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WORKING CAPITAL MANAGEMENT IN THE FOOD INDUSTRY: A COMPARISON OF CASH CONVERSION CYCLES ALONG THE VALUE CHAIN AND THEIR IMPACT ON PROFITABILITY

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Abstract

This Work Project aims to identify diversity in working capital management of companies in the food value chain. It also investigates how working capital management affects profitability of different value chain stages. Based on a sample of 194 companies of the subindustries Agricultural Products, Packaged Foods & Meats, and Food Retail, this study found different working capital management patterns across the value chain. Furthermore, shortening cash conversion cycle does not, as a rule, improve profitability. However, working capital management levers can be used to increase profitability, depending on the value chain stage in which a company operates.

Key words: Food industry; Value Chain; Working Capital Management; Cash Conversion Cycle; Profitability; Return on Assets; Agricultural Products; Packaged Foods & Meats; Food Retail

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1. Introduction

Over the last two decades, a plethora of research has been published about working capital management (WCM) and its impact on profitability. For example, in 2000, a study about cash conversion cycles (CCC) in the food industry found a significant correlation between CCC and the profitability metrics Return on Investment and Net Profit Margin (Lyroudi and Lazaridis 2000). Like Lyroudi and Lazaridi, most of the work about WCM and its relationship to profitability encompasses the whole of an industry. Other publications use stock indices of listed companies or countries as sampling criteria. Previous research has proved that CCC can vary widely within an industry, and along its value chain it can also vary greatly. A study on the automotive industry provides an example and proves there are large differences in WCM between raw materials, producers, and retailers (Lind, Pirttilä, Viskari, Schupp and Kärri 2012). This observation suggests that WCM may also have differing effects on profitability depending on the value chain stage in which a company operates. With regard to the food industry, which comprises firms for agricultural products as well as food producers or retailers, research has shown that WCM does matter. In addition, research on other industries has led us to assume diversity in WCM across the food value chain could well exist, and that this will impact a firm's profitability. Hence, it is of relevance to differentiate within the food industry in order to identify divergences in WCM patterns across the value chain and its impact on profitability. Therefore, this Work Project proposes to explore these potential differences of WCM within the food value chain and to understand how it can affect the profitability of companies at different value chain stages.

Following, this introduction, Section 2 describes the key concepts of this project and explains how WCM and profitability are measured in the analyses. Section 3 provides an overview of the food industry and its value chain. Section 4 reviews the literature about WCM along a value chain and the impact of WCM on profitability, with a focus on the food industry.

Section 5 explains the methodology used, abbreviated research questions, the data source, selected variables and proxies, and a detailed description of the sample. Section 6 presents results of the statistical analyses and answers to the research questions of this project. Section 7 provides a discussion of the findings and results of this project and managerial implications. Section 8 discusses the limitations of this study and gives recommendations for future research. Section 9 concludes this project's findings.

2. Key Concepts

The focus of this work project is on *liquidity*, more precisely *working capital management*, and *profitability*. Thus, these terms will be explained in this section.

Liquidity refers to a company's ability to meet its short-term obligations by its current assets and to convert its assets into cash. The components of operating capital mostly used for analyses are inventory, accounts receivable, and accounts payable (Palepu and Healy 2013, p.194). Every company must have sufficient liquidity to pay its payables and debt on time. However, if a company holds too much cash, this can lead to unnecessary interest payments and missed investment opportunities that would generate additional returns. This trade-off between risk and return highlights the importance of efficient WCM for companies. To assess how a company manages its liquidity, several concepts have been developed over past decades.[1] The concept used for this study is Cash Conversion Cycle (CCC), a metric originally established by Hager (1976) that combines data from the balance sheet and income statements. This metric refers to the time it takes a company to convert its inventory and receivables into cash flows and how much time it has to pay its payables.

The CCC consists of three components, namely the Days Inventory Outstanding (DIO), Days Receivables Outstanding (DSO), and Days Payables Outstanding (DPO), as follows:

[1] Liquidity is often measured by ratios based on balance sheet accounts only, e.g. current ratio and quick ratio. These ratios have the disadvantage of being static.

$$CCC\ (in\ days) = DIO + DRO - DPO \quad [1]$$

$$DIO\ (in\ days) = \frac{Avg.Inventory}{Cost\ of\ goods\ sold}\ x\ 365 \quad [2]$$

$$DSO\ (in\ days) = \frac{Avg.Accounts\ Receivable}{Credit\ sales}\ x\ 365 \quad [3]$$

$$DPO\ (in\ days) = \frac{Avg.Accounts\ payable}{Cost\ of\ goods\ sold}\ x\ 365 \quad [4]$$

The shorter a CCC, the faster a company is able to turn its investments into inventory and cash. To follow an aggressive WCM approach, managers can work on several key levers related to the balance sheet. First, the average inventory level should be kept low in order to achieve a short DIO period and reduce inventory costs. This can be reached by reducing the time it takes to convert inventory to sales. Possible strategies may include just-in-time deliveries or greater accuracy of future sales forecasts, as well as discounts on old outstanding stock. However, keeping inventory low can lead to out-of-stocks and unrealised sales (Sagner 2011, pp. 111-131). Second, accounts receivable should be low relative to total credit sales. This can be achieved through shorter credit terms for customers and incentives, such as discounts, for payments in advance. On the other hand, managers should concern that longer payment terms can support customers in times of financial distress and strengthen the customer relationship (Sagner 2011, pp. 89-109). Third, a generally higher amount of accounts payables can lower the CCC. Here, a diversified supplier list can help to have a strong negotiation position on payment. Although aggressive receivables management can increase liquidity, it can also lead to a deterioration in supplier relationships (Sagner 2011, pp. 132-149). Several research papers, e.g. Shin and Soenen (1998) and Deloof (2003) have identified a negative relationship between CCC and profitability. It can be inferred that efficient WCM, measured by short CCC, can improve profitability. In this work project, the CCC proxies the efficiency in WCM.

Profitability measures the extent to which a company yields profit. It measures the profit of an organisation, product, or business in relation to its expenses. A common and widely used

measure of operating profitability is the Return on Assets (ROA) ratio. The ratio shows how efficiently a company generates profits in relation to its balance sheet assets, regardless of how its assets are financed (Wahlen 2017, p. 201). It is widely used for intra-industry comparisons.

$$ROA = \frac{EBIT}{Total\ Assets} \quad [5]$$

Looking at the formula, companies are able to increase ROA by either increasing their EBIT or decreasing their total assets.[2] ROA can be broken down into two meaningful ratios, Return on Sales (ROS) and Assets Turnover (AT). This breakdown allows managers to identify the key drivers of profitability. A comparatively higher AT indicates that the company is using its assets efficiently to generate sales, whereas a higher ROS indicates high efficiency of operations and the conversion of sales into profits. An additional breakdown of ROS can differentiate between operating risk and how much is earned per unit of sale before the deduction of fixed costs.

$$ROA = \frac{EBIT}{Gross\ Margin} \times \frac{Gross\ Margin}{Sales} \times \frac{Sales}{Total\ Assets} \quad [6]$$

$$ROA = Operating\ Risk \times Gross\ Sales\ Margin \times Asset\ Turnover \quad [7]$$

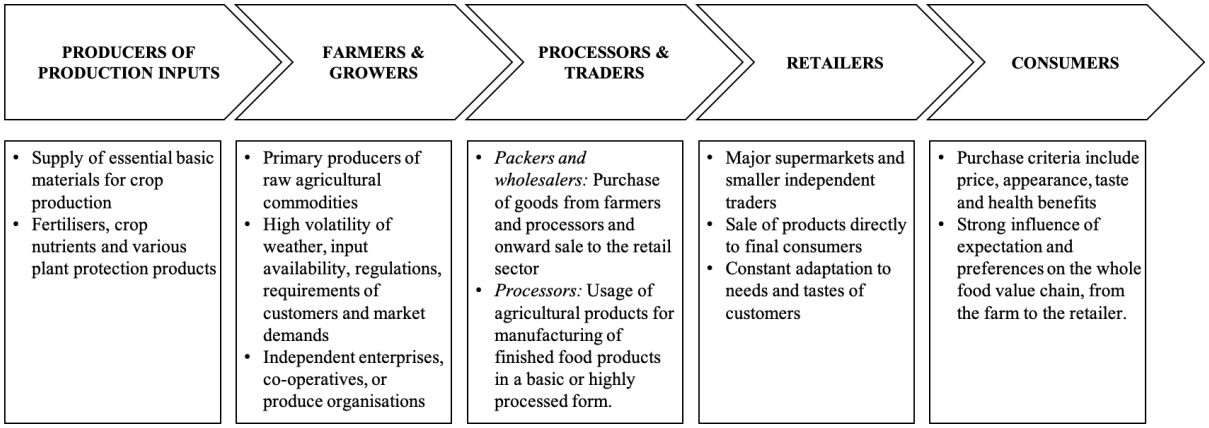
3. Industry Overview

The food industry had a global value of $6.1tn in 2020. China is leading food production with a production value of approximately $2.0tn, followed by the United States (approx. $1.3tn), Japan, and Germany (Euromonitor International 2021, pp. 5-11). Figure 1 describes the food value chain. For the upcoming analyses, the food value chain will be regrouped and divided into three subindustries, categorised according to the Global Industry Classification Standard (GICS), including Agricultural Products, Packaged Foods & Meats, and Food Retail.[3]

[2] Items of the denominator can either be end of period data or average of the period data. Due to low year-to-year changes of total assets in selected industries end of period data is used for this project.

[3] Farmers & Growers = Agricultural Products; Processors & Traders = Packaged Foods & Meats; Retailers = Food Retail.

Figure 1 – Food Value Chain



Source: (BASF 2021)

Agricultural Products: Most enterprises for agricultural products are mostly small, privately owned and capital-intensive enterprises supplied by crop and seed producers. Their small size limits their bargaining power. Agricultural companies have long production and cash cycles and tie up a lot of working capital, which often requires external financing (Deloitte 2013, pp. 3-7). They sell their products primarily to the food processing industry, to traders and to themselves, but also to retailers and final consumers (Bukeviciute, Dierx, and Ilzkovitz 2009, p. 4). It is the riskiest activity within the value chain because of its exposure to market price volatility and weather conditions (KPMG 2013, p. 30).

Packaged Foods & Meats: The subindustry supplies distributors and retailers and consists of a diverse group of companies that process products at different stages. Suppliers are agricultural companies or traders of agricultural products. It is crucial for producing companies to secure the right volume and quality of raw materials at the right time and place from suppliers (Vorst, Da Silva, and Trienekens 2007, p. 17). The costs of goods sold and resulting profits are mainly influenced by crop and livestock prices for ingredients (KPMG 2013, p. 32). Companies operating in the most concentrated food categories sell international branded goods globally (Bukeviciute, Dierx, and Ilzkovitz 2009, p. 21). Negotiating power vis-à-vis their customers increases with product differentiation. The world's largest packaged foods and meats

companies demand high payment targets from their suppliers, while they require much earlier payments from their customers (Strom 2015).

