A Work Project, presented as part of the requirements for the Award of a

Master's degree in Management from the Nova School of Business and Economics.

DOES SUSTAINABILITY PERFORMANCE INFLUENCE WORKING CAPITAL MANAGEMENT?

EVIDENCE FROM EUROPEAN COMPANIES ACROSS INDUSTRIES

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17-05-2024

Abstract

This Work Project examines whether there is a significant relationship between sustainability performance, proxied by Environmental, Social, and Governance (ESG) scores and working capital management, proxied by the cash conversion cycle (CCC). Based on a sample of 382 company-year observations from Euro Stoxx 50 companies for the period 2010-2022, the findings reveal a significant relationship between ESG scores and CCC. However, if an increase in ESG score leads to an increase or decrease in CCC, and which ESG component influences this effect, appears to vary across industries. Managers could therefore follow industry-specific ESG strategies to improve their working capital management.

Keywords: Working Capital Management; Cash Conversion Cycle; Financial Performance; Sustainability Performance; Environmental, Social and Governance (ESG) Score; Europe.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1. Introduction

In today's world sustainability is gaining evermore importance, impacting companies in a multitude of ways (Grundmann, Klein, and Josten 2022). Simultaneously, with the growing significance of sustainability, Environmental, Social, and Governance (ESG) scores have taken on a crucial role in the evaluation of corporate sustainability levels (Garcia, Mendes-Da-Silva, and Orsato 2018). Consequently, there has been significant academic attention towards understanding the relationship between ESG scores and financial performance of firms. However, research lacks exploration into if and how corporate sustainability impacts working capital management (WCM), a critical aspect for upholding corporate liquidity and operational efficiency. In fact, research on WCM has predominantly focused on its effects on company performance and profitability. This Work Project strives to bridge the gap in literature between corporate sustainability and WCM by examining their relationship. Research on United States (US) publicly listed firms suggests that companies with higher ESG scores experience a shorter cash conversion cycle (CCC) (Barros, Falcão, and Sarmento 2022). Conversely, research involving Swedish firms indicates that higher ESG scores do not shorten the CCC of companies (Moin 2023). To the best of our knowledge, there has not yet been an examination of the impact of ESG scores on WCM for Eurozone firms. Therefore, this Work Project seeks to explore this gap and addresses managers, as understanding the relationship between ESG scores and WCM can form strategic decisions on both fronts.

The Work Project progresses as follows: Section 2 discusses the theoretical framework, while Section 3 presents a literature review and formulates the main hypotheses. Section 4 outlines the research methodology. Section 5 analyzes the data, research findings, and conducts robustness checks. Section 6 addresses the limitations of the research and proposes opportunities for future research. Finally, Section 7 concludes the Work Project and offers recommendations to managers.

2. Theoretical Framework

WCM and corporate sustainability are the two main pillars of this Work Project. Working Capital (WC) denotes the financial resources essential for daily business operations (Atseye, Ugwu, and Maneyo 2015). Consequently, WCM is a crucial component of a company's daily operational activities (Marobhe 2015), since it can have a direct impact on a firm's liquidity, profitability and solvency (Opler 1999; Peel and Wilson 1996). WCM involves the oversight of current assets and liabilities, with its objective being to free up excess capital tied up in daily activities, thereby enhancing liquidity (Högerle et al. 2020). The goal is to properly manage the company's current assets and current liabilities in order to achieve a balance between risk and profitability that improves the company's value (Gitman and Zutter 2015). To measure WCM efficiency, the CCC is used predominately in literature (Deloof 2003; Quayyum 2011; Chang 2018) and is also used in this Work Project as a proxy for WCM. The CCC measures the time, mostly in days, it takes for a company to turn its operational investments into cash flows, focusing on three key components: Days Inventory Outstanding (DIO), Days Sales Outstanding (DSO) and Days Payables Outstanding (DPO) (Högerle et al. 2020). The CCC [1] is calculated as the sum of DIO [2] and DSO [3] minus DPO [4].

$$CCC_t = DIO_t + DSO_t - DPO_t \quad [1]$$

The three components of CCC track the length of time from purchasing and production to sales, highlighting the efficiency of a firm's cash management. DIO measures how long a company's inventory stays on hand before it is sold, therefore a lower DIO indicates that the company sells its inventory more quickly. DSO calculates the average number of days it takes for a company to collect payment after a sale has been made and DPO assesses the average number of days a company takes to pay suppliers.

$$DIO_t = \frac{Inventories\ at\ end\ of\ period_t}{Cost\ of\ Goods\ Sold\ during\ period_t}\ x\ 365 \quad [2]$$

$$DSO_t = \frac{Accounts\ Receivables\ at\ end\ of\ period_t}{Sales\ during\ period_t}\ x\ 365 \quad [3]$$

$$DPO_t = \frac{Accounts\ Payables\ at\ end\ of\ period_t}{Cost\ of\ Goods\ Sold\ during\ period_t}\ x\ 365 \quad [4]$$

A reduced CCC suggests that a company is able to turn its investments in inventory and other assets into cash flows from sales at a faster rate. This typically means the company is more efficient at managing its WC (Nastiti, Atahau, and Supramono 2019) and has lower capital requirements (Gitman and Zutter 2015). Conversely, a longer CCC suggests that a company takes more time to convert its investments into cash flows from sales. Nonetheless, maintaining a certain positive discrepancy in the CCC is a common practice across various industries to facilitate seamless operations (Charifzadeh and Taschner 2017). The strategic challenge for companies lies in improving their WC to ensure it is minimized, yet sufficient (Horváth, Gleich, and Michel 2011; Charifzadeh and Taschner 2017). However, identifying an ideal WC level is complex, as it greatly depends on the unique industry and clientele of a company (Van Der Wielen et al. 2006).

Since the 1987 World Commission on Environment and Development (WCED) report, corporate sustainability has garnered significant attention from businesses, academics and policymakers (Moufty, Clark, and Al-Najjar 2021). The report defined sustainable company development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, 37). This means that corporations should deliver competitive results in the short term while preserving human and natural resources for the long term (Artiach et al. 2010). Given the complexity of corporate sustainability (Clark and Viehs 2014), focusing on ESG aspects nowadays has emerged as a prevalent approach for measuring corporate sustainability performance (Garcia et al. 2018). Following this rationale, the

ESG score has become widely adopted, offering insight into companies' enhancement of ESG aspects. Reputable rating agencies like Bloomberg and Refinitiv Eikon regularly provide ESG ratings, covering overall performance and individual components. For this Work Project, Refinitiv Eikon's ESG scores are utilized as a proxy for corporate sustainability. The scores range from 0 to 100, with respective Grades from D- to A+ (Refinitiv 2022) (Appendix B). The Environmental (E) component assesses a company's influence on the natural ecosystem, including emissions, resource efficiency, and pollution; the Social (S) component assesses the company's relationships with its workforce, customers, and society; the Governance (G) component encompasses both traditional corporate governance mechanisms aimed at safeguarding shareholder interests and a narrower focus on diversity, inclusion, and minority representation in corporate leadership and processes (Liang and Renneboog 2020). The ESG framework reflects a company's operational impact and commitment to a sustainable future.

3. Literature Review and Hypotheses Development

Corporate Sustainability and Financial Performance

There is a substantial body of literature that explores the association between a company's sustainability performance and its financial performance (FP). Nevertheless, several studies (e.g., Fulton, Kahn, and Sharples 2012; Carpenter and Wyman 2009) that have compiled the findings of more than one thousand research reports, have determined that the correlation between ESG factors and FP is not conclusive (Giese et al. 2019). Existing research has identified various relationships between ESG factors and FP, including positive, negative, and neutral associations, though the majority of studies indicate a positive relationship (Giese et al. 2019). For instance, Murphy (2002) suggests a positive association between environmental performance (EP) and FP. Similarly, evidence across various industries suggests that stronger EP is associated with higher Return on

Assets (ROA) (Russo and Fouts 1997). In the hospitality industry within the European Union (EU), enhanced EP is linked to improved revenues, market share and profitability, driven by heightened demand and increased customer loyalty (Kassinis and Soteriou 2003). Additionally, effective environmental risk management can lower the cost of capital (Sharfman and Fernando 2008) and commendable environmental practices can positively affect future financial market returns (Klassen and McLaughlin 1996). Smith, Yahya, and Amiruddin (2007), analyzed Malaysian companies and found a negative influence on ROA when there is an increase in EP. Likewise, Chiong (2010) provided evidence of a negative relationship between the level of EP disclosure and FP, measured by Return on Equity (ROE), debt to equity and revenue growth.

Regarding Corporate Social Performance (CSP)[1], there is no consensus about the relationship between CSP and FP, with some authors suggesting a negative link, some a positive, and some no link at all (Waddock and Graves 1997). Eccles, Ioannou, and Serafeim (2014) propose that companies are able to adopt environmentally and socially responsible practices without harming shareholder wealth. They state that firms committed to sustainability achieve better stock returns, indicating sustainability integration as a potential long-term competitive advantage. Research by Greening and Turban (2000) at a US university suggests that CSP is valued by job applicants, enhancing a company's ability to attract skilled personnel and mitigate reputational risks (Peloza 2006). Nonetheless, investment in CSP may negatively impact FP if resources are not translated into higher profits (Brooks and Oikonomou 2018). A study based on S&P 500 companies found that disclosure of EP and CSP inversely correlate with operational (ROA) and financial success (ROE), possibly due to increased expenses (Alareeni and Hamdan 2020). The same study also

[1] CSP is closely linked to Corporate Social Responsibility and refers to a company's social responsibility as recognized by stakeholders. It encompasses ecological and social aspects of business, as well as engagement with broader social issues beyond direct business operations (Aßländer 2022).

states that Corporate Governance (CG) disclosures positively correlate with ROA, indicating improved asset efficiency, but negatively correlate with ROE, revealing an ambiguous relationship between the ESG components and FP. Research shows that there is little or no consensus regarding the relationship between CG and FP. Some research has found a positive relationship between CG and FP (Bauer, Eichholtz, and Kok 2010), suggesting that good CG practices positively impact a company's FP and market performance (Klapper and Love 2004). Another study examining the CG-FP link before and after the Sarbanes–Oxley Act of 2002 (SOX) discovered a negative relationship before SOX but a positive relationship after its implementation (Bhagat and Bolton 2019). Nonetheless, there are potential downsides to CG efforts. Alareeni and Hamdan (2020) and Core, Guay, and Rusticus (2004) have identified a negative association between CG initiatives and ROE, suggesting that the costs involved in CG practices may adversely affect FP.

