvements in inventory turnover. From working capital perspective it would be better that if value of stock increases it wouldn't have statistically significant correlation to inventory turnover. Statistically

significant negative correlation between stock and EBIT also indicates that companies are not working with their stock in most efficient way from working capital point of view. This finding shows that companies are not able to turn their increased stock volumes to profit in best way possible. R-squared is 0,5677).

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 11/07/20 Time: 14:20
Sample: 2011 2019
Periods included: 9
Cross-sections included: 433
Total panel (unbalanced) observations: 3066

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	85578109	6670092.	12.83012	0.0000
EBIT	-0.145919	0.005297	-27.54880	0.0000
STOCK_TURNOVER	-813474.4	185440.9	-4.386705	0.0000
TOTAL_ASSETS	0.022854	0.001475	15.49192	0.0000
TURNOVER	0.032063	0.002243	14.29478	0.0000

R-squared	0.567747	Mean dependent var	1.65E+08
Adjusted R-squared	0.567182	S.D. dependent var	5.17E+08
S.E. of regression	3.40E+08	Akaike info criterion	42.13025
Sum squared resid	3.55E+20	Schwarz criterion	42.14009
Log likelihood	-64580.68	Hannan-Quinn criter.	42.13379
F-statistic	1005.126	Durbin-Watson stat	0.144926
Prob(F-statistic)	0.000000		

Table 54. Regression statistics, industry 26, USA.

From below graph can be seen that if value of stock increases the also values of total assets, turnover and EBIT increases. Graph indicates that, compared to Finnish peers, EBIT seems to increase more for the US companies.

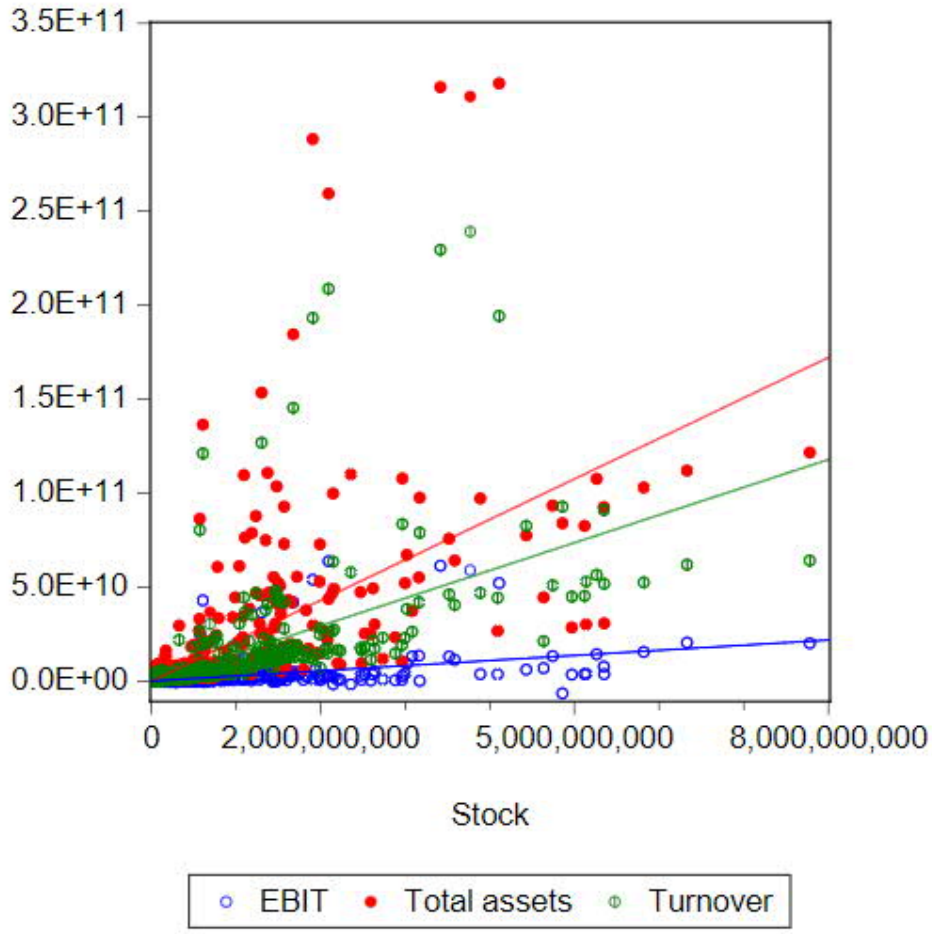

Table 55. Stock scatter, industry 26, USA.