Food Retail: Food retailers sell their goods directly to the final consumer. Consumers are very price sensitive. At the same time, quality has become a key purchasing criterion for them in recent years. Therefore, retailers are making more efforts to ensure that their suppliers comply with quality standards (MarketLine 2021, p. 16). The industry is highly competitive and dominated by big retail chains (Deloitte 2013, pp. 7-9). In the EU, for example, the five largest food retailers hold more than fifty per cent of the market in most countries. As profit margins are narrow compared to earlier value chain participants, supply chain efficiency and high inventory turnover are of utmost importance. Food retailers often operate in several countries and have a wide range of suppliers and final consumers which strengthens their bargaining power (Bukeviciute, Dierx, and Ilzkovitz 2009, p. 21). Nevertheless, food retailers usually pay their bills earlier compared to food manufacturers (Perkins 2019).

4. Literature Review

The literature review relevant for this work project is two-fold. First, literature on WCM and CCC along a value chain is summarized. The second part focuses on the impact of CCC on profitability.

Rizky and Mayasari (2018) studied WCM in the automotive supply chain from raw materials to the final consumer over a time period from 2006 to 2008. They found significant differences in CCC between different value chain participants. For instance, the CCC of component suppliers is smaller than of car manufacturers but higher than car retailers. Dooley, Martens, and Blomeke (2009) presented similar results in their work on effects of supply chain management for food and grocery companies. Based on a sample with data from 104 companies, the paper concludes that CCC are higher for producing food companies (72 days) than for retailers and wholesalers (22 days) in the years 1993 to 2007. The research also proved

that retailers and wholesalers have lower inventory to sales ratios and higher inventory to total assets ratios due to less capital tied up in plants and equipment compared to food manufactures. Both papers suggest that there is diversity in WCM within industries and along supply chains. Yet, there is limited evidence about differences of WCM along value chains and their impact on profitability.

Research provides several analyses of the impact of CCC on a firm's profitability in different periods of time, various geographies, several industries, and using diverse methodologies.

Shin and Soenen (1998) analysed the relationship between corporate profitability and CCC. The results showed a strong negative relationship for American companies in the period between 1975 to 1994. Since then, many other research papers have been published on this topic. Deloof (2003) studied the CCC and corporate profitability for 1,009 large Belgian non-financial companies, and his results suggest that the decision to reduce days sales and inventory outstanding can increase corporate profitability. In addition, the author found that more profitable firms have a higher amount of Days Payables Outstanding.

Later, Lazaridis and Tryfonidis (2006) investigated the relationship between WCM, proxied by CCC and its components, and gross operating profit, based on a sample of 131 companies listed on the Athens Stock Exchange in the years 2001 to 2004. Using four OLS regression models, Lazaridis and Tryfondis found evidence that there is a negative relationship between CCC, and its components DIO and DSO, and profitability, while the relationship between DPO and profitability is positive.

However, there is also evidence of a positive relationship between CCC and profitability. Gill, Biger, and Mathur (2010) searched for a possible impact of WCM on gross operating profit for 88 American manufacturing companies, also including food producers in their work. They

found that CCC is positively correlated with profitability for the sample. Furthermore, DRO had a significant negative impact on profitability.

Muscettola (2014) found similar results. The research model used EBITDA on net sales as an indicator of profitability of 4,226 Italian manufacturing SMEs and looked for a statistical relationship between it and CCC. Like Gill, Biger and Mathur (2010), the analysis revealed a positive relationship between CCC and profitability within the sample.

Referring to the food industry, Bieniasz and Gołaś (2011) found a negative relationship between CCC and profitability. The article focuses on the WCM measured as CCC and its impact on ROA for European food companies in the years 2005 to 2009. The analyses showed that CCC varies widely across countries as well as company size.[4] However, the results presented that CCC has a significant negative impact on ROA for all enterprise sizes. DIO, DSO, and DPO all had significant negative coefficients on ROA, with DSO having the highest coefficient. This result implies that managers in the food industry can increase a firm's profitability through effective WCM decisions on inventory and payables management. A study by Phuong Linh and Mohanlingam (2018), which includes a sample of 34 agricultural and food companies listed on the Stock Exchange of Thailand, revealed similar results. An OLS regression analysis for the years 2009 to 2013 found a very small significant negative coefficient (-0.001 at 1% level) for CCC on ROA. The analysis provided a significant negative coefficient (-0.001 at 1% level) for DIO and a significant positive coefficient for DPO (0.001 at 1% level). Receivable management measured by DSO did not present a significant impact on ROA.

Another study came to contradictory findings. Based on a sample of 82 companies of the food industry results showed positive Pearson correlation coefficients of CCC and ROI and

[4] The sample was split according to firm's size into small-sized, medium-sized, and large-sized companies.

ROE, indicating a positive relationship of CCC and profitability for the year 1997 (Lyroudi and Lazaridis 2000).

In contrast to that studies from Shahid and Saad (2016) and Anojan, Arulalan, and Nimalathasan (2013) found that WCM (measured by CCC, DIO, DSO, and DPO) has no statistically significant impact on profitability for companies from the food sector in Saudi Arabia and Sri Lanka, respectively.

The literature reveals that WCM matters for profitability in most studies, especially in the food industry, although the results are not consensual.

Previous research also shows that there are different patterns in WCM within an industry, which can have different effect on profitability. Thus, it is of utmost importance to explore and understand the diversity within the food value chain. However, to the best of our knowledge, no research has been done about disparities in WCM and its impact on profitability within a value chain, neither the food value chain. Due to this lack of differentiated analysis approach for the food industry, it is important to clarify WCM differences and its impacts on profitability across a value chain to a get a more detailed view on the industry characteristics. Thus, this work project contributes to the literature with knowledge about the WCM patterns within the food value chain and investigates its impact on profitability in three different value chain stages.

5. Methodology

This work project explores WCM in the food industry. It is about the comparison of cash conversion cycles along the value chain and their impact on profitability. The food value chain is represented and analysed through three subindustries, namely "Agricultural Products", "Packaged Foods & Meats", and "Food Retail". The choice of the three subindustries is intended to represent the food value chain, from raw materials to the final consumer.[5]

[5] Other subindustries within food industry were left out of the scope of this research. They are producers of production inputs and wholesalers (BASF 2021).

The first step in this project concerns the diversity of WCM in a value chain, in this study the food value chain. Hence, the first research question (RQ1) is stated as following:

RQ1: *Does Working Capital Management differ within the food value chain?*

To explore differences between WCM in the selected food subindustries, a univariate analysis of means of CCC, DIO, DSO, and DPO is presented. In the following, t-tests are used to confirm expected significant differences of the means at a 5% confidence level. Supporting data analysis of common-sized balance sheets of selected subindustries provides additional understanding of industry patterns. According to prior research about WCM, the CCC differs within value chains (Lind et al. 2012). It is further expected, that food retailers present lower CCCs compared to food producers (Dooley, Martens, and Blomeke 2009).

As a next step this project aims to identify an association between WCM and ROA in the food industry and its value chain. Thus, the second research question is defined as follows:

RQ2: *Is Working Capital Management associated to profitability in the food industry?*

To answer to RQ2, a bivariate Pearson correlation analysis is conducted and tested at a 5% level of confidence (p-value) for WCM variables (CCC, DIO, DSO, and DPO) and ROA. The results are expected to show a significant correlation between WCM and ROA. However, the direction of the coefficient cannot be predicted. Phuong Linh and Mohanlingam (2018) found significant negative correlation coefficients for CCC and ROA as well as for DIO and ROA. DSO and DPO do not present significant correlation coefficients in their correlation analysis. Bieniasz and Gołaś (2011)[6] found a significant negative correlation coefficients for CCC and all three components with ROA in the food industry, whereas Lazaridis and Tryfonidis (2006) presented a positive coefficient for CCC and ROA.

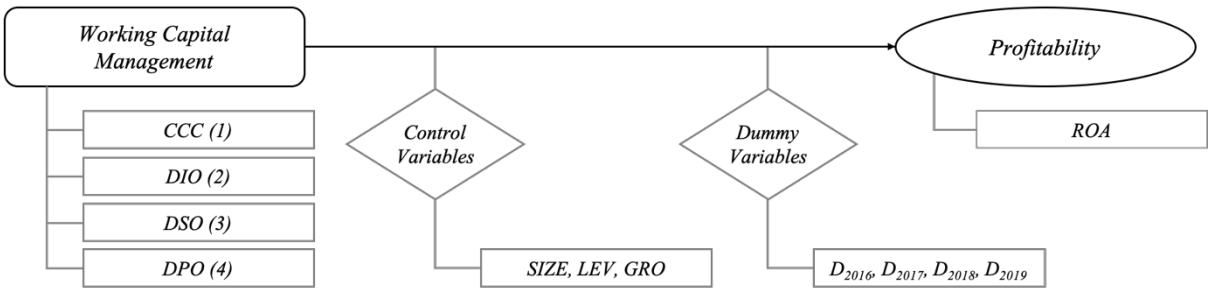
[6] Only for middle- and large-sized enterprises.

As a next step this work project aims to identify a possible causal relationship between WCM and profitability in the food industry in a multivariate analysis to understand how and to what extent can managers' decisions about WC policies change profitability levels.

RQ3: *How does Working Capital Management impact profitability in the food industry?*

To analyse a possible relationship between WCM and profitability in the food industry Ordinary Least Square (OLS) regression analyses is performed, in line with previous studies (Phuong Linh and Mohanlingam 2018; Bieniasz and Gołaś 2011). Figure 2 illustrates the regression model:

Figure 2 – Regression model



Regression equations 1 – 4 are the following:

$$1: ROA_{it} = \beta_1 + \beta_2 CCC_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 GRO_{it} + \beta_5 D_{2016it} + \beta_5 D_{2017it} + \beta_5 D_{2018it} + \beta 5 D_{2019it} + \varepsilon_{it} \quad [8]$$

$$2: ROA_{it} = \beta_1 + \beta_2 DIO_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 GRO_{it} + \beta_5 D_{2016it} + \beta_5 D_{2017it} + \beta_5 D_{2018it} + \beta 5 D_{2019it} + \varepsilon_{it} \quad [9]$$

$$3: ROA_{it} = \beta_1 + \beta_2 DSO_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 GRO_{it} + \beta_5 D_{2016it} + \beta_5 D_{2017it} + \beta_5 D_{2018it} + \beta 5 D_{2019it} + \varepsilon_{it} \quad [10]$$

$$4: ROA_{it} = \beta_1 + \beta_2 DPO_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 GRO_{it} + \beta_5 D_{2016it} + \beta_5 D_{2017it} + \beta_5 D_{2018it} + \beta 5 D_{2019it} + \varepsilon_{it} \quad [11]$$

All variables used in the regression can be found in Appendix 2. *ROA* is used as a proxy for profitability as the dependent variable. *CCC*, *DIO*, *DSO*, and *DPO* are the independent variables, each at a time in four regression models. These models are moderated by three control variables. Those are size (*SIZE*), proxied by the natural logarithm of sales, debt (*LEV*), measured by debt to total assets, and growth (*GRO*), represented by year-to-year sales growth. In addition, the models include dummy variables in order to control for the year and ensure no

time-related effects are neglected (D_{2016}, D_{2017}, D_{2018}, D_{2019}). The index *it* refers to the pair firm-year observations and ε_{it} to the error term.