Much of the existing literature has concentrated on analyzing individual elements of a firm's ESG performance, while fewer studies have examined the impact of all three ESG components on FP comprehensively. Given the interconnected nature of ESG issues, concentrating exclusively on one component may represent a limitation of those studies (Galbreath 2012). Previous results were challenged by Giese et al. (2019) focusing on issues of possible correlation mining and no strict differentiation between correlation and causality, arguing that previous findings might not differentiate whether good ESG performance leads to financial benefits or vice-versa. Their research revealed how ESG practices have influenced company valuation and performance, "both through their systematic risk profile and their idiosyncratic risk profile" (Giese et al. 2019, 14). This suggests that companies with enhanced ESG practices can reduce their overall risk exposure, potentially leading to more stable financial outcomes. Similarly, an extensive review by Brooks and Oikonomou (2018) of research spanning 45 years supports the overall significant influence of ESG practices on FP.

Working Capital Management and Financial Performance

WCM is seen as crucial for a company's operations because of its significant influence on profitability, risk, and ultimately, the company's value (Smith 1980). Research on the relationship between WC and firm profitability has produced mixed results, with studies showing either a negative or positive linear relationship (Tauringana and Afrifa 2013). On the one hand, it is suggested that a minimal investment in WC, thus an aggressive WC policy, can enhance a firm's profitability (Chang 2018). This approach aims to reduce inventory levels and accounts receivable (Bhatia and Srivastava 2016; Tahir and Anuar 2016; Afza and Nazir 2007; Deloof 2003; García-Teruel and Martínez-Solano 2006). Lowering inventory investment may reduce storage and insurance costs, while cutting accounts receivable can free up surplus funds, both potentially boosting profitability (Altaf and Shah 2018). In a similar vein, reducing Net Working Capital (NWC), thus shortening the CCC, can enhance a company's financial flexibility in the short and long term by releasing unused cash reserves and reducing the need for relatively more financing for day-to-day operations (Autukaite and Molay 2011; Aktas, Croci, and Petmezas 2015). Financially flexible firms are better positioned to capitalize on investment opportunities (Denis and Sibilkov 2010; Duchin, Ozbas, and Sensoy 2010). Furthermore, a shorter CCC is often an indicator of efficient WC utilization (Nobanee 2009).

On the other hand, a conservative WC policy involves substantial investment in WC to increase inventories and receivables (Tauringana and Afrifa 2013). This strategy aims to enhance profitability by preventing production interruptions (García-Teruel and Martínez-Solano 2006), avoiding stockouts (Deloof 2003) and stabilizing supply costs and price fluctuations (Blinder and Maccini 1991). Increased investment in receivables is believed to extend sales by providing customers with longer payment periods (Deloof and Jegers 1996), reduce information asymmetry

about product quality (Long, Malitz, and Ravid, 1993; Deloof and Jegers 1996) and strengthen long-term supplier-customer relationships (Wilner 2000).

Critics such as Altaf and Shah (2018) have challenged the overall concept of a linear relationship, asserting that it overlooks the crucial trade-off between risk and profitability in deciding on WC investment levels. They reason that the positive and negative impacts of WC imply a trade-off in decision-making, where corporate profitability is anticipated to rise until the firm reaches its optimal CCC. Beyond this point, the relationship between CCC and firm profitability is expected to turn negative. In the same vein, some literature present evidence supporting a non-monotonic (concave) correlation between the level of WC and firm profitability, suggesting that companies possess an optimal WC level that maximizes their profitability (e.g., Altaf and Shah 2018; Baños-Caballero, García-Teruel, and Martínez-Solano 2012; Singhania and Mehta 2017).

Working Capital Management and Corporate Sustainability

Limited focus has been directed towards the influence of corporate sustainability on firms' WCM. To the best of our knowledge, only Barros et al. (2022) and Moin (2023) explored the relationship between corporate sustainability and WCM (Appendix C). Both studies used ESG scores as a proxy for corporate sustainability performance and CCC and Working Capital Requirements (WCR)[2] as proxies for WCM. Barros et al. (2022) focused on US companies and found that higher ESG scores correlate with lower WCR. Their analysis also revealed that firms with better sustainability practices typically had a shorter CCC compared to their industry counterparts. The effects were mainly attributed to environmental and social components of ESG. Similarly, Moin (2023) found that reductions in WCR were influenced by the environmental and social components of ESG.

[2] WCR was used as a second proxy for WCM to capture cash requirements and was calculated by (*Receivables* + *Inventories* – *Payables*) as a percentage of sales.

However, there was no significant relationship found between the CCC and ESG scores or any of the ESG components.

This Work Project seeks to contribute to the academic discourse of analyzing the relationship between corporate sustainability and WCM by specifically focusing on Eurozone companies, acknowledging that previous investigations have centered on the US (Barros et al. 2022) and Sweden (Moin 2023). Therefore, the research question (RQ) is:

RQ: *Is there a significant relationship between sustainability performance and working capital management among corporations listed in Europe?*

This research examines if there is a relationship between a company's overall ESG score and its CCC, predicated on the understanding that different ESG components are interconnected (Galbreath 2012). Consequently, the first hypothesis (H1) proposed for testing is:

H1: *There is a significant relationship between the ESG Score (ESGS) and CCC.*

However, while Barros et al. (2022) and Moin (2023) have demonstrated the influence of environmental and social components on a company's WCM, this study aims to further investigate the impact of each ESG component on WCM. Consequently, H2 through H4 are as follows:

H2: *There is a significant relationship between the Environmental Pillar Score (ENPS) and CCC.*

H3: *There is a significant relationship between the Social Pillar Score (SOPS) and CCC.*

H4: *There is a significant relationship between the Governance Pillar Score (GOPS) and CCC.*

4. Methodology

Sampling and Data Collection

Aligning with the study's goal to capture Europe-specific effects, the Euro Stoxx 50 index was selected as a proxy due to its representation of significant economies and diverse industries across the Eurozone. Its good accessibility to information further supported its suitability as a proxy. This research is based on secondary data, obtained from Refinitiv Eikon databases, and it covers the

years 2010 to 2022. Selecting 2010 as the starting point offers an extended timeframe to observe potential developments, with 2022 serving as the endpoint and representing the most recent data available for each company. The collected data include items from financial statements, ESG scores in aggregated form and for each component, and other company information related to the country where it operates and the industry.

The initial sample data amounts to a total of 650 firm-year observations. The 50 companies included in the initial sample represent seven different countries and are from eight different industries (Appendix D). Out of the initial list of 50 companies, 17 firms were excluded due to several reasons, as follows: first, eleven companies operating in the financial industry were excluded, following the rationale of previous studies, given the industry's distinct business model and working capital requirements compared to the other industries presented (e.g., Shin and Soenen 1998, Deloof 2003). Secondly, six companies with missing data at random (ESG scores and/or financial statement items) on Refinitiv were excluded. Lastly, firm-year observations with identified outliers in CCC and/or ESG scores were removed (Appendix E). The final dataset consists of 382 firm-year observations, encompassing 32 companies across eight industries originating from six different countries. The exact breakdown and details of the final sample can be found in Appendix F.

Variables

Dependent Variable: This Work Project analyzes the impact of ESG, and its three components, on CCC for European-listed companies, thus CCC is designated as the dependent variable. This methodology aligns with previous research (Appendix C.1).

Independent Variables: Considering that the ESG score serves as a measure of a corporation's sustainability performance, it is utilized as the independent variable in this analysis. In line with the hypotheses, the overall ESG score and the scores from its individual components are employed

as independent variables. Additionally, Asset Turnover (*AT*), EBIT-Margin (*EBITM*) and the Current Ratio (*CR*) are included as independent variables based on correlation tests (Appendix I) and the premise that financial metrics account for major variability in CCC.

Control Variables: Control variables were selected based on a review of previous literature (Appendix C.1) and the results of correlation tests (Appendix I). The control variables *Size*, proxied by the natural logarithm of total assets, and Leverage (*Lev*) have been included in the analysis. The formulas used to calculate the variables are detailed in Appendix H. Despite the removal of outliers, the variables are not normally distributed (Appendix J). However, given the overall large sample size, they are approximately normally distributed (Wooldridge 2012).

Research Model

This research adopts a panel data framework, analyzing data across time and entities belonging to various industries and European countries. Regression analysis was selected as the primary research model due to its demonstrated effectiveness to uncover significant quantitative relationships, including the strength and direction of such relationships between dependent and independent variables (Studenmund 2017). The multiple regression method was used to evaluate the impact of each independent variable while controlling for other variables (Studenmund 2017). Initially, to ensure the suitability of regression analysis for the research, several data requirements were assessed as outlined by Sarstedt and Mooi (2014), including sample size adequacy, sufficient variability among variables, the scale type of the dependent variable and the absence of collinearity (Appendix L). The sample size was evaluated using Green's (1991) rule of thumb suggesting a size of 104+k, where k represents the number of independent variables. The variability of the samples was confirmed and the scale of the dependent variable, in this case the *CCC,* was identified as a

ratio[3]. To address the potential for collinearity, the Variance Inflation Factor (VIF) was calculated. A VIF value of 10 or higher typically signals a concern for multicollinearity (Hair et al. 2019). For smaller sample sizes under 200 and an R^2 value equal to or less than 0.25, collinearity becomes more challenging (Mason and Perreault 1991) and a VIF threshold of 5 is recommended (Sarstedt and Mooi 2014). In this sample, the VIF did not exceed these thresholds, hence collinearity was not a concern.