4.8 Industry 27 – manufacture of electrical equipment

Sample of manufacture of electrical equipment industry consist of 650 companies from Finland and 99 companies from the USA, so in total 749 companies. 277 companies from Finland and 65 companies from the USA were selected to further review. Other companies didn't enough sufficient data to be analyzed further.

Below graph describes stock turnover in average in the USA and in Finland during the reference period 2011 – 2019. Based on the data and diagram below US companies within studied industry have enhanced its stock turnover in average compared to Finnish peers. At the end of 2019 US companies value of stock turnover in average stood in

15,29x while for Finnish companies the number was 11,20x. If we look only Finnish companies within this industry, data shows that their stock turnover in average has actually decreased during the reference period (at the end of 2011 it was 12,04x and at the end of 2019 11,20x). This might indicate weaker working capital management and yield to weaker EBIT. Especially between 2017 and 2019 trend of stock turnover in average has been decreasing for Finnish companies in manufacture of electrical equipment industry.

Table 56. Average stock turnover in Finland and USA, period 2011-2019, industry 27.

Below graph describes how value of stock in average and value of totals assets in average have developed during the period considered in Finland in manufacture of electrical equipment industry. The value of inventory to value of totals has increased during the reference period. At the end of 2019 it was 21,80 %. Both variables have increased from 2011 to 2019.

Table 57. Stock average and total assets average, industry 27, Finland.

Below is same graph for US companies in manufacture of electrical industry. It can be seen that value of total assets in average has increased during the reference period. Also value of inventories in average has increased during the reference period but not as much as the values of total assets. This leads to that the value of inventories in average to value of total assets in average ratio has decreased during the reference period. At the end of 2011 it was 13,75 % and at the end of 2019 it was 11,94 %. Compared to Finnish data value of inventories in average to value of total assets in average ratio has been around 6-7 percentage points lower in the USA compared to Finnish peers in this industry.

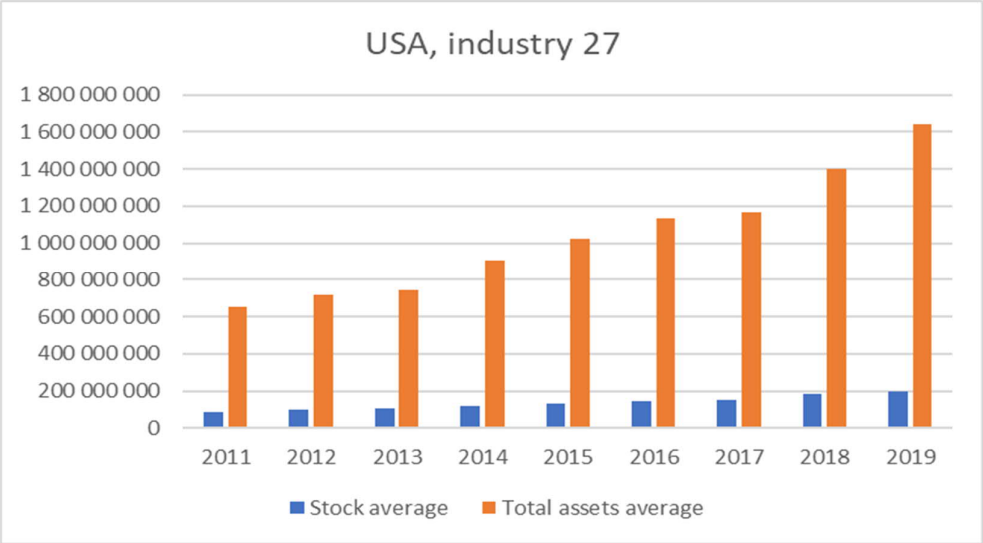

Table 58. Stock average and total assets average, industry 27, USA.