Most previous research let assume a negative causal relationship of CCC, DIO, and DSO on profitability and a positive causal relationship of DPO on profitability. It is noteworthy, that metrics for profitability differ across past research. An isolated view on the food industry creates similar expectations. CCC is expected to have a negative coefficient on the prediction of ROA. However, there is no consensus in the literature. The analyses of Bieniasz and Gołaś (2011) found a negative effect of DPO on ROA while Phuong Linh and Mohanlingam (2018) found a positive impact of DPO on ROA; they show contradictory expectations. According to Bieniasz and Gołaś (2011) DSO is expected to have a negative impact on ROA in the food industry.

The final step of the analyses examines differences within the food value chain and the relationship between WCM and profitability.

RQ4:	*Has effective Working Capital Management different impact on profitability across the food value chain? Is it less and more important for different value chain parts?*

As in RQ4, regressions models with CCC, DIO, DSO, and DPO as independent variables are applied to identify a possible relationship to profitability, measured through ROA. The control and dummy variables remain the same to regression equations 1 – 4. In this stage, separate regressions are run for each subindustry.

Due to lack of existing research on subindustries of the food value chain, expectations for each subindustry are hard to define. However, due to the existence of significant variety in CCCs between producing and retailing food companies, a stronger negative impact of CCC on profitability for food retail companies compared to other subindustries is expected (Dooley, Martens, and Blomeke 2009). Further, especially DIO for food retailers is expected to have a significant impact on ROA as supply chain and inventory management is of utmost importance

for food retailers. The capital-intensive business of the Agricultural Products subindustry lets assume that efficient receivable and payable management can have a significant negative, respectively positive impact on profitability. The dependence on cultivation and harvesting season suggests that DIO is rather difficult to influence and therefore, is not a significant negative predictor of profitability. For Packaged Foods & Meats companies, which are producing food products, the research of Gill, Biger, and Mathur (2010) and Muscettola (2014) may provide insightful expectations. Both analyses found a negative coefficient for CCC on profitability in the manufacturing sector. Due to contradictory results regarding DSO and DPO in the manufacturing sector, no expectations for Packaged Foods & Meats companies can be derived.

All statistical tests were run in IBM® SPSS® Statistics version 28.[7] All regressions were tested for validity and meet the assumptions of no multicollinearity, no autocorrelation and a normality distribution of residuals (Brooks 2014, pp. 90-91; Wooldridge 2016, pp. 40-45). A summary of statistical methods and tests for each research question is provided in Appendix 3.

Sampling

The sample includes listed companies in Europe and North America classified in the GICS subindustries "Agricultural Products", "Packaged Foods & Meats", and "Food Retail". The annual data from the consolidated financial statements were retrieved through Bloomberg database. The period of analysis covers the years 2016 to 2020. The latter is the most recent date for available financial data, whereas the former was used to have a sufficient amount of data. The initial sample includes 474 companies. The final sample includes 194 companies.[8] Companies whose data for the key variables used in the analyses were non-consistent for all five years were excluded from the sample. In a second step, outliers in key variables of this analysis were excluded by the interquartile rule. Any data point above the third quartile or below

[7] A table with the summary of the statistical tests used for RQ1-4 is presented in Appendix 2.
[8] A list of all companies in the final sample is presented in Appendix 3.

the first quartile multiplied by 1.5 times the interquartile range was excluded from the sample. In total, the sample comprises 922 observations.[9] It is noteworthy, that Packaged Foods & Meats is the largest sample with 667 observations (Agricultural Products 133 observations, Food Retail 122 observations). The analyses for the whole sample are therefore biased by the Packaged Foods & Meats subindustry. Appendices 4-6 present all companies of the sample, steps from the initial to the final sample, and the number of observations per subindustry.

6. Results

Diversity of WCM in the food industry (RQ1)

Descriptive statistics, including median, mean, standard deviation, minimum, and maximum for all variables are listed in Appendices 7-10. T-statistics are presented in Appendices 11-13.

Table 1 – Industry means for CCC, DIO, DSO, DPO, and ROA 2016-2020

	Whole sample	Agricultural Products	Packaged Foods & Meat	Food Retail
CCC (days)	50.375	62.977	57.683	-3.313
DIO (days)	67.984	74.118	72.793	35.008
DSO (days)	37.775	36.801	43.463	7.740
DPO (days)	55.384	47.942	58.573	46.061
ROA	0.064	0.053	0.064	0.073
ROS	0.063	0.043	0.068	0.036
AT	1.226	0.702	1.143	1.958

Results show an average CCC of 50 days in the food industry. DIO has an average value of 68 days, DSO 38 days, and DPO 55 days. Comparing the three subindustries with each other, CCC are decreasing the closer the subindustry operates to the final consumer. Companies from the Agricultural Products subindustry have the highest CCC, followed by Packaged Foods & Meats, and Food Retail (CCC_{AP} = 63 days; CCC_{PFM} = 58 days; CCC_{FR} = -3 days). The differences between Food Retail and both value chain partners are significant (p-value < 0.05).

[9] A detailed description of the derivation of the sample is presented in Appendix 4.

Food Retailers are able to convert their investments into inventory and cash more than 60 days faster than their value chain partners. This indicates a more effective WCM of food retailers. The difference of 5 days between the means of Agricultural Products and Packaged Foods & Meats is not significant (p-value > 0.05). The mean DIO show similar patterns. The difference between Agricultural Products and Packaged Foods & Meats subindustries is rather small and not significant (DIO_{AP} = 74 days; DIO_{PFM} = 73 days). Food Retail companies hold its inventory for a significantly shorter period on average (DIO_{FR} = 35 days) compared to the other subindustries. Food retailing companies also collect their receivables the fastest (DSO_{FR} = 8 days). Both industries, Agricultural Products and Packaged Foods & Meats take more than one month (DSO_{AP} = 37 days; DSO_{PFM} = 43 days). The T-statistics for mean differences in receivables management across all subindustries are significant (p-value < 0.05). In terms of payables, Packaged Foods & Meats firms manage to pay their bill latest (DPO_{PFM} = 59 days), significantly different compared to the other value chain actors (p-value < 0.05). Agricultural Products and Food Retail almost present identical average values (DPO_{AP} = 48 days; DPO_{FR} = 46 days) and do not differ significantly. Appendices 14-16 present the year-to-year development of the average CCC and ROA for all three subindustries. The graphs show that ROA of all subindustries declined from 2016 to 2020. However, in 2020 ROA increased for all three subindustries compared to the previous year, with the biggest change for Food Retail (+0.8%). This indicates that profitability in the food industry was not negatively affected by the global COVID-19 pandemic. The Agricultural Products subindustry managed to decrease its average CCC in the last five years (-20 days), while companies from the Packaged Foods & Meats and Food Retail subindustry remained a constant CCC with only low variation.

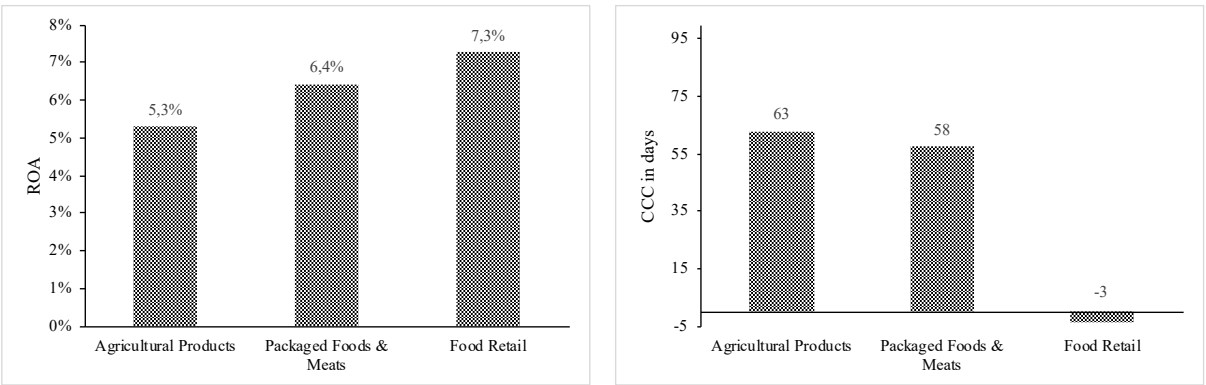
Average common sized-industry balance sheets (see Appendix 18-19) support the observations and results from univariate analyses. Food Retail has a smaller portion of current assets (0.32) compared to Agricultural Products (0.39) and Packaged Foods & Meats (0.40).

The largest difference can be detected in Accounts Receivable which only account 0.04 of Total Assets for Food Retail compared to 0.10 for Agricultural Products and 0.13 for Packaged Foods & Meats. This suggests a more effective management of receivables. On the liabilities side, there is also clear difference between subindustries in Payables & Accruals. Food Retail, with an average of 0.24 holds the biggest position in this account compared to firms from Agricultural Products (0.13) and Packaged Foods & Meats (0.16) industries. This supports the significant difference in DPO from Food Retail to the other industries.

Summarized, the presented results confirm that there are significant differences in WCM in the food value chain, with the Food Retail subindustry showing the greatest variation from its value chain partners. The results are consistent with existing literature that has found significant differences in WCM across the automotive value chain. This study confirms the diversity of WCM in value chains and provides further evidence that this also applies to the food value chain. Furthermore, the results are consistent with the study of Dooley, Martens, and Blomeke (2009), that found smaller CCCs for food retailers compared to its producers.