The analysis initially employed pooled ordinary least squares (OLS) regression. Based on Dougherty's (2011) guidance (Appendix M) to use OLS regression with fixed effects (FE) in scenarios where observations do not represent a random sample, which is applicable here since not every company in Europe had an equal likelihood of selection, FE model was used as the final model. The FE model is advantageous for controlling omitted variables that differ across entities but are consistent over time (Stock and Watson 2019), such as industry[4] effects. These industry effects were therefore fixed in the FE model. To enhance the model's robustness to heteroskedasticity and autocorrelation, clustered standard errors were used, with each cluster representing an entity (Stock and Watson 2019). Consequently, four regression models [5.A-D] were developed to investigate the relationship between corporate sustainability and working capital management for European-listed corporations:

$$CCC_{i,t} = \beta_0 + \beta_1 ESGS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \nu_i + \varepsilon_{i,t} \quad [5.A]$$

$$CCC_{i,t} = \beta_0 + \beta_1 ENPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \nu_i + \varepsilon_{i,t} \quad [5.B]$$

$$CCC_{i,t} = \beta_0 + \beta_1 SOPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \nu_i + \varepsilon_{i,t} \quad [5.C]$$

$$CCC_{i,t} = \beta_0 + \beta_1 GOPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \nu_i + \varepsilon_{i,t} \quad [5.D]$$

[3] When a variable is measured on a ratio scale, it provides precise information about the rank order and allows for direct interpretation of the magnitude of differences between values. When the data are not on interval or ratio scales, different types of regression should be considered (Sarstedt and Mooi 2014).
[4] Inustry referrs to the sepific Refinitiv business sector of each company (definitions in Appendix G).

The general research model is detailed in Appendix N. All statistical analyses were conducted using Stata version 18.0.

5. Data Analysis and Results

Descriptive Statistics

Table 1 presents the descriptive statistics for the dependent, independent and control variables of the analysis. The analysis of the dependent variable reveals a mean *CCC* of 63 days for the observed companies, indicating the average duration required to transform inputs into outputs in cash terms. The median value is close at 51 days, showing that the *CCC* for half of the companies in the sample is below the mean value. The *CCC* ranges from a minimum of -216 to a maximum of 505 days, showcasing a significant disparity as reflected by the high standard deviation (SD) of 108, likely influenced by the diverse industries represented in the sample. The presence of a negative minimum *CCC* implies that some companies are able to sell products and recoup cash from trade debtors, before settling payments with their trade creditors, suggesting that suppliers and sellers are funding the operations of the firm. Conversely, companies with a high *CCC* may encounter long-term liquidity issues, as extended *CCC* ties up WC, limiting available funds for operational expenses, investments, or debt repayments. The overall *ESGS* reveals a mean of 79 and a median of 82 respectively, corresponding to a Grade of A- which indicates "excellent relative ESG performance and high degree of transparency in reporting material" (Refinitiv 2022, 7) for the observed companies. The minimum *ESGS* value is 40 (corresponding to Grade C) and the maximum value is 95 (corresponding to Grade A+), with an SD of 10, translating to a deviation of more than a grade point (i.e., from B+ to A-). Given that the *ESGS* is an aggregated form of the individual pillar scores, it is reasonable that the environmental pillar score (*ENPS*) and social pillar score (*SOPS*) behave similarly to the *ESGS*. Both scores have a mean value of 83 with a slightly higher median

of 85 for *ENPS* and 86 for *SOPS*. The maximum value for ENPS and SOPS is 98, while the minimum is 37 for *ENPS* and 35 for *SOPS*, with an SD of 13 indicating the level of performance variability within the data. The governance pillar score (*GOPS*) demonstrates a slightly different pattern with a mean of 70 and a median of 73, suggesting that companies' performance in this area tends to lag behind their performance in environmental and social aspects. This is underscored by the low minimum value of 16, which may be attributed to varying regulatory requirements, investor preferences, and corporate cultures that prioritize governance practices differently across countries and companies. Additionally, the discrepancy among companies is evident in the SD of 17, which is the highest among all scores. The maximum value of 99 is comparable to the other scores.

Table 1 *Summary Statistics of Variables included in Regression Models*

Variable	N	Mean	Median	SD	Min	Max
Dependent Variable						
CCC	382	62.86	51.34	107.82	-216.40	505.03
Independent Variables						
ESGS	382	79.30	82.36	10.17	40.20	95.18
ENPS	382	82.80	85.43	12.70	36.57	98.46
SOPS	382	82.97	86.44	13.07	34.87	98.19
GOPS	382	70.31	72.66	16.64	16.02	98.56
AT	382	0.68	0.58	0.36	0.22	2.41
CR	382	1.25	1.16	0.43	0.59	3.62
EBITM	382	0.13	0.12	0.06	0.00	0.40
Control Variables						
Size	382	10.98	11.00	0.99	8.68	13.24
Lev	382	0.26	0.24	0.12	0.00	0.55

Note: Size (in ln) is the natural logarithm of total assets. Leverage is calculated as debt divided by total assets.

When analyzing the financial independent variables, the *AT* demonstrates a median of 0.58, which is beneath the mean of 0.68. The spectrum, ranging from a minimum of 0.22 to a maximum of 2.41, highlights diversity, indicating varying degrees of efficiency in revenue generation. This variability might also be influenced by differences across industries in asset utilization. The *CR* exhibits a mean of 1.25, with a lower median of 1.16. The SD of 0.43 highlights significant dispersion, ranging from a minimum of 0.59 to a maximum of 3.62. This variation reflects diverse financial management practices and industry dynamics among the companies analyzed.

Additionally, this outcome may also be influenced by the different significance of inventories within the companies, aligning with the economic perspective of the current ratio, which assesses a firm's ability to meet short-term liabilities with its current assets, including inventory. *EBITM* has mean and median values closely aligned at 0.13 and 0.12 respectively, but relatively wide ranges between minimum and maximum values. The minimum value of 0.00 for *EBITM* suggests instances of loss among companies[5], a scenario that may be attributed to company-specific challenges. Conversely, the maximum value of 0.40 reflects robust profitability for companies[6].

The descriptive statistics for the control variable *Size* reveal a mean and a median of 11. The SD of 0.99 indicates that the data points are relatively closely clustered around the mean value, suggesting limited variability in the size across the dataset. This observation is coherent, given that all companies are part of the Euro Stoxx 50 index. The mean value of *Lev* stands at 0.26, with a corresponding median value of 0.24, indicating that the majority of companies possess leverage values below the mean. A minimum value of 0.00 suggests that certain companies carry no debt, while a maximum value of 0.55 signifies that debt exceeds half of a company's assets.

Univariate Analysis – Evolution of CCC and ESG Score

Figure 1 *Mean and Median CCC*

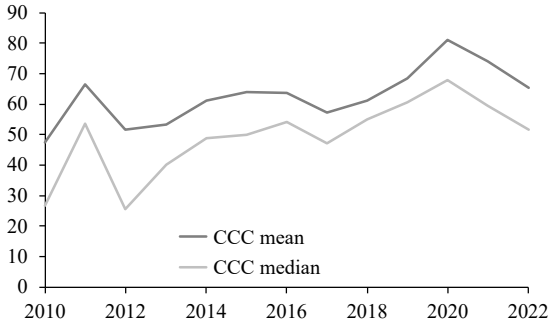
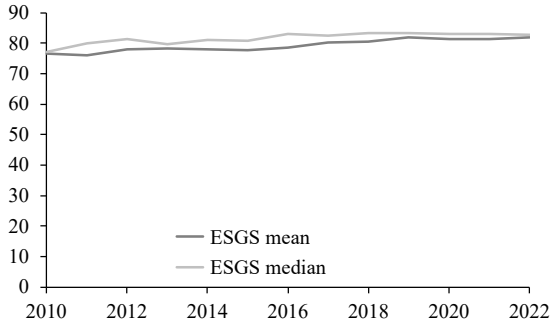


Figure 2 *Mean and Median ESGS*



[5] Airbus SE in 2016 and Nokia Oyj in 2011.
[6] Hermes International SCA in 2021.

Figures 1 and 2 show the trends in mean and median *CCC* and *ESGS* of the sample companies for the period of 2010-2022. It is evident that both mean and median *ESGS* started at a high level, nearly 80, from 2010 onwards and have gradually increased in an approximately linear way, surpassing 80 by 2022. Conversely, the *CCC* does not follow a linear trend and experienced a spike in 2020, likely attributable to the economic slowdown caused by the COVID-19 pandemic. From 2020 on there seems to be a downward trend of mean and median *CCC*.

In contrast to the findings of Barros et al. (2022), this study's sample does not visually seem to indicate any trends suggesting a negative relationship between *ESGS* and *CCC*. However, a significant difference lies in the fact that this Work Project controls for variations across industries. Conducting a Kruskal-Wallis test and a one-way ANOVA[7] revealed significant differences in *CCC* across industries (Appendix O), as well as significant differences in *ESGS* across industries (Appendix P). Therefore, when considering the data in aggregated form, where averages and medians are derived from the entire sample, it is plausible that no relationship may emerge. This is apparent from the observed trends in mean *CCC* and *ESGS* across each industry (Appendix S).

Bivariate Analysis – Correlation Analysis

Table 2 presents the Pearson and Spearman rank correlation matrix for the variables utilized in the analysis, aiming to ensure robustness by encompassing both, parametric and non-parametric methods. It is evident that most variables pose a significant relationship to each other. For instance, a significant negative low correlation is evident between *CCC* and *ESGS*, with the Spearman rank correlation indicating a slightly weaker correlation compared to the Pearson. Both matrices show no significant correlation between *CCC* and *ENPS*, as well as between *CCC* and *SOPS*, which contradicts the findings of Barros et al. (2022), possibly attributable to their concentration on US

[7] The purpose of a one-way ANOVA is to determine whether there are any statistically significant differences between the means of three or more unrelated groups. The Kruskal-Wallis test is its non-parametric counterpart.

companies and the size and industry composition of their sample. Only *GOPS* appears to exhibit a significantly negative correlation with *CCC*. The correlation between *CCC* and *GOPS* is observed to be higher (more negative) than between *CCC* and *ESGS*, showing a smaller disparity in the Spearman correlation, compared to the Pearson correlation. This finding aligns with the results reported by Barros et al. (2022). In conclusion, the results suggest that higher *ESGS* and higher *GOPS*, so a better performance in overall ESG matters and better governance will lead to a decrease in *CCC*.