Below is main statistics for Finnish companies in manufacture of electrical equipment industry between years 2011 and 2019. Data has in total 1895 observations and r-squared is 0,9069. Below regression model shows that stock has a statistical significant regression EBIT (coefficient: 0,2954) and total assets (coefficient: 0,1701) and negative regression with turnover (coefficient: -0,0402). R-square is over 0,5 so predictor variable stock explains very well the response variables EBIT, stock turnover, total assets and turnover. There was no statistical significant regression between stock and stock turnover.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 10/30/20 Time: 01:31
Sample: 2011 2019
Periods included: 9
Cross-sections included: 277
Total panel (unbalanced) observations: 1895

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	716801.1	144103.2	4.974222	0.0000
EBIT	0.295433	0.028252	10.45701	0.0000
STOCK_TURNOVER	-6690.059	3730.801	-1.793196	0.0731
TOTAL_ASSETS	0.170069	0.006504	26.14976	0.0000
TURNOVER	-0.040177	0.005873	-6.840462	0.0000

R-squared	0.906903	Mean dependent var	2814509.
Adjusted R-squared	0.906706	S.D. dependent var	18802228
S.E. of regression	5742965.	Akaike info criterion	33.96748
Sum squared resid	6.23E+16	Schwarz criterion	33.98212
Log likelihood	-32179.19	Hannan-Quinn criter.	33.97287
F-statistic	4602.853	Durbin-Watson stat	0.408922
Prob(F-statistic)	0.000000		

Table 59. Regression statistics, industry 27, Finland.

Below stock scatter observes that if value of stock in big then also total assets and turnover tend to be big. EBIT also increases but not with as sharp slope.

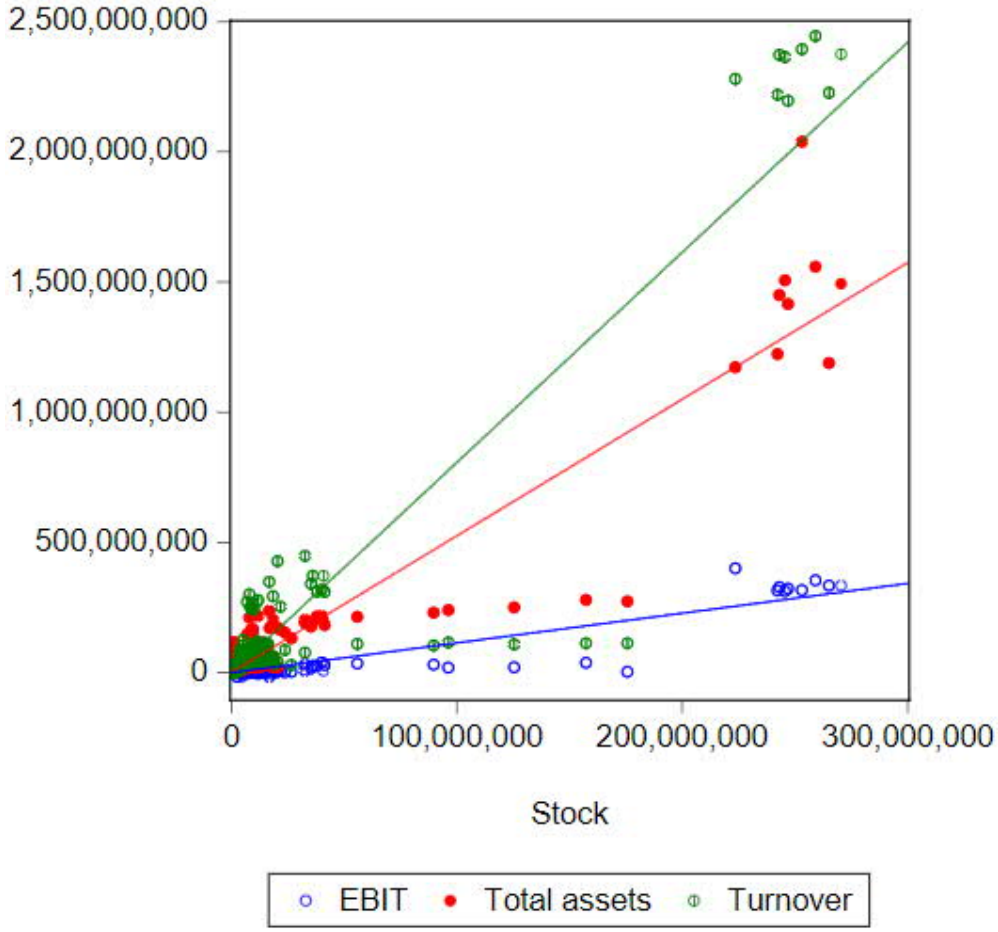

Table 60. Stock scatter, industry 27, Finland.