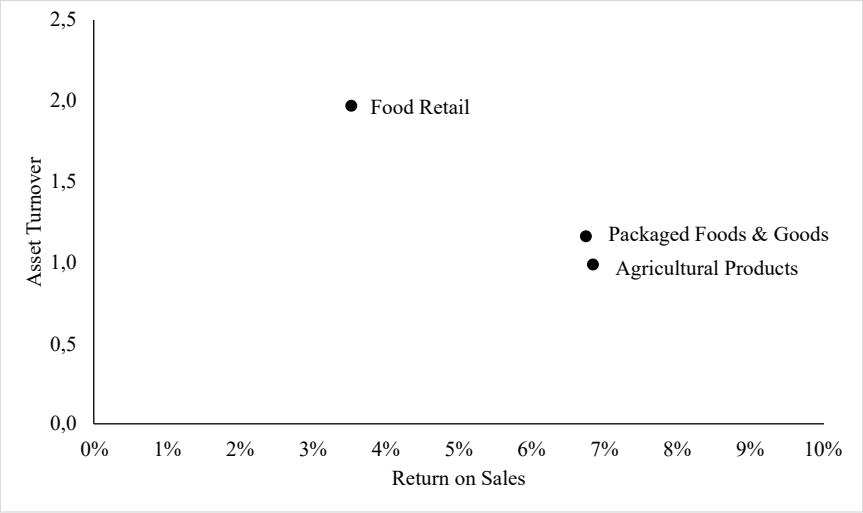
For RQ2-4 it is noteworthy, that descriptive statistics disclose mean ROA values of 7.3%, 6.4%, and 5.3% for Food Retail, Packaged Foods & Meats, Agricultural Products industries, respectively. This observation may indicate an inverse relationship between CCC and ROA as CCC follow the opposite direction (See Figure 3).

Figure 3: Average ROA and CCC per subindustry



In addition, the statistics give insight that Food Retail has the highest AT (2.0), which underlines the importance of efficiency in the use of its assets, especially when compared to Agricultural Products (1.0) and Packaged Foods & Meats (1.1) subindustries. The Agricultural Products subindustry has the highest ROS (6.9%), followed by Packaged Foods & Meats (6.8%), and Food Retail (3.6%).

Figure 4: AT and ROS of subindustries



Association of WCM to profitability in the food industry (RQ2)

Pearson correlation analysis is used to determine the relationships between WCM, size, and profitability in the food industry. Correlation matrices containing all variables are presented in Appendices 20-23. Correlation coefficients are considered as significant at a 5% confidence level.

Table 2 – Correlation coefficients for ROA across food value chain

Variable	Whole sample	Agricultural Products	Packaged Foods & Meats	Food Retail
CCC	0.055	0.197*	0.079*	0.032
DIO	-0.016	0.190*	-0,012	-0.320**
DSO	-0.149**	-0,159	-0.154**	0.023
DPO	-0.224**	-0,137	-0.251**	-0.239**

** Correlation is significant at the 0.02 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

Looking at the whole sample, only DSO (-0.149) and DPO (-0.224) have a significant negative coefficient with ROA, implying that collecting receivables and paying bills faster may

improve profitability. Quantifying this correlation, a company with one day less in DIO (DSO) has a 0.15% (0.22%) higher ROA, and vice versa. Regarding the relationship of CCC and ROA this study shows contradictory results to past research that noticed significant correlation coefficients between CCC and ROA in the food industry, although the direction of the relationship differs across studies. Negative correlation coefficients of DSO and DPO are in line with results of Bieniasz and Gołaś (2011).

However, subindustries reveal different findings. Both, Agricultural Products and Packaged Foods & Meats industries have positive coefficients (0.197 and 0.079) for the relationship between CCC and ROA that are significant at a 5% confidence level. This may indicate that less effective WCM is more likely to increase ROA. In the Food Retail subindustry, the coefficient of 0.032 is not significant. This finding is relevant, as CCCs for Food Retail are really small, indicating a potential importance for its profitability. In contrast to that, DIO and ROA have a significant negative coefficient of -0.320 in Food Retail, implying that an efficient inventory management may be important for the ROA of food retailers. Agricultural Products provide an opposite finding, with a positive significant coefficient of 0.190. For Packaged Foods & Meats companies, DIO and ROA do not significantly correlate. It is noteworthy that DSO and ROA do not significantly correlate for Food Retail, although Food Retailers have a significant lower rate of receivables outstanding compared to the other industries. DSO and ROA are only significantly negatively correlated in the Packaged Foods & Meats subindustry with a coefficient of 0.154. This may indicate that shorter payment targets for their customers can improve their profitability. Another relevant finding is the significant negative correlation between DPO and ROA for Packaged Foods & Meats and Food Retail companies. Paying their bills earlier and reducing liquidity therefore could increase the companies' profitability.

Impact of WCM on profitability in the food industry (RQ3)

Table 3 – Regression coefficients for models (1) – (4)

Variables	ROA (1)	ROA (2)	ROA (3)	ROA (4)
CCC (days)	0.010*** (0,000)			
DIO (days)		0.007* (0,065)		
DSO (days)			-0.006 (0,424)	
DPO (days)				-0.021*** (0,000)

*** significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Complete regression outputs are presented in Appendix 24. The four regression outputs have R^2 values from 0.161 to 0.176 indicating a moderate effect size according to Cohen (1988). Results show that CCC has a significant positive impact on ROA (p-value 0.000). By increasing CCC by one day, ROA can be raised by 0.01%. Longer CCCs therefore increase profitability. This observation is supported by a small positive coefficient for DIO (0.007) that is significant on a 10% confidence level (p-value 0.065) and negative coefficient for DPO of -0.021 (p-value 0.000) in models (2) and (4). Therefore, reducing CCC decreases the profitability of companies in the food industry and is not a useful management tool to improve profitability. Nevertheless, paying bills earlier can increase profitability. A cause for this could be discounts for advanced or early payments. These findings reveal opposite evidence for the impact of CCC on profitability in the food industry compared to Bieniasz and Gołaś (2011) and Phuong Linh and Mohanlingam (2018), who both found an inverse relationship between the variables in regression analyses. The negative coefficient of DPO is in line with findings from Bieniasz and Gołaś (2011), but contradictory to Phuong Linh and Mohanlingam (2018).

Impact of WCM on profitability in different stages of the food value chain (RQ4)

Table 4 – Regression coefficients for equations 5-16

Variables	Agricultural Products (5) – (8)	Packaged Foods & Meats (9) – (12)	Food Retail (13) – (16)
CCC (days)	0.014* (0,056)	0.010*** (0,004)	0.034* (0,091)
DIO (days)	0.026*** (0,001)	0.003 (0,465)	-.068** (0,011)
DSO (days)	-0.012 (0,483)	-0.013 (0,128)	0.035 (0,613
DPO (days)	-0.022 (0,146)	-0.028*** (0,000)	-0.050*** (0,003)

*** significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

The regression equations 5-16 follow the same approach as equations 1-4 from RQ3. Results are listed in Appendices 25-27. All regressions have a moderate effect size.

Regression outputs show different impacts of WCM on profitability within the food value chain. Regarding CCC, all industries show a significant positive coefficient of CCC for ROA on a 10% confidence level, Packaged Foods & Meats even on a 5% confidence level. Agricultural Products and Packaged Foods & Meats have similar, small coefficients of 0.014 and 0.010. In Food Retail an increase in CCC days has the biggest impact on ROA with a coefficient of 0.034. This finding implies that keeping CCCs short is not relevant for companies within the food value chain. This evidence is different from most of past research, that showed a negative causal relationship of CCC on ROA. However, a positive relationship of CCC on ROA for Packaged Foods & Meats companies was expected according to the findings of Gill, Biger, and Mathur (2010) and Muscettola (2014). DIO has a significant positive coefficient of 0.026 for companies from the Agricultural Products subindustry (p-value 0.001). Food Retailers experience an opposite effect with a significant negative coefficient of -0.068 for DIO (p-value 0.011). Thus, effective inventory management matters for the profitability of Food Retail. This is in accordance with the observation of generally lower DIO periods of Food Retail companies in comparison to other value chain actors. Further, it shows that narrow margins force food retailers to have a high inventory turnover. DSO shows a negative coefficient for Agricultural

Products and Packaged Foods & Meats industries and a positive coefficient for Food Retailers. However, for all industries DSO has a non-significant coefficient, meaning that the receivables management does not influence a company's profitability. This also goes in hand with findings from regression 3, that found a non-significant relationship of DSO and ROA for the whole food industry. The insignificance of DSO is in line with the findings of Phuong Linh and Mohanlingam (2018) but does not correspond to the negative significant causal relationship found by Bieniasz and Gołaś (2011). Lastly, the period companies take to pay their bills, measured in DPO, has significant negative impact on profitability for the Packaged Foods & Meats and Food Retail industries with coefficients of -0.028 and -0.050. Hence, shorter terms of payment seem to increase the profitability of Packaged Foods & Meats and Food Retail companies. This effect could result from financial discounts for short payment targets. The insignificance of DSO is in line with the findings of Phuong Linh and Mohanlingam (2018).

7. Discussion

The purpose of this study was to identify diversity in WCM across the food value chain and to define the impact of WCM on profitability in the case of different actors in the value chain. Univariate analyses show that WCM across the food value chain is not homogenous. Depending on the value chain stage, companies tend to show different WCM patterns. CCC becomes smaller, the closer a company is to the final consumer. Comparing the activities of the selected industries, companies from Agricultural Products, having less bargaining power and long inventory cycles caused by long cultivation and harvesting seasons, need more time to convert their inventory into cash. On the contrary, Food Retailers have low profit margins and focus on scale and efficiency in their operations, and this may explain the shorter CCCs in this subindustry. Their efficient inventory management and short receivable collection time confirm this. It is noteworthy that the Packaged Foods & Meats subindustry has the longest period for paying its invoices. Although food retailers are larger, they do not achieve similar payment

terms. Year-to-year analysis shows that WCM efficiency in the Packaged Foods & Meats and Food Retail subindustry is stable, while the Agricultural Products subindustry was able to decrease the average CCC by 20 days in the last five years. This implies that Packaged Foods & Meats and Food Retail companies already operate at a high WCM efficiency and there is little room for further improvements. In fact, Packaged Foods & Meats companies witnessed an increase in CCC of more than 10 days from 2019 to 2020. This could be driven by the global COVID-19 pandemic, which caused several supply chain issues across the world that may have led to longer inventory cycles. The trend is for ROA to be negative in all subindustries in the five-year period under study. However, there was an increase of ROA from 2019 to 2020 for all analysed subindustries which shows the global pandemic did not impact the profitability of food companies. This seems feasible given that food products fill a basic human need. The insignificance of the dummy variable for 2020 in all regression models underlines this fact.

Regarding the impact of WCM on profitability on the food industry as a whole, this project finds evidence which contradicts past research. CCC has a small and positive impact on the ROA of food companies in Europe and North America. This can mainly be explained by the significant negative effect of DPO on ROA. Possible causes for this may be down to shorter payment terms or payments in advance due to financial discounts. However, as mentioned previously, WCM patterns differ within the value chain and an analysis of the whole industry should therefore not be used as a basis for recommendations. Detailed regression outputs, isolating each value chain actor provide better insights into causal relationships.