Table 2 *Correlation Matrix*

Spearman Rank Correlation Matrix

Pearson Correlation Matrix	*CCC*	*Size*	*Lev*	*EBITM*	*AT*	*CR*	*ESGS*	*ENPS*	*SOPS*	*GOPS*
CCC	1	-0.11**	-0.16***	0.17	-0.23***	0.43***	-0.11**	-0.03	-0.08	-0.17***
Size	-0.14***	1	0.51***	-0.27***	-0.32***	-0.27***	0.44***	0.40***	0.28***	0.25***
Lev	-0.10**	0.53***	1	-0.12***	-0.42**	-0.48***	0.15***	0.15***	-0.01	0.24***
EBITM	0.22	-0.29***	-0.12***	1	-0.34***	0.16	-0.42***	-0.31***	-0.25***	-0.30***
AT	-0.22***	-0.32***	-0.32**	-0.34***	1	0.21***	0.12***	0.01***	0.19***	0.05***
CR	0.38***	-0.40***	-0.47***	0.34***	0.07***	1	0.05	-0.03	0.11**	-0.03
ESGS	-0.14***	0.47***	0.19***	-0.49***	0.13***	-0.11**	1	0.68***	0.79***	0.63***
ENPS	0.01	0.49***	0.17***	-0.36***	0.04***	-0.12**	0.76***	1	0.53***	0.15***
SOPS	-0.01	0.35***	0.02	-0.43***	0.14***	-0.06	0.86***	0.63***	1	0.24***
GOPS	-0.30***	0.21***	0.26***	-0.28***	0.10***	-0.08*	0.63***	0.19***	0.25***	1

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

Analyzing the financial variables, both matrices indicate that *CR* exhibits the strongest, positive significant correlation with *CCC*. *AT*, *Size* and *Lev* display a low, negative significant correlation with *CCC* and *EBITM* shows no significant correlation with *CCC*. The financial variables show contrasting behavior towards *ESGS*, with *CR* and *EBITM* correlating significantly negatively, and *AT*, *Size* and *Lev* correlating positively. For the *CR* a discrepancy arises between the Spearman and Pearson matrices, as the correlation between *ESGS* and *CR* appears to be insignificant and positive in the Spearman matrix.

Multivariate Analysis – Regression Analysis Results

The results of testing H1 (Table 3) via Model 5.A show that all independent variables are significant at a 5% level, except for *EBITM* which is non-significant. This implies that, except for *EBITM*, all independent variables do in fact explain variability in *CCC*. Hence, **H1 cannot be rejected** as the *ESGS* shows an inverse significant relationship with *CCC*, which means that for every unit increase

in *ESGS*, the *CCC* decreases, holding other variables constant. The R^2 is 0.44 which indicates that approximately 44% of the variability in the *CCC* can be explained by the independent variables. The F-test statistic yields a p-value of 0.06, indicating significance at the 10% level. *AT* shows a negative relationship with *CCC*, which can be explained by its nature, of *AT* measuring a company's ability to generate revenue from its assets. This observed relationship aligns with past literature indicating that aggressive WCM, thus shorter CCC, enhances profitability (Chang 2018). *CR* shows a positive relationship with *CCC* which can be understood by considering the components of *CR*. A higher *CR* suggests that a company holds more current assets compared to its liabilities, indicating a conservative approach to liquidity management. While this may signify the ability to meet short-term obligations, it could also imply an accumulation of surplus cash or inventory, potentially prolonging the *CCC*. When comparing the coefficients of the financial metrics *AT* and *CR* to the coefficient of the non-financial metric *ESGS*, the latter appears to have a relatively lower impact on *CCC* in the model. Considering that components of *AT* and *CR* are also encompassed within *CCC* (accounts receivable and inventory), this finding is not unexpected. The lack of significant influence of *EBITM* on *CCC* may question previous research suggesting a link between profitability and WCM. The discussed discrepancy in *CCC* impact suggests that financial metrics remain the primary drivers of explained variability in *CCC*, while the non-financial metric, the *ESGS*, appears to exert a more moderate influence. For the control variables, both *Size* and *Lev* show no significance. The non-significance of *Size* could stem from the proxy used and the composition of the sample size, since all the included companies are part of the Euro Stoxx 50 index. For *Lev,* the non-significance may be explained with the rationale that *Lev* typically reflects long-term financial health (Ross, Westerfield, and Jaffe 2012), whereas the CCC is a measure of short-term operational efficiency.

Testing H2 with model 5.B (Table 4) shows that the independent non-financial variable *ENPS* is not significant. Out of the remaining financial independent variables, *AT* and *CR* are significant at a 5% level. *AT* seems to have a negative relation to *CCC*, thus shortening the *CCC*, while *CR* has a positive relation, thus increasing *CCC*. The result proposes that *ENPS* has no significant impact on *CCC,* suggesting that a company's performance in environmental matters alone does not influence the *CCC*. The results suggest that the relationship between *ESGS* and *CCC*, explored in H1, may not be primarily attributed to the environmental component. Hence, **H2 is rejected**. The control variables, *Size* and *Lev*, show no statistical significance within this model. Although the R^2 is 0.41, the F-test's p-value of 0.14 exceeds the usual thresholds for significance, indicating that, collectively, the independent variables do not significantly account for the variance in *CCC* at the conventional levels. This means, that while individual predictors might be significant, as a group, they do not provide a statistically robust explanation for changes in *CCC*. Nevertheless, the rejection of H2 is not affected by the overall model significance, as it specifically pertains to the link between *ENPS* and *CCC*.

Table 3 *Model 5.A*

CCC	Coefficient	P-Value
ESGS	-2.51	0.0450**
AT	-87.17	0.0320**
CR	93.40	0.0200**
EBITM	172.69	0.4070
Size	12.81	0.3550
Lev	46.45	0.7620
Intercept	29.83	0.8160
R-squared = 0.44		
Prob > F = 0.06*		

Table 4 *Model 5.B*

CCC	Coefficient	P-Value
ENPS	-0.48	0.7560
AT	-100.27	0.0340**
CR	85.40	0.0290**
EBITM	272.01	0.2380
Size	5.90	0.6980
Lev	43.33	0.8080
Intercept	-46.34	0.7340
R-squared = 0.41		
Prob > F = 0.14		

Table 5 *Model 5.C*

CCC	Coefficient	P-Value
SOPS	-0.64	0.6730
AT	-96.11	0.0340**
CR	83.97	0.0290**
EBITM	271.27	0.2350
Size	5.76	0.6740
Lev	35.43	0.8170
Intercept	-31.08	0.8070
R-squared = 0.41		
Prob > F = 0.13		

Table 6 *Model 5.D*

CCC	Coefficient	P-Value
GOPS	-1.48	0.0260**
AT	-92.05	0.0280**
CR	93.39	0.0180**
EBITM	151.22	0.4750
Size	2.11	0.8590
Lev	111.91	0.4790
Intercept	41.67	0.7670
R-squared = 0.45		
Prob > F = 0.07*		

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

The results of testing H3 with model 5.C (Table 5) again show no significance for the non-financial independent variable *SOPS*, while the financial independent variables *AT* and *CR* are significant at a 5% level. *EBITM* is not significant. The coefficients of *AT* and *CR* are similar to previous models, with *AT* showing a negative relationship with *CCC* and *CR* showing a positive relationship. The findings suggest that *SOPS* do not significantly influence *CCC*, indicating that a company's

performance in social aspects alone does not influence the *CCC*. Moreover, the results propose that the relationship between *ESGS* and *CCC*, analyzed in H1, may not arise from the social component. Consequently, **H3 is rejected**. As with previous models, the control variables, *Size* and *Lev*, are not statistically significant. The R^2 value is 0.41 and the F-test yields a p-value of 0.13, which is not significant at any common significance level. This again suggests that, collectively, the independent variables fail to significantly explain the variance in *CCC*, yet this does not alter the conclusion drawn for H3.

Testing H4 with model 5.D (Table 6) shows that the non-financial independent variable *GOPS* is significant. Out of the financial independent variables, again, *EBITM* is not significant, while *AT* and *CR* remain significant as in previous models. *AT* again, has a negative relationship with *CCC*, while *CR* has a positive one. *GOPS* shows a negative impact on *CCC*, suggesting that a higher governance pillar score lowers the *CCC* of a company. This result indicates that the results of H1 may be mainly attributed to the governance aspect of *ESGS*. Hence, **H4 cannot be rejected**. Analyzing control variables shows that *Size* and *Lev* are not significant. The R^2 is 0.45 and the p-value of the F-Test static is 0.07, so significant at a 10% level.

Overall, the analysis suggests a relationship between a company's overall sustainability performance, measured as *ESGS*, and its WCM, indicated by *CCC*. This notion aligns with the findings of Barros et al. (2022), indicating that higher *ESGS* correspond to shorter *CCC*. However, contrary to these findings, this analysis proposes that this effect primarily stems from the governance component of ESG rather than the environmental and social components. On the one hand governance factors, such as transparency, effective decision-making processes, and internal controls, are likely to exert more significant influence on a company's *WCM*. On the other hand, environmental and social aspects may influence *WCM* more indirectly. Considering H1 and H4 and the lower coefficient of *GOPS* compared to *ESGS*, it is reasonable to assume that while

environmental and social aspects alone may not directly impact *WCM*, the combined influence of all ESG components affects *WCM*. Thus, it would be reasonable not to conclude that *CCC* is exclusively influenced by *GOPS*. Results using OLS regression can be found in Appendix T.