Below is statistics for US companies in manufacture of electrical equipment industry in reference period 2011 – 2019. Total number of observations found was 404. R-square is around 0,97 so predictor variable explains very well response variables EBIT, stock turnover, total assets and turnover. There is strong statistical regression between stock (predictor variable) and turnover (coefficient: 0,0935), and also between stock and total assets (coefficient: 0,0432) with 99 % confidence interval. Between value of stock and EBIT there was negative regression with 90% confidence interval. There was no significant statistical findings between stock and stock turnover.

Dependent Variable: STOCK
Method: Panel Least Squares
Date: 10/30/20 Time: 01:36
Sample: 2011 2019
Periods included: 9
Cross-sections included: 65
Total panel (unbalanced) observations: 404

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19012272	3552204.	5.352247	0.0000
EBIT	-0.070046	0.026702	-2.623217	0.0090
STOCK_TURNOVER	-205478.6	111105.1	-1.849407	0.0651
TOTAL_ASSETS	0.043159	0.005371	8.034954	0.0000
TURNOVER	0.093493	0.004528	20.64977	0.0000

R-squared	0.970626	Mean dependent var	1.60E+08
Adjusted R-squared	0.970331	S.D. dependent var	3.41E+08
S.E. of regression	58789399	Akaike info criterion	38.62912
Sum squared resid	1.38E+18	Schwarz criterion	38.67864
Log likelihood	-7798.082	Hannan-Quinn criter.	38.64872
F-statistic	3296.073	Durbin-Watson stat	0.309501
Prob(F-statistic)	0.000000		

Table 61. Regression statistics, industry 27, USA.

Below stock scatter for US companies observes that if value of stock increases then slope for turnover and total assets is bigger compared to slope of EBIT.