For the Agricultural Products subindustry, analyses predict a positive impact of CCC and DIO on ROA. One possible explanation for this may be the product quality, which can be increased through longer cultivation cycles. Quality in the food industry matters and final consumers are becoming more aware of this, leading to less price sensitivity if products meet quality standards. Therefore, careful and extensive farming could lead to improvements in

quality and higher selling prices.

In the Packaged Foods & Meats subindustry, the study finds a similar impact of CCC on ROA. Longer CCCs lead to higher ROA. The only significant component is DPO, with a negative coefficient. This implies that earlier payments of invoices to suppliers increases profitability. When Agricultural Products are the subindustry's suppliers this becomes more meaningful. Agricultural companies are often short of liquidity. Thus, in order to collect their receivables earlier these companies may offer discounts on their products. On the other hand, DSO turned out to be an insignificant predictor in the regression model for the Agricultural Products subindustry suggesting that this explanation may not hold. Nevertheless, it is likely that early payments of invoices are associated to discounts that may decrease costs of goods sold and simultaneously increase ROA. Hence, a suggestion for managers of Packaged Foods & Meats companies might be to negotiate financial discounts for advance or short payment terms. In addition, early payments can lead to strengthening of supplier relationships, which can lead to lower prices and exclusive supplies in the future. Another reason for the negative impact of DPO on ROA could be that insolvent and unprofitable companies that usually have low or negative profitability are not able to meet their obligations on time.

Lastly, Food Retailers also show a positive impact of CCC on ROA. This finding is relevant as retailers focus on efficiency in supply chain and WCM. Looking at DIO, it becomes clear, that inventory management matters for food retailers. By holding inventory only for short periods of time, managers can increase business profitability. Too much stock can lead to inappropriate inventory costs while out-of-stocks can disappoint customers and lead to unrealised sales. Just-in-time ordering and delivering, efficient stock tracking and accurate demand forecasting are examples of essential tools to improve inventory management. Like in the Packaged Foods & Meats subindustry, the impact of DPO on ROA is negative in the Food

Retail subindustry, but with an even greater impact. Possible management activities to exploit this causal link are therefore the same as in the Packaged Foods & Meats subindustry.

8. Limitations and recommendations for future research

This study only analysed the food value chain, focusing on companies from North America and Europe. Other regions, e.g. Asia have a large share in the food industry. Analyses of WCM within other value chains as well as an analysis of the food value chain of the latter regions may be object for future research. It should be taken into account that food companies in Europe and North America get supplied and supply companies from other regions. Therefore, identified explanations for value chain interdependencies within sample regions can be distorted due to unrecognized impacts of value chain participants of other regions. Depending on IFRS or US GAAP accounting standards, measures of income statement accounts and balance sheet items can shift. Relevant positions include EBIT, costs of goods sold, and inventory. For instance, in contrast to IFRS, US GAAP allows to include dividends and interests received before EBIT. Differences also appear in the treatment of inventory. According to IFRS the use of last-in, first-out (LIFO) method, which accounts for finished inventory that was produced last and includes most recent costs, is banned, while US GAAP allows it. The First-in, last-out (FIFO) approach, which accounts for inventory that was produced first and therefore consists of costs incurred first is allowed in both standards. These differences influence both, the inventory balance sheet item as well as the cost of goods sold account of the income statement.

9. Conclusion

This project adds to existing literature such as Bieniasz and Gołaś (2011), who revealed a significant negative impact of CCC as well as DIO, DSO, and DPO on corporate profitability, as measured by ROA, for European food companies. Phuong Linh and Mohanlingam (2018) found a weak negative relationship between CCC and ROA and a positive relationship of DPO and ROA for agricultural and food companies in Thailand. This study extends previous research

by dividing the food industry into three subindustries and proves that diversity in WCM and its impact on corporate profitability exists. The findings suggest that future research should by considering subdividing industries in order to identify differences in WCM patterns across subindustries and give useful recommendation for managers.

The results show conflict evidence on the impact of CCC on profitability in the food industry. Both, for the whole sample and for each value chain participant analysed, higher CCCs predict a higher ROA. For managers, it seems that low CCCs, used as a metric for WCM efficiency, cannot lead to higher profitability. However, a differentiated view on CCC components found that WCM can affect profitability in different ways depending on the stage of the value chain in which a company operates. With the exception of the Agricultural Products subindustry, a low DPO has negative impact on ROA. For managers, this implicates that maintaining small payment cycles for their invoices is a useful tool to increase ROA. As discussed, possible discounts and strengthened supplier relationships could be indicators of this. The analysis of the relationship between DIO and profitability perfectly shows how important a differentiated analysis of an industry can be. The number of days inventory is held is important for both, Agricultural Products and Food Retail. However, it was observed that agricultural companies can increase their profitability by more inventory days, while food retail can increase their profitability by a more efficient inventory management, keeping DIO low. The results therefore suggest that managers of companies from Agricultural Products subindustry should increase DIO for increasing profitability while managers of food retailers should keep inventory days relatively low in order to achieve higher profitability. When comparing business models, this observation is reasonable. Increasing quality standards for food products that go along with lower price-sensitivity of customers can create incentives for longer growing periods for agricultural businesses. In contrast to that, Food Retailers have narrow margins and therefore short inventory cycles and low inventory costs are crucial for them.

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Appendix

Table of Contents

Appendix 1 – Abbreviations and acronyms

Abbreviations and acronyms	Meaning
AP	Agricultural Products
Approx.	Approximately
AT	Asset Turnover
CCC	Cash Conversion Cycle
COGS	Cost of goods sold
DIO	Days Inventory Outstanding
DPO	Days Payables Outstanding
DSO	Days Sales Outstanding
E.g.	Exempli gratia
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation and amortization
Et al.	And others
EU	European Union
FIFO	First In First Out
FR	Food Retail
GAAP	Generally Accepted Accounting Principles
GICS	Global Industry Classification Standard
IFRS	International Financial Reporting Standards
LIFO	Last In First Out
OLS	Ordinary Least Squares
P.	Page
PFM	Packaged Foods & Meats
Pp.	Pages
ROA	Return on Assets
ROS	Return on Sales
RQ	Research question
SME	Small and medium-sized enterprises
Tn	Trillion
VAT	Value added tax
WC	Working Capital
WCM	Working Capital Management

Appendix 2 – Key variables

Variables	Abr.	Definitions	Formula
Days Inventory Outstanding	DIO	Average number of days a company holds its inventory before turning it to sales	*(Avg. Inventories / Cost of goods sold) x 365*
Days Sales Outstanding	DSO	Average number of days a company needs to collect payables from its customers	*(Avg. Accounts receivable / Credit sales) x 365*
Days Payables Outstanding	DPO	Average number of days it takes for a company to pay its bills and invoices	*(Avg. Accounts payable / Cost of goods sold) x 365*
Return on Assets	ROA	An indicator of profitability that measures how effectively a company uses its assets to generate profits.	*EBIT / Total Assets*
Cash Conversion Cycle	CCC	A metric for working capital management that expresses the time it takes companies to convert its resources into cash	*DIO + DSO - DPO*
Size	SIZE	Size of a company in terms of sales	*Natural logarithm of sales*
Leverage	LEV	Refers to the proportion of assets financed with debt	*Total Liabilities / Total Assets*
Growth	GRO	Growth of a company measured by year-to-year sales development	(Sales t_1 / Sales t_2) -1

Appendix 3 – Statistical method and tests for research questions

#RQ	Type of analysis	Statistical test
RQ1	Univariate	Descriptive statistics incl. Mean, Median, Std. dev., Min., Max.; T-test
RQ2	Bivariate	Correlation analysis-Pearson coefficient
RQ3	Multivariate	OLS regression
RQ4	Multivariate	OLS regression