Robustness Results

To conclude robust results, another analysis was conducted for two specific industries, Consumer Cyclicals (*COCY)* and Industrials (*IND)*, to determine whether the findings remain consistent across different industries characterized by different CCCs (Appendix S). Models 5.A to 5.D with robust standard errors were used to test H1 to H4 for the two industries (all results can be found in Appendix U). Testing H1 for *COCY* (Table 7) shows that *ESGS, CR* and *EBITM* are significant, while *AT* is not significant. *ESGS* and *CR* show negative coefficients, while *EBITM* shows a positive one. This reaffirms the earlier findings, indicating that higher *ESGS* leads to a decrease in *CCC*, thus H1 cannot be rejected. Testing H2 for *COCY* reveals a significant negative coefficient for *ENPS, AT* and *CR*, and a significant positive coefficient for *EBITM*. This contradicts the initial findings where *ENPS* was nonsignificant. This suggests that for *COCY*, higher *ENPS* results in a decreased *CCC*, implying that the impact from H1 is linked to the environmental aspect of *ESGS*, thus H2 cannot be rejected. Testing for H3, all independent variables are significant and show similar coefficients to the previous model. The negative coefficient associated with *SOPS* suggests a decrease in *CCC* with an increase in *SOPS*. Consequently, in contrast to the initial findings, H3 cannot be rejected. Examining H4 for *COCY* uncovered the non-significance of *GOPS*, contradicting the earlier findings and leading to the rejection of H4. The results for *AT, CR* and *EBITM* remain similar to those of H2 and H3. Overall, for *COCY*, the models unveil a significant relationship between *ESGS* and *CCC*, primarily driven by *ENPS* and *SOPS*.

Testing H1 for IND (Table 8) reveals that *ESGS*, *AT* and *CR* are significant, while *EBITM* is not significant. *AT* has a negative relationship with *CCC* while *CR* and *ESGS* have a positive

relationship with *CCC*. This contradicts the initial findings, as a higher *ESGS* in *IND* is associated with an increased *CCC*. Hence, H1 cannot be rejected, although the direction of the relationship between *ESGS* and *CCC* differs from previous results.

Table 7 *Model 5.A for COCY*

CCC	Coefficient	P-Value
ESGS	-2.53	0.0250**
AT	-56.97	0.2520
CR	-46.56	0.0000***
EBITM	431.62	0.0010***
Size	-32.54	0.0000***
Lev	308.88	0.0000***
Intercept	617.81	0.0000***
R-squared = 0.62		
Prob > F = 0.00***		

Table 8 *Model 5.A for IND*

CCC	Coefficient	P-Value
ESGS	2.49	0.0240**
AT	-171.01	0.0000***
CR	117.43	0.0140**
EBITM	-170.64	0.3930
Size	-67.70	0.0000***
Lev	-939.76	0.0000***
Intercept	827.00	0.0000***
R-squared = 0.55		
Prob > F = 0.00***		

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

Results for testing H2 show similar outcomes for *AT*, *CR*, and *EBITM* as in the H1 test. *ENPS* is not significant, which aligns with the initial findings, thus H2 is rejected. When testing H3, the results for *AT*, *CR*, and *EBITM* remain consistent with those of H1 and H2. *SOPS* emerges as significant with a positive relation to *CCC*. This implies that an increase in *SOPS* will increase *CCC*. Hence, H3 cannot be rejected, but again, the direction of the relationship differs from the initial findings. Testing for H4, again reveals similar outcomes for *AT*, *CR* and *EBITM*. However, *GOPS* is not significant, similar to the model for *COCY,* but contradicting the initial results. Hence H4 is rejected, indicating that the governance aspect of ESG does not seem to contribute to changes in *CCC*. Overall, the results suggest a significant positive relationship between *ESGS* and *CCC* in *IND* with this effect being mainly attributable to the social component of ESG.

The robustness analysis presents varied findings, indicating that the effect of *ESG* factors on the *CCC* differs across industries. Nonetheless, throughout these varied outcomes, there is a notable and consistent significance in the impact of the overall *ESGS* on *CCC*. Important to note is also that, across all analyses in this research, the intercepts for financial independent variables are higher

than those for the non-financial variables. This indicates that financial metrics primarily account for the variability in *CCC*, with non-financial factors contributing to a lesser extent.

6. Limitations and Recommendations for Future Research

This Work Project is subject to several limitations that could influence its findings. Firstly, the selection and size of the sample may have affected the outcomes as other proxies could have been used to reflect European companies. Further, the variation in the number of companies per industry (Appendix F.1) shows that not all industries are equally represented, which could have skewed the results. Also, alternative calculations for CCC exist, like using averages of the numerators to reflect operational flows throughout an observed period (Chang 2018; Amarasekara, Rathnayake, and Pathirawasam 2021). Similarly, different ESG ranking providers like Bloomberg or MSCI, may use diverse methodologies, potentially affecting the assessment of corporate sustainability performance. Another limitation concerns the regression model's independent and control variables. While efforts were made to include major influences, other factors like macroeconomic conditions, internal company factors like varying accounting choices made by the management, and differences in Value Added Tax (VAT) across countries, remain unaddressed. Future research could incorporate some of these additional factors. Further, utilizing a larger and more diverse sample size could be more representative for examining effects across various industries and determining, whether the relationship between ESG and WCM is generally applicable or specific to certain industries. Moreover, expanding the focus to include other geographical regions and differing between company sizes, could provide further insights. Additionally, exploring the reverse relationship, whether WCM influences sustainability performance, could be enlightening. It might reveal, whether financially robust companies, which typically exhibit efficient WCM, have a greater capacity to invest in ESG initiatives and thus have higher ESG ratings.

7. Conclusion

The purpose of this Work Project was to examine, whether there is a relationship between a corporation's sustainability performance and WCM with a focus on European-listen companies. This research revealed mixed empirical findings when analyzing the whole sample and analyzing specific industries. Examining the whole sample indicates a statistically significant negative relationship between *ESGS* and *CCC*, and between *GOPS* and *CCC,* suggesting that the effect of *ESGS* on *CCC* primary stems from the governance component of ESG. When performing the analysis for Consumer Cyclicals, a negative significant relationship between *ESGS* and *CCC*, *ENPS* and *CCC*, and between *SOPS* and *CCC* is evident, which suggests that for Consumer Cyclicals the effect of *ESGS* on *CCC* stems from the environmental and social components of ESG. In both analyses, the negative relationship implies that with increased sustainability scores, *CCC* would decrease. The analyses for industrials indicate a positive significant relationship between *ESGS* and *CCC* and between *SOPS* and *CCC*, which implies that with increased sustainability scores *CCC* would also increase. This result questions the overall direction of *ESGS* effect on *CCC*, suggesting that the impact and importance of different ESG components may vary by industry. For end-consumer businesses, environmental and social aspects might be more crucial, whereas for Industrials, the social aspects like employee treatment and workplace conditions could be more important. Similarly, the direction of the effect may be influenced by how sustainability efforts translate in each industry, so if they lead to economic advantages or are mere costs. Nonetheless, the results indicate that there is a significant link between corporate sustainability and WCM, which suggests that managers should align sustainability efforts with WCM practices, specific to their business. By doing so, companies can not only enhance their ESG impact but also improve their CCC, potentially reaping both sustainability and economic benefits in the future.

References

Afza Talat, and Mian Sajid Nazir. 2007."Is it Better to be Aggressive or Conservative in Managing Working Capital?."*Journal of Quality and Technology Management* 3(2): 11-21.

Aktas, Nihat, Ettore Croci, and Dimitris Petmezas. 2015. "Is Working Capital Management Value-enhancing? Evidence From Firm Performance and Investments." *Journal of Corporate Finance* 30 (February): 98–113. https://doi.org/10.1016/j.jcorpfin.2014.12.008.

Alareeni, Bahaaeddin, and Allam Hamdan. 2020. "ESG Impact on Performance of US S&P 500-listed Firms." *Corporate Governance* 20 (7): 1409–28. https://doi.org/ 10.1108/CG-06-2020-0258.

Altaf, Nufazil, and Farooq Ahmad Shah. 2018. "How Does Working Capital Management Affect the Profitability of Indian Companies?" *Journal of Advances in Management Research* 15 (3): 347–66. https://doi.org/10.1108/jamr-06-2017-0076.

Amarasekara, A.G.D.T., R. M. S. S. Rathnayake, and C. Pathirawasam. 2021. "The Impact of Working Capital Management on Firm Profitability and Value." *Journal of Business and Technology* 5 (1): 34–47. https://doi.org/10.4038/jbt.v5i1.26.

Artiach, Tracy, Dong Hoon Lee, David M. Nelson, and Julie Walker. 2010. "The Determinants of Corporate Sustainability Performance." *Accounting and Finance* 50 (1): 31–51. https://doi.org/10.1111/j.1467-629x.2009.00315.x.

Atseye, Fiedel Anake, James Ike Ugwu, and Samuel Menyo Takon . 2015. "Determinants of Working Capital Management." *International Journal of Economics, Commerce and Management* 3(2): 1-11.

Autukaite, Ruta, and Éric Molay. 2011. "Cash Holdings, Working Capital and Firm Value: Evidence From France." *International Conference of the French Finance Association (AFFI)*: 11-13. https://doi.org/10.2139/ssrn.1836900.

Aßländer, Michael S. 2022. *Handbuch Wirtschaftsethik*. 2nd ed. J.B.Metzler

Baños-Caballero, Sonia, Pedro J. García-Teruel, and Pedro Martínez-Solano. 2012. "How Does Working Capital Management Affect the Profitability of Spanish SMEs?" *Small Business Economics* 39 (2): 517–29. https://doi.org/10.1007/s11187-011-9317-8.

Barros, Victor, Pedro Fontes Falcão, and Joaquim Miranda Sarmento. 2022. "Are More Sustainable Firms Able to Operate With Lower Working Capital Requirements?" *Finance Research Letters* 46 (May): 102407. https://doi.org/10.1016/j.frl.2021.102407.