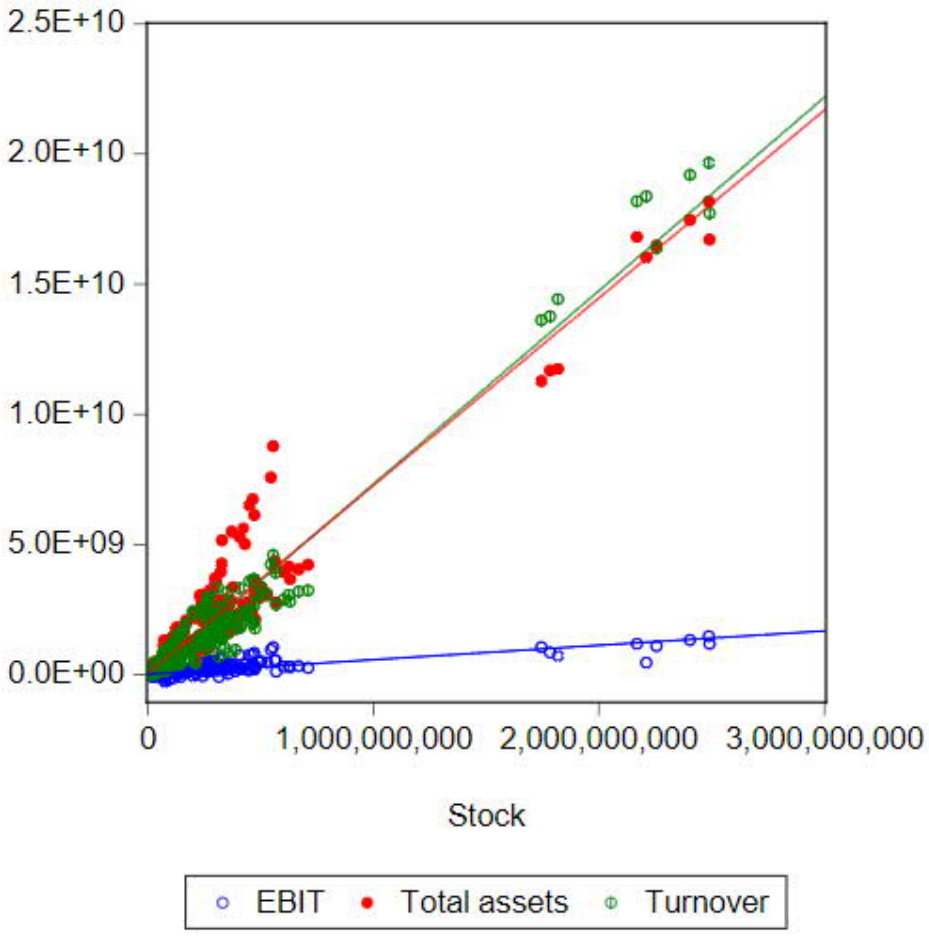

Table 62. Stock statistics, industry 27, USA.

5 Conclusions

The objective of this master's thesis was to study how company's stock values affect to other key variables (EBIT, total assets, turnover and stock turnover) and study this topic especially from working capital point of view. To achieve this objective theoretical background related to working capital management and supply chain management, was studied in second chapter of thesis. Theoretical framework was studied based on academic journals and sources and literature.

After the theory review, in the second part of the thesis, empirical research methodologies were presented. Empirical research was based on quantitative research methods. Data to the empirical part was gathered from Orbis database. Due to the big amount of data, the data has several limitations: only two countries were selected (USA and Finland), reference period was limited to years 2011 – 2019 and seven industries (based on NACE rev. 2 classification) was studied. Empirical part focused to answer to the research questions that what is the correlation and regression between stock and selected financial variables, is there differences between industries overall and differences between industries in Finland and the USA and finally is there any visible differences between Finland and USA in selected industries in terms of selected variables.

Correlation analysis was done in correlogram. In correlogram Finnish companies in all studied industries were grouped and compared against US peers. From Finland the major finding was that correlation between value of stock and EBIT was 0,24 meaning that correlations between those variables is weak. In practice that means that in general the EBIT doesn't grow as fast as the value of stock. Academic literature support this finding from working capital point of view. Higher value of stock needs to be financed and the capital is tied into stock. Also, based on the academic literature, high value of stock have also other possible disadvantages, e.g. increased possibility to write-downs, if stock is not any more saleable. Instead of investing into inventories companies could invest the capital into other operations that would grow its EBIT. However, it should be noticed that higher value of stock is not necessary poor thing for the companies; with high levels of

inventories companies can supply its customers also if there are any kind of disturbance in the markets and normal supply in the chain is not working as it should. Between other variables there was strong correlation between stock and total assets and between stock and turnover. Stock turnover did have very weak negative correlation to all variables.

Correlogram based on data from US companies had fairly parallel findings as Finnish data. Between stock and EBIT the correlation was 0,45 so it was stronger than Finnish companies had but still weak correlation in absolute terms. So if value of inventory also EBIT tends to increase but less than the value of stock. However, seems that US companies can turn increased values of inventories more better into profit than Finnish peers can. Other findings were also similar as Finnish data; total assets had strong correlation to EBIT and turnover, turnover did have strong correlation to EBIT. Stock did have over 0,5 correlation to total assets (0,64) and to turnover (0,65), these correlations were weaker than Finnish peers. Stock turnover did have very weak but positive correlation to all variables.

5.1 Managerial implications

Based on the theoretical review of working capital management, academic research and literature and empirical research this part of the thesis provides author provides suggestions and implications regarding inventories and company's financial performance.