Appendix 4 – Sample composition

Company name	*GICS Subindustry Name*	*Company name*	*GICS Subindustry Name*
AAK AB	Packaged Foods & Meats	LA DORIA SPA	Packaged Foods & Meats
ACTIVE MARINE FISHER BASE	Packaged Foods & Meats	LANCASTER COLONY CORP	Packaged Foods & Meats
ADESE ALISVERIS MERKEZLERI T	Food Retail	LANDEC CORP	Packaged Foods & Meats
AGROTON PUBLIC LTD	Agricultural Products	LEROY SEAFOOD GROUP ASA	Packaged Foods & Meats
ALICO INC	Agricultural Products	LIFEWAY FOODS INC	Packaged Foods & Meats
ALTINYAG KOMBINALARI A.S.	Packaged Foods & Meats	LINAS AGRO GROUP AB	Agricultural Products
ANGLO-EASTERN PLANTATIONS	Agricultural Products	LOULIS MILLS S.A.	Packaged Foods & Meats
ANPARIO PLC	Packaged Foods & Meats	MAKARONY POLSKIE SA	Packaged Foods & Meats
ARCHER-DANIELS-MIDLAND CO	Agricultural Products	MCCORMICK & CO-NON VTG SHRS	Packaged Foods & Meats
ARGUS SA CONSTANTA	Packaged Foods & Meats	MERKO GIDA SANAYI VE TICARET	Packaged Foods & Meats
ARYZTA AG	Packaged Foods & Meats	METRO INC/CN	Food Retail
ASSOCIATED BRITISH FOODS PLC	Packaged Foods & Meats	MHP SE	Packaged Foods & Meats
ASTARTA HOLDING NV	Packaged Foods & Meats	MITSIDES PUBLIC CO LTD	Packaged Foods & Meats
ATLANTIC GRUPA DD	Packaged Foods & Meats	MONDELEZ INTERNATIONAL INC-A	Packaged Foods & Meats
ATRIA OYJ	Packaged Foods & Meats	NAKED WINES PLC	Food Retail
AUGA GROUP AB	Agricultural Products	NATURAL GROCERS BY VITAMIN C	Food Retail
AUSTEVOLL SEAFOOD ASA	Packaged Foods & Meats	NOMAD FOODS LTD	Packaged Foods & Meats
AXFOOD AB	Food Retail	NORWAY ROYAL SALMON ASA	Packaged Foods & Meats
B&G FOODS INC	Packaged Foods & Meats	OCADO GROUP PLC	Food Retail
BAKKAVOR GROUP PLC	Packaged Foods & Meats	ORIGIN ENTERPRISES PLC	Agricultural Products
BANVIT BANDIRMA VITAMINLI YE	Packaged Foods & Meats	ORIOR AG	Packaged Foods & Meats
BARRY CALLEBAUT AG-REG	Packaged Foods & Meats	ORKLA ASA	Packaged Foods & Meats
BEL SA	Packaged Foods & Meats	OTMUCHOW SA	Packaged Foods & Meats
BELL FOOD GROUP AG-REG	Packaged Foods & Meats	PAMAPOL SA	Packaged Foods & Meats
BENCHMARK HOLDINGS PLC	Packaged Foods & Meats	PENGUEN GIDA SANAYII AS	Packaged Foods & Meats
BG AGRO	Packaged Foods & Meats	PIK RIJEKA DD RIJEKA	Packaged Foods & Meats
BIM BIRLESIK MAGAZALAR AS	Food Retail	PILGRIM'S PRIDE CORP	Packaged Foods & Meats
BLUE APRON HOLDINGS INC-A	Food Retail	PINAR ENTEGRE ET VE UN SANAY	Packaged Foods & Meats
BLUE ISLAND PLC	Packaged Foods & Meats	PINAR SUT MAMULLERI SANAYII	Packaged Foods & Meats
BORGES AGRICULTURAL AND INDU	Packaged Foods & Meats	PODRAVKA PREHRAMBENA IND DD	Packaged Foods & Meats
BRIDGFORD FOODS CORP	Packaged Foods & Meats	POST HOLDINGS INC	Packaged Foods & Meats
BRIM HF	Packaged Foods & Meats	PREMIER FOODS PLC	Packaged Foods & Meats
BUNGE LTD	Agricultural Products	PREMIUM SNACKS NORDIC AB	Packaged Foods & Meats
CAKOVECKI MLINOVI DD	Packaged Foods & Meats	PRODLACTA SA BRASOV	Packaged Foods & Meats
CALAVO GROWERS INC	Packaged Foods & Meats	R.E.A. HOLDINGS PLC	Agricultural Products
CAMELLIA PLC	Agricultural Products	RAISIO OYJ-V SHS	Packaged Foods & Meats
CARR'S GROUP PLC	Agricultural Products	RALLYE SA	Food Retail
CASEY'S GENERAL STORES INC	Food Retail	REAL GOOD FOOD PLC	Packaged Foods & Meats
CASINO GUICHARD PERRACHON	Food Retail	ROCKY MOUNTAIN CHOC FACT INC	Packaged Foods & Meats
CENTRALE DEL LATTE D'ITALIA	Packaged Foods & Meats	ROGERS SUGAR INC	Packaged Foods & Meats
CHERKIZOVO GROUP PJSC	Packaged Foods & Meats	ROKISKIO SURIS	Packaged Foods & Meats
CHOCOLADEFABRIKEN LINDT-REG	Packaged Foods & Meats	ROS AGRO PLC- GDR REG S	Agricultural Products
CLOETTA AB-B SHS	Packaged Foods & Meats	S&W SEED CO	Agricultural Products
COLRUYT SA	Food Retail	SAINSBURY (J) PLC	Food Retail
CONAGRA BRANDS INC	Packaged Foods & Meats	SAINT JEAN GROUPE SA	Agricultural Products
CRANSWICK PLC	Packaged Foods & Meats	SAJKASKA FABRIKA SECERA AD Z	Packaged Foods & Meats
CRVENKA FABRIKA SECERA AD	Packaged Foods & Meats	SANDERSON FARMS INC	Packaged Foods & Meats
DANONE	Packaged Foods & Meats	SAVENCIA SA	Packaged Foods & Meats
DARLING INGREDIENTS INC	Agricultural Products	SCANDI STANDARD AB	Packaged Foods & Meats
DINO POLSKA SA	Food Retail	SCHOUW & CO	Packaged Foods & Meats
EBRO FOODS SA	Packaged Foods & Meats	SCHWAELBCHEN MOLKEREI AG	Packaged Foods & Meats
EMMI AG-REG	Packaged Foods & Meats	SEABOARD CORP	Packaged Foods & Meats
EVROFARMA S.A.	Packaged Foods & Meats	SEKO SA	Packaged Foods & Meats
FARMER BROS CO	Packaged Foods & Meats	SELCUK GIDA ENDUSTRI IHRACAT	Packaged Foods & Meats
FINSBURY FOOD GROUP PLC	Packaged Foods & Meats	SENECA FOODS CORP-CL B	Packaged Foods & Meats
FLEURY MICHON SA	Packaged Foods & Meats	SIPEF NV	Agricultural Products
FLOWERS FOODS INC	Packaged Foods & Meats	SKANE-MOLLAN AB	Packaged Foods & Meats
FORFARMERS NV	Agricultural Products	SOCFIN	Agricultural Products
FRESH DEL MONTE PRODUCE INC	Agricultural Products	SOCFINAF	Agricultural Products
FRESHPET INC	Packaged Foods & Meats	SONAE	Food Retail
FRIGO PAK GIDA MADDELERI	Packaged Foods & Meats	SPROUTS FARMERS MARKET INC	Food Retail
FROSTA AG	Packaged Foods & Meats	START JSC	Packaged Foods & Meats
GENERAL MILLS INC	Packaged Foods & Meats	SUEDWESTDEUTSCHE SALZWERKE A	Packaged Foods & Meats
GINGER BEEF CORP	Packaged Foods & Meats	SUEDZUCKER AG	Packaged Foods & Meats
GLANBIA PLC	Packaged Foods & Meats	SUNOPTA INC	Packaged Foods & Meats
GOBARTO SA	Packaged Foods & Meats	SWISS WATER DECAFFEINATED CO	Packaged Foods & Meats
GRANOLIO DD	Packaged Foods & Meats	TAC TARIM URUNLERI HAYVANCIL	Agricultural Products
GREENCORE GROUP PLC	Packaged Foods & Meats	TALLINNA KAUBAMAJA GRUPP AS	Food Retail
GREENYARD NV	Packaged Foods & Meats	TARCZYNSKI SA	Packaged Foods & Meats
GROUPE MINOTERIES SA-REG	Packaged Foods & Meats	TAT GIDA SANAYI AS	Packaged Foods & Meats
HAIN CELESTIAL GROUP INC	Packaged Foods & Meats	TATE & LYLE PLC	Packaged Foods & Meats
HALLOREN SCHOKOLADENFABRIK A	Packaged Foods & Meats	TESCO PLC	Food Retail
HERSHEY CO/THE	Packaged Foods & Meats	TOFUTTI BRANDS INC	Packaged Foods & Meats
HIGH LINER FOODS INC	Packaged Foods & Meats	TONKENS AGRAR AG	Agricultural Products
HILTON FOOD GROUP PLC	Packaged Foods & Meats	TOOTSIE ROLL INDS	Packaged Foods & Meats
HKSCAN OYJ-A SHS	Packaged Foods & Meats	TREEHOUSE FOODS INC	Packaged Foods & Meats
HOCHDORF HOLDING AG	Packaged Foods & Meats	TYSON FOODS INC-CL A	Packaged Foods & Meats
HORMEL FOODS CORP	Packaged Foods & Meats	ULKER BISKUVI SANAYI	Packaged Foods & Meats
HOTEL CHOCOLAT GROUP PLC	Packaged Foods & Meats	ULUSOY UN SANAYI VE TICARET	Packaged Foods & Meats
INDUSTRIAL MILK CO	Agricultural Products	UNIBEL	Packaged Foods & Meats
INGLES MARKETS INC-CLASS A	Food Retail	VALSOIA SPA	Packaged Foods & Meats
INGREDION INC	Agricultural Products	VILKYSKIU PIENINE	Packaged Foods & Meats
IZ HAYVANCILIK TARIM VE GIDA	Packaged Foods & Meats	VILLAGE FARMS INTERNATIONAL	Agricultural Products
J & J SNACK FOODS CORP	Packaged Foods & Meats	VILLARS HOLDING AG-REG	Food Retail
JERONIMO MARTINS	Food Retail	VIRO TVORNICA SECERA	Packaged Foods & Meats
JM SMUCKER CO/THE	Packaged Foods & Meats	WASGAU PRODUKTIONS & HAN-REG	Food Retail
JOHN B. SANFILIPPO & SON INC	Packaged Foods & Meats	WEIS MARKETS INC	Food Retail
JOSEF MANNER & COMP AG	Packaged Foods & Meats	YAPRAK SUT VE BESI CIFTLIKLE	Agricultural Products
KARAMOLENGOS BAKERY SA	Packaged Foods & Meats	YEW BIO-PHARM GROUP INC	Agricultural Products
KENT GIDA MADDELERI SANAYII	Packaged Foods & Meats	ZAGREBACKE PEKARNE KLARA DD	Packaged Foods & Meats
KEREVITAS GIDA	Packaged Foods & Meats	ZEMAITIJOS PIENAS ORS	Packaged Foods & Meats
KERNEL HOLDING SA	Agricultural Products	ZITNJAK DD	Agricultural Products
KERRY GROUP PLC-A	Packaged Foods & Meats		
KESKO OYJ-B SHS	Food Retail		
KOESTLIN DD BJELOVAR	Packaged Foods & Meats		
KONINKLIJKE AHOLD DELHAIZE N	Food Retail		
KRAFT HEINZ CO/THE	Packaged Foods & Meats		
KRAS D.D.	Packaged Foods & Meats		
KRASNYJ OCTYABR PJSC	Packaged Foods & Meats		
KRI-KRI MILK INDUSTRY SA	Packaged Foods & Meats		
KWS SAAT SE & CO KGAA	Agricultural Products		
L.D.C. SA	Packaged Foods & Meats		
LA DORIA SPA	Packaged Foods & Meats		
LANCASTER COLONY CORP	Packaged Foods & Meats		

Appendix 5 – Sample derivation

Step	Description	Companies	Observations
Initial sample	All companies listed in GICS-subindustries "Agricultural Products", "Packaged Foods & Meats", and "Food Retail" in North America and Europe as of end of 2020	474	2,370
First adjustment	Removal of all companies that Bloomberg database does not provide consistent data points for all five years (2016-2020)	-239	-960
Second adjustment	Removal of all outlier data points in key variables for regression	-41	-488
Final sample	Data points used for statistical analyses in this project	194	922

Appendix 6 – Observations per industry

Industry	Companies	Obs.
Whole sample	194	922
Agricultural Products	30	133
Packaged Foods & Meats	139	667
Food Retail	25	122

Appendix 7 – Descriptive Statistics for Whole Sample 2016-2020

Variable	Obs.	Median	Mean	St. Dev	Max	Min
ROA	728	0.062	0.064	0.049	0.200	-0.082
CCC (days)	728	40.414	50.375	54.647	236.037	-78.451
DIO (days)	728	56.848	67.984	42.829	216.804	6.078
DSO (days)	728	35.023	37.775	23.779	107.707	0.145
DPO (days)	728	48.469	55.384	32.296	164.457	2.449
SIZE	728	6.724	6.697	2.160	11.355	0.566
LEV	728	0.520	0.496	0.158	0.770	0.093
GRO	728	0.035	0.043	0.091	0.316	-0.213
ROS	728	0.053	0.063	0.063	0.351	-0.356
AT	728	1.113	1.226	0.683	4.717	0.118