Bauer, Rob, Piet Eichholtz, and Nils Kok. 2010. "Corporate Governance and Performance: The REIT Effect." *Real Estate Economics* 38 (1): 1–29. https://doi.org/10.1111/j.1540-6229.2009.00252.x.

Bhatia, Shikha, and Aman Srivastava. 2016. "Working Capital Management and Firm Performance in Emerging Economies: Evidence From India." *Management and Labour Studies* 41 (2): 71–87. https://doi.org/10.1177/0258042x16658733.

Bhagat, Sanjai, and Brian Bolton. 2019. "Corporate Governance and Firm Performance: The Sequel." *Journal of Corporate Finance* 58 (October): 142–68. https://doi.org/10.1016/j.jcorpfin.2019.04.006.

Blinder, Alan S., and Louis J. Maccini. 1991. "Taking Stock: A Critical Assessment of Recent Research on Inventories." *Journal of Economic Perspectives* 5 (1): 73–96. https://doi.org/10.1257/jep.5.1.73.

Brooks, Chris, and Ioannis Oikonomou. 2018. "The Effects of Environmental, Social and Governance Disclosures and Performance on Firm Value: A Review of the Literature in Accounting and Finance." *The British Accounting Review* 50 (1): 1–15. https://doi.org/10.1016/j.bar.2017.11.005.

Carpenter, Guy, and Oliver Wyman. 2009. *Shedding Light on Responsible Investment: Approaches, Returns, Impacts*. London. Mercer Investment Consulting. https://www.sustainablefinance.ch/upload/cms/user/Shedding_light_on_responsible_investment_free_version.pdf

Chang, Chong-Chuo. 2018. "Cash Conversion Cycle and Corporate Performance: Global Evidence." *International Review of Economics & Finance* 56 (July): 568–81. https://doi.org/10.1016/j.iref.2017.12.014.

Charifzadeh, Michel, and Andreas Taschner. 2017. *Management Accounting and Control: Tools and Concepts in a Central European Context*. 1st ed. John Wiley & Sons

Chiong, Paul Tiong Nyit. 2010. "Examination of Corporate Sustainability Disclosure Level and Its Impact on Financial Performance." PhD thesis, University of Multimedia. http://shdl.mmu.edu.my/3398/.

Clark, Gordon L., and Michael Viehs. 2014. "The Implications of Corporate Social Responsibility for Investors: An Overview and Evaluation of the Existing CSR Literature." *Social Science Research Network*, January. https://doi.org/10.2139/ssrn.2481877.

Core, John E., Wayne R. Guay, and Tjomme O. Rusticus. 2006. "Does Weak Governance Cause Weak Stock Returns? An Examination of Firm Operating Performance and Investors' Expectations." *The Journal of Finance* 61 (2): 655–87. http://www.jstor.org/stable/3699354.

Deloof, Marc. 2003. “Does Working Capital Management Affect Profitability of Belgian Firms?” *Journal of Business Finance & Accounting* 30 (3–4): 573–88. https://doi.org/10.1111/1468-5957.00008.

Deloof, Marc, and Marc Jegers. 1996. “Trade Credit, Product Quality, and Intragroup Trade: Some European Evidence.” *Financial Management* 25 (3): 33 – 43. https://www.jstor.org/stable/3665806.

Denis, David J., and Valeriy Sibilkov. 2010. “Financial Constraints, Investment, and the Value of Cash Holdings.” *Review of Financial Studies* 23(1): 247-69.

Dougherty, Christopher. 2011. *Introduction to Econometrics*. 4th ed. Oxford: Oxford University Press

Duchin, Ran, Oguzhan Ozbas, and Berk A. Sensoy. 2010. “Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis.” *Journal of Financial Economics* 97 (3): 418–35. https://doi.org/10.1016/j.jfineco.2009.12.008.

Eccles, Robert G., Ioannis Ioannou, and George Serafeim. 2014. “The Impact of Corporate Sustainability on Organizational Processes and Performance.” *Management Science* 60 (11): 2835–57. https://doi.org/10.1287/mnsc.2014.1984.

Escrig-Olmedo, Elena, María Ángeles Fernández Izquierdo, Idoya Ferrero-Ferrero, Juana María Rivera-Lirio, and María Jesús Muñoz Torres. 2019. “Rating the Raters: Evaluating How ESG Rating Agencies Integrate Sustainability Principles.” *Sustainability* 11 (3): 915. https://doi.org/10.3390/su11030915.

Fulton, Mark R., Bruce M. Kahn, and Camilla Sharples. 2012. “Sustainable Investing: Establishing Long-Term Value and Performance.” *Social Science Research Network*, January. https://doi.org/10.2139/ssrn.2222740.

Galbreath, Jeremy. 2012. “ESG in Focus: The Australian Evidence.” *Journal of Business Ethics* 118 (3): 529–41. https://doi.org/10.1007/s10551-012-1607-9.

Garcia, Alexandre Sanches, Wesley Mendes-Da-Silva, and Renato J. Orsato. 2018. “Corporate Sustainability, Capital Markets, and ESG Performance.” In *Springer eBooks*, 287–309. https://doi.org/10.1007/978-3-319-91911-9_13.

García-Teruel, Pedro J. and Pedro Martínez-Solano. 2006. “Effects of Working Capital Management on SME Profitability.” *Social Science Research Network*, January. https://doi.org/10.2139/ssrn.894865.

Giese, Guido, Linda-Eling Lee, Dimitris Melas, Zoltán T. Nagy, and Laura Nishikawa. 2019. “Foundations of ESG Investing: How ESG Affects Equity Valuation, Risk, and Performance.” *The Journal of Portfolio Management* 45 (5): 69–83. https://doi.org/10.3905/jpm.2019.45.5.069.

Gitman, Lawrence J., and Chad J. Zutter. 2015. *Principles of Managerial Finance*. 14th ed. Pearson Higher Education

Green, Samuel B. 1991. "How Many Subjects Does It Take to Do a Regression Analysis." *Multivariate Behavioral Research* 26 (3): 499–510. https://doi.org/10.1207/s15327906mbr2603_7.

Greening, Daniel W., and Daniel B. Turban. 2000. "Corporate Social Performance as a Competitive Advantage in Attracting a Quality Workforce." *Business & Society* 39 (3): 254–80. https://doi.org/10.1177/000765030003900302.

Grundmann, Gordon, Florian Klein, and Frederik Josten. 2022. "Sustainability in Business: Staying Ahead of the Curve." Deloitte Insights. Accessed March 5, 2024. https://www2.deloitte.com/xe/en/insights/topics/strategy/sustainability-in-business-staying-ahead-of-the-curve.html.

Hair, Joseph, Rolph Anderson, Bill Black, and Barry Babin. 2019. *Multivariate Data Analysis*. 8th ed. Pearson Higher Education

Högerle, Bernadette, Michel Charifzadeh, Marlene Ferencz, and Konstantin B. Kostin. 2020. "The Development of Working Capital Management and Its Impact on Profitability and Shareholder Value: Evidence From Germany." *Strategic Management* 25 (2): 27–39. https://doi.org/10.5937/straman2002027h.

Horváth, Péter, Ronald Gleich, and Uwe Michel. 2011. *Finanz-Controlling: Strategische und operative Steuerung der Liquidität*. 1st ed. Haufe-Lexware

Kassinis, George I. and Andreas C. Soteriou. 2003. "Greening the Service Profit Chain: The Impact of Environmental Management Practices." *Production and Operations Management* 12 (3): 386–403. https://doi.org/10.1111/j.1937-5956.2003.tb00210.x.

Klapper, Leora ,and Inessa Love. 2004. "Corporate Governance, Investor Protection, and Performance in Emerging Markets." *Journal of Corporate Finance* 10 (5): 703–28. https://doi.org/10.1016/s0929-1199(03)00046-4.

Klassen, Robert D., and Curtis P. McLaughlin. 1996. "The Impact of Environmental Management on Firm Performance." *Management Science* 42 (8): 1199–1214. https://doi.org/10.1287/mnsc.42.8.1199.

Liang, Hao, and Luc Renneboog. 2020. "Corporate Social Responsibility and Sustainable Finance: A Review of the Literature." *Social Science Research Network*, January. https://doi.org/10.2139/ssrn.3698631.

Long, Michael S., Ileen B. Malitz, and S. Abraham Ravid. 1993. "Trade Credit, Quality Guarantees, and Product Marketability." *Financial Management* 22 (4): 117-27. https://doi.org/10.2307/3665582.

Marobhe, Mutaju Isaack and Tanzania Institute of Accountancy. 2015. “Determinants of Firms’ Working Capital Panel Evidence From Listed East African Manufacturing Companies.” *International Journal of Business and Social Science* 6: 108 -16.

Mason, Charlotte H., and William D. Perreault. 1991. “Collinearity, Power, and Interpretation of Multiple Regression Analysis.” *Journal of Marketing Research* 28 (3): 268-80. https://doi.org/10.2307/3172863.

Moin, Muhammad Shehzad. 2023. “Corporate Sustainability and Working Capital : A Panel Data Analysis of the Relationship in Swedish-listed Firms.” Master’s thesis, Umeå School of Business and Economics. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1776753&dswid=3574

Moufty, Souad, Ephraim Clark, and Basil Al-Najjar. 2021. “The Different Dimensions of Sustainability and Bank Performance: Evidence From the EU and the USA.” *Journal of International Accounting, Auditing and Taxation* 43 (June): 100381. https://doi.org/10.1016/j.intaccaudtax.2021.100381.

Murphy, Christopher. 2002.“The Profitable Correlation Between Environmental & Financial Performance: a review of the research.”

Nastiti, Pambayun Kinasih Yekti, Apriani Dorkas Rambu Atahau, and Supramono Supramono. 2019. "The Determinants of Working Capital Management: The Contextual Role of Enterprise Size and Enterprise Age." *Business, Management and Education* 17 (2): 94–110. https://doi.org/10.3846/bme.2019.10409.