Based on the statistical analysis and supported by academic research companies should not target to increase stock levels. Based on the statistical analysis, if value of stock increases also EBIT tend to increase but lower slope. Companies should target to optimize their inventory level to the point where they can avoid possible costly stock-outs but where it does not tie working capital more than necessary into inventories. Based on the data used in this thesis Finnish companies have positive correlation between value of stock and EBIT (0,24) and so also does US companies (0,45). However, correlation below 0,5 (but over 0) can be considered as a weak correlation. That indicates that companies should not target to increase their inventory levels over reasonable level where they can

secure their supply to the end customers. From correlogram it was found also that stock and stock turnover does not have linear relationship between each other. From correlogram it can also be highlighted that US companies had weak positive (0,12) correlation between stock turnover and EBIT. So, this might indicate that faster inventory turns benefit also profitability of the companies. Also academic literature has found that higher efficiency in inventory turns will benefit working capital levels that have relationship to the profitability of the company.

There was no big variations between industries. High value of stock tend to have strong positive regression especially to turnover and total assets. That is logical because if company afford to have invested to value of stock it needs to finance it and operative cash flow comes from sales, i.e. turnover. Also if company is able to sell produced goods, the goods are first accounted in inventory. Inventory is booked in total assets so regression between those variables is also logical. It was seen that inventory values during the reference period have increased. Companies may have for instance higher their safety margins to avoid costly stock-outs. From working capital perspective however, the increase is not beneficial from profitability perspective. Companies may should consider to avoid any further increase in values of inventory but instead try to put efforts to optimize the goods flow in whole supply chain.

Inventory turnovers were overall in average higher for Finnish companies compared to US peers. In the data analyzed US companies were larger in terms of turnover and EBIT for instance. This indicated that smaller companies are more agile to handle their inventories. Academic literature shows that one negative aspect for slow inventory turnover is increased risk to inventory write-offs. Relationship between inventory turnover and inventory write-downs was not studied in this thesis.

In some industries was found negative regression between EBIT and value of inventories. Between studied countries there were no major differences. This finding is something companies should understand in operative business. However, this finding was

dependent by business. In industries where there seems to be negative regression between value of stock and EBIT, companies should target to decrease their inventory levels and that way released tied capital into other operations. Reduce of tied capital should positively affect to company's return on investment ratio and also improve liquidity position.

5.2 Limitations and implications for future research

This research was conducted as a quantitative research with several limitations and therefore the results and implications are only applicable only if all limitations are taken into consideration within the scope of the thesis. Empirical part was studied in seven industries. Thus, the results and implications are applicable only in those industries and cannot be extended to all industries available. An other major limitation is that companies only two countries, Finland and USA, were studied, thus, considerations from this thesis cannot be extended to other countries. In USA only public companies were studied and that should be taken also into account when analyzing and reading the results. This limitation needed to be done in order to have sufficient data for all companies, i.e. for non-public US companies the data was not available. Third major limitations is related to reference period, the data was gathered for years 2011 – 2019, thus the findings might not be valid for other reference periods.

During the thesis, some recommendations for future research were observed. Based on the academic literature there might be a room for a study that would analyze more accurate that would it be beneficial for a supply chain, in terms of overall quality, that stronger companies would finance weaker ones in terms of faster payment (terms). If weaker companies would that way have a faster in-flow in cash, would it increase the quality and speed of its deliveries and that way benefit all companies in supply chain in terms of higher overall quality in whole supply chain. Also related to supply chain context, future research could study how stock levels could be optimized in a supply chain in a way that the price of a having stock would be as low as possible in supply chain context but also secure the deliveries. Also it would be interesting to see research related to

relationship between value of inventory, inventory safety margin and company's profitability. I.e. if companies would lower their value of inventory and that way also inventory safety margin, would it have positive or negative impact on company's profitability. Further studies could also focus on relationship between inventory turnover and inventory write-offs more deeply, i.e. does slow inventory turnover lead significantly more inventory write-downs or not.

This thesis mainly focused on major metrics related to stock and company's financial performance. To extend this research future research would focus on smaller metrics and take also into account how accounts payables and accounts receivables would affect to EBIT and stock. It would be interesting to see would changes in accounts payables and account receivables affect to value of stock and EBIT. Also more comprehensive study between different countries or between different industries would bring more understanding how stock is related to different metrics. In order to understand more deeply, why there are differences between industries future research could focus for example in very few industries and go more deep into industries financials, compare them and research if there are some mechanism why other industries have more correlation between value of stock and e.g. EBIT.

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