Appendix 8 – Descriptive Statistics for Agricultural Products 2016-2020

Variable	Obs.	Median	Mean	St. Dev	Max	Min
ROA	133	0.051	0.053	0.048	0.197	-0.065
CCC (days)	133	61.615	62.977	55.467	209.680	-35.957
DIO (days)	133	54.817	74.118	50.891	211.224	6.078
DSO (days)	133	31.719	36.801	25.133	106.531	0.575
DPO (days)	133	32.798	47.942	38.272	151.220	3.441
SIZE	133	6.298	6.420	2.312	11.077	0.566
LEV	133	0.477	0.461	0.152	0.751	0.102
GRO	133	0.024	0.035	0.102	0.274	-0.164
ROS	133	0.043	0.069	0.088	0.351	-0.356
AT	133	0.702	0.974	0.672	2.851	0.118

Appendix 9 – Descriptive Statistics for Packaged Foods & Meats 2016-2020

Variable	Obs.	Median	Mean	St. Dev	Max	Min
ROA	667	0.064	0.064	0.049	0.200	-0.082
CCC (days)	667	51.114	57.683	52.978	236.037	-78.451
DIO (days)	667	61.795	72.793	41.706	216.804	7.164
DSO (days)	667	39.371	43.463	21.242	107.707	2.709
DPO (days)	667	55.469	58.573	31.553	164.457	2.449
SIZE	667	6.462	6.415	2.039	10.673	1.040
LEV	667	0.504	0.486	0.157	0.767	0.093
GRO	667	0.031	0.040	0.090	0.316	-0.213
ROS	667	0.061	0.068	0.061	0.308	-0.115
AT	667	1.092	1.143	0.541	4.717	0.213

Appendix 10 – Descriptive Statistics for Food Retail 2016-2020

Variable	Obs.	Median	Mean	St. Dev	Max	Min
ROA	122	0.067	0.073	0.049	0.195	-0.039
CCC (days)	122	-2.514	-3.313	23.470	66.269	-62.119
DIO (days)	122	32.028	35.008	17.245	100.165	12.218
DSO (days)	122	6.004	7.740	6.498	29.139	0.145
DPO (days)	122	37.969	46.061	25.624	119.260	11.956
SIZE	122	8.755	8.542	1.690	11.355	4.389
LEV	122	0.621	0.592	0.129	0.770	0.201
GRO	122	0.056	0.073	0.078	0.310	-0.091
ROS	122	0.035	0.036	0.018	0.074	-0.052
AT	122	1.890	1.958	0.895	4.705	0.639

Appendix 11 – T-test for WCM measures between Agricultural Products and Packaged Foods & Meats

Variable	Mean Agricultural Products	Mean Packaged Foods & Meats	Mean difference
CCC (days)	62.977	57.683	5.294
DIO (days)	74.118	72.793	1.325
DSO (days)	36.801	43.463	-6.662**
DPO (days)	47.942	58.573	-10.631**

**. Mean difference is significant at the 0.02 level (2-tailed).

*. Mean difference is significant at the 0.05 level (2-tailed).

Appendix 12 – T-test for WCM measures between Agricultural Products and Food Retail

Variable	Mean Agricultural Products	Mean Food Retail	Mean difference
CCC (days)	62.977	-3.313	66.290**
DIO (days)	74.118	35.008	39.110**
DSO (days)	36.801	7.740	29.061**
DPO (days)	47.942	46.061	1.882

**. Mean difference is significant at the 0.02 level (2-tailed).

*. Mean difference is significant at the 0.05 level (2-tailed).

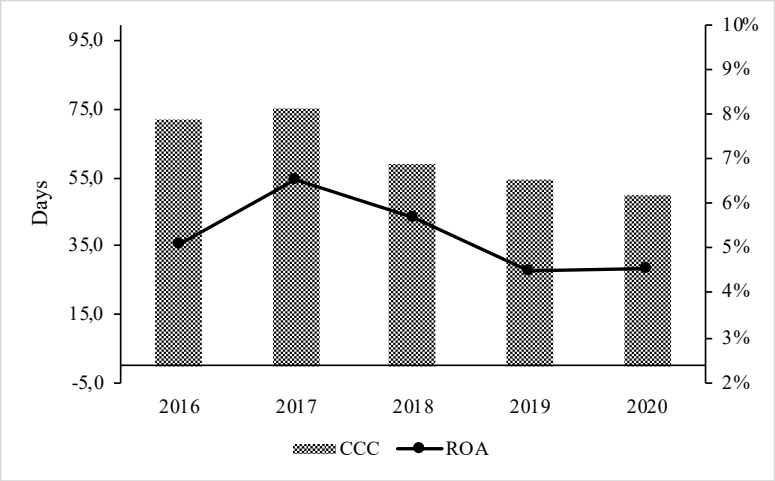
Appendix 13 – T-test for WCM measures between Packaged Foods & Meats and Food Retail

Variable	Mean Packaged Foods & Meats	Mean Food Retail	Mean difference
CCC (days)	57.683	-3.313	60.995**
DIO (days)	72.793	35.008	37.785**
DSO (days)	43.463	7.740	35.723**
DPO (days)	58.573	46.061	12.513**

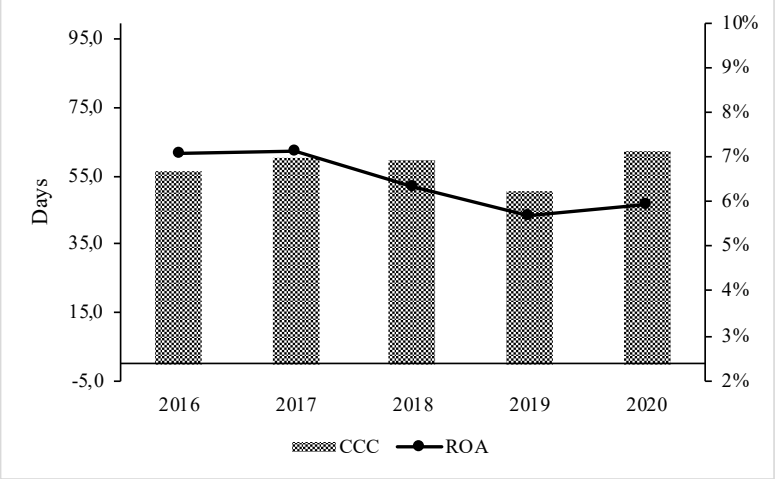
**. Mean difference is significant at the 0.02 level (2-tailed).

*. Mean difference is significant at the 0.05 level (2-tailed).

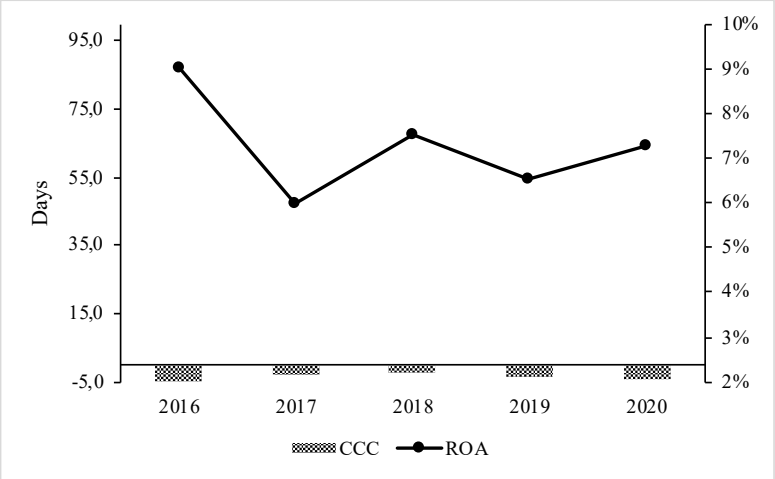
Appendix 14 – CCC and ROA year-to-year Agricultural Products



Appendix 15 – CCC and ROA year-to-year Packaged Foods & Meats



Appendix 16 – CCC and ROA year-to-year Food Retail



Appendix 17 – Year-to-year analysis of all subindustries

Industry	Year	CCC	DIO	DSO	DPO	ROA
Agricultural Products	2016	72.200	85.469	39.107	52.376	0.051
	2017	75.490	81.013	36.256	41.779	0.065
	2018	58.994	68.995	36.561	46.562	0.057
	2019	54.321	70.756	36.591	53.026	0.045
	2020	50.179	61.006	34.756	45.583	0.045
Packaged Foods & Meats	2016	56.368	70.280	45.972	59.885	0.071
	2017	60.121	72.205	43.394	55.477	0.071
	2018	59.515	74.138	43.771	58.394	0.063
	2019	50.573	70.190	42.910	62.528	0.057
	2020	61.932	77.091	41.392	56.551	0.059
Food Retail	2016	-4.481	34.802	7.930	47.076	0.090
	2017	-2.565	39.424	7.771	49.760	0.060
	2018	-2.298	35.681	7.270	45.249	0.075
	2019	-3.415	31.525	7.614	42.554	0.065
	2020	-3.837	32.568	8.261	44.666	0.073

Appendix 18 – Common-Sized Balance Sheet Assets per industry

2016-2020	Agricultural Products	Packaged Foods & Meats	Food Retail
Cash, Cash Equivalents	0.09	0.08	0.09
Accounts Receivable	0.10	0.13	0.04
Inventories	0.13	0.15	0.14
Other short-term Assets	0.08	0.05	0.05
Total Current Assets	**0.39**	**0.40**	**0.32**
Property, Plant & Equip, Net	0.43	0.33	0.49
Long-term Investments & Receivables	0.01	0.02	0.02
Other long-term Assets	0.17	0.24	0.17
Total Noncurrent Assets	**0.61**	**0.60**	**0.68**
Total Assets	**1.00**	**1.00**	**1.00**

Appendix 19 – Common-Sized Balance Sheet Liabilities per industry

2016-2020	Agricultural Products	Packaged Foods & Meats	Food Retail
Payables & Accruals	0.13	0.16	0.24
Short-term Debt	0.07	0.07	0.04
Other short-term Liabilities	0.04	0.02	0.04
Total Current Liabilities	**0.24**	**0.25**	**0.31**
Long-term Debt	0.16	0.16	0.21
Other long-term Liabilities	0.06	0.07	0.06
Total Noncurrent Liabilities	**0.22**	**0.23**	**0.28**
Total Liabilities	**0.46**	**0.49**	**0.59**
Total Equity	**0.54**	**0.51**	**0.41**
Total Liabilities & Equity	**1.00**	**1.00**	**1.00**