Nobanee, Haitham. 2009. “Working Capital Management and Firm’s Profitability: An Optimal Cash Conversion Cycle.” *Social Science Research Network*, January. https://doi.org/10.2139/ssrn.1471230.

Opler, Tim C. 1999. “The Determinants and Implications of Corporate Cash Holdings.” *Journal of Financial Economics* 52 (1): 3–46. https://doi.org/10.1016/s0304-405x(99)00003-3.

Orlitzky, Marc. 2013. “Corporate Social Responsibility, Noise, and Stock Market Volatility.” *Academy of Management Perspectives* 27 (3): 238–54. https://doi.org/10.5465/amp.2012.0097.

Peel, Michael J., and Nick Wilson. 1996. “Working Capital and Financial Management Practices in the Small Firm Sector.” *International Small Business Journal* 14 (2): 52–68. https://doi.org/10.1177/0266242696142004.

Peloza, John. 2006. “Using Corporate Social Responsibility as Insurance for Financial Performance.” *California Management Review* 48 (2): 52–72. https://doi.org/10.2307/41166338.

Quayyum, Sayeda Tahmina. 2011. “Relationship Between Working Capital Management and Profitability in Context of Manufacturing Industries in Bangladesh.” *International Journal of Business and Management* 7 (1): 58 - 69. https://doi.org/10.5539/ijbm.v7n1p58.

Refinitiv. 2022. *Environmental, Social and Governance Scores From Refinitiv*. https://www.lseg.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf.

Ross, Stephen, Randolph Westerfield, and Jeffrey Jaffe. 2012. *Corporate Finance.* 10th ed. McGraw-Hill Higher Education

Russo, Michael V., and P. A. Fouts. 1997. “A Resource-Based Perspective on Corporate Environmental Performance and Profitability.” *Academy of Management Journal* 40 (3): 534–59. https://doi.org/10.2307/257052.

Sarstedt, Marko, and Erik Mooi. 2014. *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*. 1st ed. Springer

Singhania, Monica, and Prakash Mehta. 2017. “Working Capital Management and Firms’ Profitability: Evidence From Emerging Asian Countries.” *South Asian Journal of Business Studies* 6 (1): 80–97. https://doi.org/10.1108/sajbs-09-2015-0060.

Sharfman, Mark P., and Chitru S. Fernando. 2008. “Environmental Risk Management and the Cost of Capital.” *Strategic Management Journal* 29 (6): 569–92. https://doi.org/10.1002/smj.678.

Shin, Hyun-Han and Helke Soenen. 1998. “Efficiency of Working Capital Management and Corporate Profitability”. *Financial Practice and Education* 8: 37-45.

Smith, Keith Vincent. 1980. “Profitability versus Liquidity Tradeoffs in Working Capital Management.” In Readings on the Management of Working Capital, edited by Keith Vincent Smith, 549-562. St Paul, MN: West Publishing Company.

Smith, Malcolm, Khadijah Yahya, and Ahmad Marzuki Amiruddin. 2007. “Environmental Disclosure and Performance Reporting in Malaysia.” *Asian Review of Accounting* 15 (2): 185–99. https://doi.org/10.1108/13217340710823387.

Stock, James H., and Mark W. Watson. 2019. *Introduction to Econometrics*. 4th ed. Pearson Higher Education

Studenmund, Arnold Harwood. 2017. *Using Econometrics: A Practical Guide*. 7th ed. Pearson Higher Education

Tahir, Mohammad, and Melati Binti Ahmad Anuar. 2016. "The Determinants of Working Capital Management and Firms Performance of Textile Sector in Pakistan." *Quality & Quantity* 50 (2): 605–18. https://doi.org/10.1007/s11135-015-0166-4.

Tauringana, Venancio, and Godfred Adjapong Afrifa. 2013. "The Relative Importance of Working Capital Management and Its Components to SMEs' Profitability." *Journal of Small Business and Enterprise Development* 20 (3): 453–69. https://doi.org/10.1108/jsbed-12-2011-0029.

Van Der Wielen, Lex, Willem Van Alphen, Joost Bergen, and Phillip Lindow. 2006. *International Cash Management: A Practical Guide to Managing Cash Flows, Liquidity, Working Capital and Short-term Financial Risks*. 4th ed. Riskmatrix

Waddock, Sandra, and Samuel B. Graves. 1997. "The Corporate Social Performance-Financial Performance Link." *Strategic Management Journal* 18 (4): 303–19. https://www.jstor.org/stable/3088143.

Wilner, Benjamin Stuart. 2000. "The Exploitation of Relationships in Financial Distress: The Case of Trade Credit." *The Journal of Finance* 55 (1): 153–78. https://doi.org/10.1111/0022-1082.00203.

Wooldridge, Jeffrey M. 2012. *Introductory Econometrics: A Modern Approach*. 5th ed. South Western, Cengage Learning

World Commission on Environment and Development (WCED).1987.*Our Common Future.* https://www.are.admin.ch/are/en/home/media/publications/sustainable-development/brundtland-report.html.

Appendices

Appendix A Abbreviations and Acronyms

Abbreviations	Explanation
ANOVA	Analysis of Variance
AT	Asset Turnover
BAMA	Basic Materials
CCC	Cash Conversion Cycle
CG	Corporate Governance
COCY	Consumer Cyclicals
CONCY	Consumer Non-Cyclicals
CR	Current Ratio
CSP	Corporate Social Performance
DIO	Days Inventory Outstanding
DPO	Days Payables Outstanding
DSO	Days Sales Outstanding
EBITM	Earnings before interest and tax margin
e.g.	Exempli gratia
ENPS	Environmental Pillar Score
ENY	Energy
EP	Environmental Performance
ESG	Environmental, Social and Governance
ESGS	Environmental, Social and Governance Score
EU	European Union
FP	Financial Performance
GOPS	Governance Pillar Score
GPM	Gross Profit Margin
HEALTH	Healthcare
i.e.	id est
IND	Industrials
MB Value	Market to Book Value
NWC	Net Working Capital
OLS	Ordinary Least Squares
ROA	Return on Assets
ROE	Retrun on Equity
SD	Standard Deviation
SOPS	Social Pillar Score
SOX	Sarbanes–Oxley Act
TECH	Technology
US	United States
UTI	Utilities

(to be continued)

Appendix A *(continued)*

Abbreviations	Explanation
VAT	Value Added Tax
VIF	Variance Inflation Factor
WCED	World Commission on Environment and Development
WCM	Working Capital Management
WCR	Working Capital Requirements
WP	Work Project

Appendix B Refinitiv ESG Score Methodology and Thresholds

Appendix B.1 Methodology

Refinitiv's ESG scoring methodology calculates two overall scores:

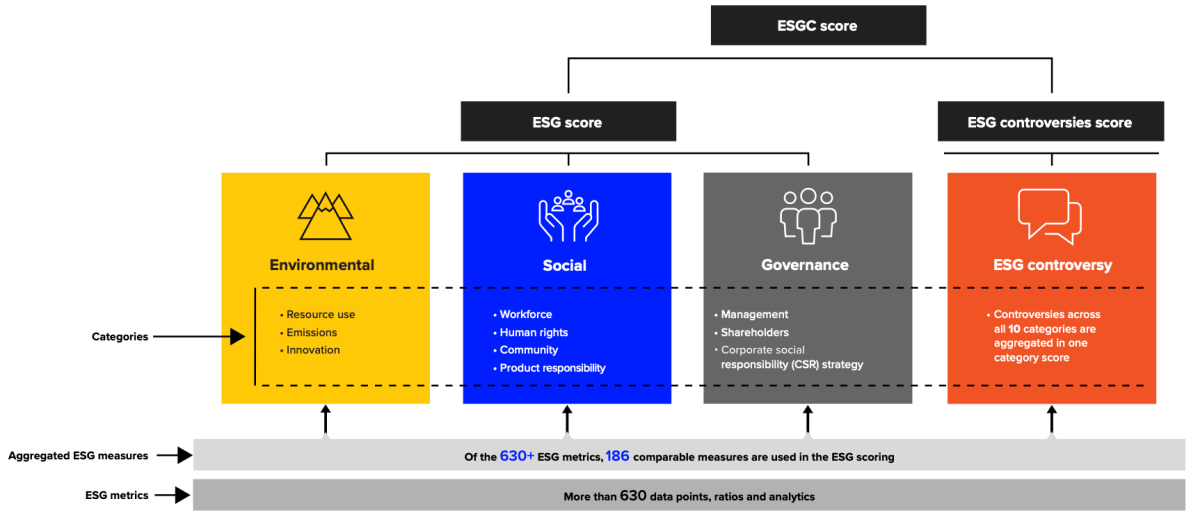
1. **ESG Score** – measures the company's ESG performance based on verifiable reported data in the public domain.
2. **ESGC Score**– overlays the ESG score with ESG controversies to provide a comprehensive evaluation of the company's sustainability impact and conduct over time.

Refinitiv collects and analyses over 630 company-level ESG measures, with a subset of 186 selected as the most comparable and material per industry. These measures are categorized into ten groups resulting in ten category scores:

Score	Definition
Refinitiv ESG resource use score	The resource use score reflects a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management.
Refinitiv ESG emissions reduction score	The emission reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes.
Refinitiv ESG innovation score	The innovation score reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes, or eco-designed products.
Refinitiv ESG workforce score	The workforce score measures a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.
Refinitiv ESG human rights score	The human rights score measures a company's effectiveness in terms of respecting fundamental human rights conventions.
Refinitiv ESG community score	The community score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics.
Refinitiv ESG product responsibility score	The product responsibility score reflects a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity and data privacy.
Refinitiv ESG management score	The management score measures a company's commitment and effectiveness towards following best practice corporate governance principles.
Refinitiv ESG shareholders score	The shareholders score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
Refinitiv ESG CSR strategy score	The CSR strategy score reflects a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes.

Source: Refinitiv 2022, p.25

The category scores then are rolled up into three pillar scores – environmental, social and corporate governance. The ESG pillar score is calculated as a relative sum of the category weights, which vary per industry for the environmental and social categories. For governance, the weights remain the same across all industries. The pillar weights are then normalized to percentages ranging between 0 and 100.