Appendix 20 – Correlation Matrix for Whole Sample

Pearson Correlation	CCC	DIO	DSO	DPO	ROA	SIZE	LEV	GRO
CCC	1							
DIO	0.822**	1						
DSO	0.386**	0.249**	1					
DPO	-0.318**	0.119**	0.414**	1				
ROA	0.055	-0.016	-0.149**	-0.224**	1			
SIZE	-0.208**	-0.135**	-0.414**	-0.133**	0.272**	1		
LEV	-0.245**	-0.047	-0.146**	0.244**	-0.076*	0.385**	1	
GRO	-0.177**	-0.177**	-0.060	0.019	0.165**	-0.020	0.071*	1

**. Correlation is significant at the 0.02 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 21 – Correlation Matrix for Agricultural Products

Pearson Correlation	CCC	DIO	DSO	DPO	ROA	SIZE	LEV	GRO
CCC	1							
DIO	0.770**	1						
DSO	0.088	-0.096	1					
DPO	-0.368**	0.152	0.403**	1				
ROA	0.197*	0.190*	-0.159	-0.137	1			
SIZE	0.112	-0.118	-0.171*	-0.431**	0.271**	1		
LEV	-0.062	0.118	0.151	0.345**	-0.071	0.397**	1	
GRO	-0.197*	-0.053	-0.051	0.181*	0.068	-0.201*	0.006	1

**. Correlation is significant at the 0.02 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 22 – Correlation Matrix for Packaged Foods & Meats

Pearson Correlation	CCC	DIO	DSO	DPO	ROA	SIZE	LEV	GRO
CCC	1							
DIO	.830**	1						
DSO	.294**	.186**	1					
DPO	-.384**	0,053	.426**	1				
ROA	.079*	-0,012	-.154**	-.251**	1			
SIZE	-.118**	0,001	-.367**	-0,047	.280**	1		
LEV	-.182**	0,012	-.077*	.269**	-.127**	.297**	1	
GRO	-.132**	-.176**	0,022	0,003	.158**	-0,033	0,056	1

**. Correlation is significant at the 0.02 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 23 – Correlation Matrix for Food Retail

Pearson Correlation	CCC	DIO	DSO	DPO	ROA	SIZE	LEV	GRO
CCC	1							
DIO	0.275**	1						
DSO	0.145	0.145	1					
DPO	-0.694**	0.458**	0.219*	1				
ROA	0.032	-0.320**	0.023	-0.239**	1			
SIZE	-0.421**	-0.333**	0.058	0.176	0,167	1		
LEV	-0.346**	-0.072	-0.212*	0.215*	0,032	0.535**	1	
GRO	-0.087	-0.134	-0,170	-0.054	0.275**	-0.055	-0.011	1

**. Correlation is significant at the 0.02 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 24 – Regression Output 1 – 4 (Whole Sample)

Variables	ROA (1)	ROA (2)	ROA (3)	ROA (4)
CCC	0.010*** (0,000)			
DIO		0.007* (0,065)		
DSO			-0.006 (0,424)	
DPO				-0.021*** (0,000)
SIZE	0.882*** (0,000)	0.864*** (0,000)	0.819*** (0,000)	0.761*** (0,000)
LEV	-6.747*** (0,000)	-7.436*** (0,000)	-7.375*** (0,000)	-5.907*** (0,000)
GRO	0.112*** (0,000)	0.107*** (0,000)	0.100*** (0,000)	0.100*** (0,000)
D_{2016}	1.325*** (0,005)	1.326*** (0,005)	1.327*** (0,005)	1.341*** (0,005)
D_{2017}	0.572 (0,229)	0.593 (0,214)	0.612 (0,201)	0.601 (0,205)
D_{2018}	0.294 (0,533)	0.293 (0,536)	0.306 (0,519)	0.337 (0,473)
D_{2019}	-0.234 (0,626)	-0.291 (0,543)	-0.307 (0,522)	-0.200 (0,675)
Constant	2.398	2.969	3.929	4.498
R	0.415	0.404	0.401	0.42
R2	0.172	0.163	0.161	0.176
Durbin-Watson	1.994	1.989	1.979	1.968
N	922	922	922	922

***. significant at the 0.01 level.
**. significant at the 0.05 level.
*. significant at the 0.1 level.

Appendix 25 – Regression output 5 – 8 (Agricultural Products)

Variables	ROA (5)	ROA (6)	ROA (7)	ROA (8)
CCC	0.014*			
	(0,056)			
DIO		0.026***		
		(0,001)		
DSO			-0.012	
			(0,483)	
DPO				-0.022
				(0,146)
SIZE	0.753***	0.919***	0.753***	1.031***
	(0,000)	(0,000)	(0,000)	(0,000)
LEV	-6.483**	-8.859***	-6.580**	-10.528***
	(0,027)	(0,002)	(0,031)	(0,005)
GRO	0.083**	0.082**	0.064	0.064
	(0,046)	(0,040)	(0,117)	(0,118)
D_{2016}	0.821	0.587	1.131	1.081
	(0,498)	(0,619)	(0,354)	(0,372)
D_{2017}	1.047	0.783	1.462	1.353
	(0,419)	(0,534)	(0,261)	(0,294)
D_{2018}	0.980	0.780	1.056	0.820
	(0,429)	(0,518)	(0,401)	(0,513)
D_{2019}	-0.048	-0.190	-0.092	-0.162
	(0,971)	(0,884)	(0,946)	(0,905)
Constant	1.640	0.826	2.887	1.589
R	0.413	0.465	0.386	0.400
R2	0.170	0.216	0.149	0.160
Durbin-Watson	2.147	2.161	2.069	2.102
N	133	133	133	133

***. significant at the 0.01 level.
**. significant at the 0.05 level.
*. significant at the 0.1 level.

Appendix 26 – Regression models 9 – 12 (Packaged Foods & Meats)

Variables	ROA (9)	ROA (10)	ROA (11)	ROA (12)
CCC	0.010** (0,004)			
DIO		0.003 (0,465)		
DSO			-0.013 (0,128)	
DPO				-0.028*** (0,000)
SIZE	0.903*** (0,000)	0.884*** (0,000)	0.831*** (0,000)	0.822*** (0,000)
LEV	-7.365*** (0,000)	-7.880*** (0,000)	-7.800*** (0,000)	-6.079*** (0,000)
GRO	0.105*** (0,000)	0.100*** (0,000)	0.098*** (0,000)	0.096*** (0,000)
D_{2016}	1.489*** (0,008)	1.471*** (0,009)	1.497*** (0,008)	1.488*** (0,007)
D_{2017}	0.952* (0,086)	0.593* (0,964)	0.976* (0,079)	0.926* (0,091)
D_{2018}	0.238 (0,665)	0.236 (0,668)	0.263 (0,633)	0.280 (0,605)
D_{2019}	-0.150 (0,784)	-0.232 (0,673)	-0.236 (0,667)	-0.088 (0,871)
Constant	1.640	3.480	4.595	1.589
R	0.431	0.420	0.423	0.454
R2	0.170	0.177	0.179	0.206
Durbin-Watson	1.973	1.967	1.958	1.959
N	667	667	667	667

***. significant at the 0.01 level.
**. significant at the 0.05 level.
*. significant at the 0.1 level.

Appendix 27 – Regression output 13– 16 (Food Retail)

Variables	ROA (13)	ROA (14)	ROA (15)	ROA (16)
CCC	0.034* (0,091)			
DIO		-.068** (0,011)		
DSO			0.035 (0,613)	
DPO				-0.050*** (0,003)
SIZE	0.829*** (0,009)	0.378 (0,225)	0.535** (0,039)	0.737** (0,012)
LEV	-2.561 (0,520)	-2.048 (0,601)	-3.050 (0,463)	-1.745 (0,653)
GRO	0.207*** (0,000)	0.170*** (0,002)	0.202*** (0,000)	0.186*** (0,001)
D_{2016}	1.325 (0,310)	1.450 (0,281)	1.280 (0,354)	1.555 (0,244)
D_{2017}	-1.846 (0,177)	-1.450 (0,286)	-1.935 (0,162)	-1.456 (0,278)
D_{2018}	-0.053 (0,969)	0.164 (0,905)	0.047 (0,974)	0.085 (0,950)
D_{2019}	-1.452 (0,298)	-1.398 (0,311)	-1.420 (0,315)	-1.452 (0,285)
Constant	0.713	6.640	2.351	3.203
R	0.438	0,466	0.415	0.482
R2	0.191	0,217	0.173	0.232
Durbin-Watson	1.997	1.901	1.946	1.998
N	122	122	122	122

***. significant at the 0.01 level.
**. significant at the 0.05 level.
*. significant at the 0.1 level.

Appendix 28 – Summary of coefficients on ROA

	Whole sample	Agricultural Products	Packaged Foods & Meats	Food Retail
CCC	Positive, significant	Positive, significant	Positive, significant	Positive, significant
DIO	Positive, significant	Positive, significant	Positive, not significant	Negative, significant
DSO	Negative, not significant	Negative, not significant	Negative, not significant	Positive, not significant
DPO	Negative, significant	Negative, not significant	Negative, significant	Negative, significant

*significant on a minimum level of 0.1.

Appendix 29 – Regression statistics

#	Industry	R	R2	Durbin Watson	Min. VIF	Max. VIF	Std. Error	Res. Norm. Dist.?	Sig.
1	Whole sample	0.415	0.172	1.994	1.120	1.654	4.510%	Yes	0.000
2	Whole sample	0.404	0.163	1.989	1.056	1.654	4.534%	Yes	0.000
3	Whole sample	0.401	0.161	1.979	1.032	1.654	4.541%	Yes	0.000
4	Whole sample	0.420	0.176	1.968	1.026	1.653	4.500%	Yes	0.000
5	Agricultural Products	0.413	0.170	2.147	1.100	1.808	4.780%	Yes	0.003
6	Agricultural Products	0.465	0.216	2.161	1.091	1.812	4.353%	Yes	0.000
7	Agricultural Products	0.386	0.149	2.069	1.113	1.781	4.535%	Yes	0.009
8	Agricultural Products	0.400	0.160	2.102	1.123	2.217	4.505%	Yes	0.005
9	Packaged Foods & Meats	0.431	0.186	1.973	1.041	1.632	4.480%	Yes	0.000
10	Packaged Foods & Meats	0.420	0.177	1.967	1.036	1.633	4.506%	Yes	0.000
11	Packaged Foods & Meats	0.415	0.173	1.958	1.024	1.633	4.500%	Yes	0.000
12	Packaged Foods & Meats	0.454	0.206	1.959	1.025	1.632	4.425%	Yes	0.000
13	Food Retail	0.438	0.191	1.997	1.050	1.888	4.600%	Yes	0.002
14	Food Retail	0.466	0.217	1.901	1.075	1.924	4.524%	Yes	0.000
16	Food Retail	0.423	0.179	1.946	1.065	1.886	4.652%	Yes	0.005
16	Food Retail	0.482	0.232	1.998	1.042	1.914	4.480%	Yes	0.000