Source: Refinitiv 2022, p.3

Appendix B.2 Threshold

Refinitiv's ESG scores are characterized by numerical thresholds spanning from 0 to 100, along with corresponding letter grades spanning from D- to A+. The conversion of a percentile score to a letter grade follows the logic outlined in the table below.

Score range	Grade	Description
0.0 <= score <= 0.083333	D -	'D' score indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly.
0.083333 < score <= 0.166666	D	
0.166666 < score <= 0.250000	D +	
0.250000 < score <= 0.333333	C -	'C' score indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly.
0.333333 < score <= 0.416666	C	
0.416666 < score <= 0.500000	C +	
0.500000 < score <= 0.583333	B -	'B' score indicates good relative ESG performance and above-average degree of transparency in reporting material ESG data publicly.
0.583333 < score <= 0.666666	B	
0.666666 < score <= 0.750000	B +	
0.750000 < score <= 0.833333	A -	'A' score indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly.
0.833333 < score <= 0.916666	A	
0.916666 < score <= 1	A +	

ESG laggards

ESG leaders

Source: Refinitiv 2022, p.7

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Appendix C Overview of Past Research on the Relationship between ESG and WCM

Appendix C.1 Sampling and Methodology

Literature	**Sample**			**Methodology**			
	N	**Period**	**Country**	**Econometric Model**	**Dependent Variable**	**Independent Variable**	**Control Vaiables**
Barros, Falcão and Sarmento (2022)	1,394	2002-2020	United States	Regression analysis with robust standard errors: $Y_{it} = B_0 + \partial_{it} ESGS + \delta_{it} controls + \mu_{it}$	Working Capital Requirements (**WCR**) Cash Conversion Cycle (**CCC**)	**Refinitiv ESG score** and its individual pillar scores.	**Size** (log of total assets) **Leverage** (excluded in Moin) **(**debt as % of total assets) **Current Ratio** (current assets/current liabilities) **Gross Margin** (net sales minus cost of goods) **EBIT Margin** (EBIT as % of sales) **Market/Book** (Market value/Book value)
Moin (2023)	38	2010-2020	Sweden	**OLS fixed effects** regression with clustered robust standard errors was used for the models with **CCC** as dependent variable. **GLS random effects** regression with clustered robust standard errors was user for the models with **WCR** as dependent variable.			

Note: WCR = [(receivables + inventories – payables)/sales]. In both studies, CCC was calculated using the same method outlined in Appendix H of this Work Project.

Appendix C.2 Results

Dependent and Independent Variable	Moin (2023)	Barros, Falcão and Sarmento (2022)	WP Results
CCC and ESGS	No	No	N/A
CCC and ENPS	No	No	N/A
CCC and SOPS	No	No	N/A
CCC and GOPS	No	No	N/A
WCR and ESGS	No	Yes (-)	N/A
WCR and ENPS	Yes (-)	Yes (-)	N/A
WCR and SOPS	Yes (-)	Yes (-)	N/A
WCR and GOPS	No	No	N/A
CCC_diff and ESGS	N/A	Yes (-)	N/A
CCC_diff and ENPS	N/A	Yes (-)	N/A
CCC_diff and SOPS	N/A	Yes (-)	N/A
CCC_diff and GOPS	N/A	No	N/A
WCR_diff and ESGS	N/A	Yes (-)	N/A
WCR_diff and ENPS	N/A	Yes (-)	N/A
WCR_diff and SOPS	N/A	Yes (-)	N/A
WCR_diff and GOPS	N/A	No	N/A
CCC and ESGS incl. control for Industries	N/A	N/A	Yes (-)
CCC and ENPS incl. control for Industries	N/A	N/A	No
CCC and SOPS incl. control for Industries	N/A	N/A	No
CCC and GOPS incl. control for Industries	N/A	N/A	Yes (-)

Note: CCC_diff and WCR_diff are CCC and WCR measured as the difference from the industry average. The primary distinction between the previous studies and the Work Project (WP) is that none of the studies controlled for industry effects in their initial regression analyses. Barros, Falcão, and Sarmento (2022) examined industry-specific impacts by conducting a second regression analysis with CCC_diff and WCR_diff. Their analysis revealed a significant negative relationship between ESGS and CCC which is in line with the results of the WP. They attributed this relationship to the environmental and social components of ESG, while the WP results suggest that the governance component plays a more critical role.

Appendix D Initial Sample

Company Name	Country	Industry
Adidas AG	Germany	Consumer Cyclicals
Adyen NV	Netherlands	Technology
Airbus SE	Netherlands	Industrials
Allianz SE	Germany	Financials
Anheuser-Busch Inbev SA	Belgium	Consumer Non-Cyclicals
ASML Holding NV	Netherlands	Technology
AXA SA	France	Financials
Banco Bilbao Vizcaya Argentaria SA	Spain	Financials
Banco Santander SA	Spain	Financials
BASF SE	Germany	Basic Materials
Bayer AG	Germany	Healthcare
Bayerische Motoren Werke AG	Germany	Consumer Cyclicals
BNP Paribas SA	France	Financials
Compagnie de Saint Gobain SA	France	Consumer Cyclicals
Danone SA	France	Consumer Non-Cyclicals
Deutsche Boerse AG	Germany	Financials
Deutsche Post AG	Germany	Industrials
Deutsche Telekom AG	Germany	Technology
Enel SpA	Italy	Utilities
Eni SpA	Italy	Energy
EssilorLuxottica SA	France	Healthcare
Ferrari NV	Italy	Consumer Cyclicals
Hermes International SCA	France	Consumer Cyclicals
Iberdrola SA	Spain	Utilities
Industria de Diseno Textil SA	Spain	Consumer Cyclicals
Infineon Technologies AG	Germany	Technology
ING Groep NV	Netherlands	Financials
Intesa Sanpaolo SpA	Italy	Financials
Kering SA	France	Consumer Cyclicals
Koninklijke Ahold Delhaize NV	Netherlands	Consumer Non-Cyclicals
L'Air Liquide Societe Anonyme	France	Basic Materials
L'Oreal SA	France	Consumer Non-Cyclicals
LVMH Moet Hennessy Louis Vuitton SE	France	Consumer Cyclicals
Mercedes Benz Group AG	Germany	Consumer Cyclicals
Muenchener Rueckversicherungs Gesellschaft in Muenchen AG	Germany	Financials
Nokia Oyj	Finland	Technology
Nordea Bank Abp	Finland	Financials
Pernod Ricard SA	France	Consumer Non-Cyclicals
Prosus NV	Netherlands	Technology
Safran SA	France	Industrials
Sanofi SA	France	Healthcare
Sap Se	Germany	Technology
Schneider Electric SE	France	Industrials

(to be continued)

Appendix D *(continued)*

Company Name	Country	Industry
Siemens AG	Germany	Industrials
Stellantis NV	Netherlands	Consumer Cyclicals
Total Energies SE	France	Energy
UniCredit SpA	Italy	Financials
Vinci SA	France	Industrials
Volkswagen AG	Germany	Consumer Cyclicals
Wolters Kluwer NV	Netherlands	Industrials

Note: The IFRS Accounting Standards apply, and the financial statements are consolidated for all companies, except for Adyen NV. The end of the reporting period is the 31st of December for all companies, except for Industria de Diseno Textil SA (31st January), Infineon Technologies AG (30th September), Koninklijke Ahold Delhaize NV (1st January), Pernod Ricard SA (30th June), Prosus NV (31st March) and Siemens AG (30th September).

Appendix E Exclusion Criteria and Excluded Companies

Criterion	Excluded Companies	Explanation
Companies operating in the financial or insurance industry	Allianz SE, AXA SA, Banco Bilbao Vizcaya Argentaria SA, Banco Santander SA, BNP Paribas SA, Deutsche Boerse AG, ING Groep NV, Intesa Sanpaolo SpA, Nordea Bank Abp, UniCredit SpA	Different business models that influence CCC calculation
Companies with missing ESG Score Ratings	Adyen NV, Compagnie de Saint Gobain SA, Ferrari NV, Prosus NV	Needed for Analysis
Companies with missing financial statement items for several years	ASML Holding NV	Needed for Analysis
Company with no inventory item on FS	SAP SE	Needed for CCC calculation

Data points that were identified as outliers in either the dependent variable CCC or the independent variable ESGS were removed. Outliers were detected using boxplots, which displayed the distributions of both variables across different industries as both variables seem to significantly vary between industries. Subsequently, the specified data points were excluded:

ESGS Outliers

Essilor Luxottica, Years 2010 and 2012

Hermes International SCA, Years 2010-2019 and 2022

Industria de Diseno Textil SA, Year 2011

Infineon Technologies AG, Years 2010 and 2011

LVMH Moet Hennessy Louis Vuitton SE, Years 2013 and 2017

Safran SA, Years 2010 and 2012-2014

Stellantis NV, Years 2020 and 2021

Total Energies SE, Year 2010

CCC Outliers

Anheuser-Busch Inbev SA, Years 2010-2022

Bayer AG, Years 2018

Essilor Luxottica SA, Years 2011, 2017, 2019-2022

L'Oreal SA, Year 2021

Appendix F Final Sample

Appendix F.1 Summarized Information

Industries	**Company**	**Country**	**Observations**
Basic Materials	BASF SE	Germany	13
Basic Materials	L'Air Liquide Societe Anonyme	France	13
			26
Consumer Cyclicals	Adidas AG	Germany	13
Consumer Cyclicals	Bayerische Motoren Werke AG	Germany	13
Consumer Cyclicals	Hermes International SCA	France	2
Consumer Cyclicals	Industria de Diseno Textil SA	Spain	12
Consumer Cyclicals	Kering SA	France	13
Consumer Cyclicals	LVMH Moet Hennessy Louis Vuitton SE	France	10
Consumer Cyclicals	Mercedes Benz Group AG	Germany	13
Consumer Cyclicals	Stellantis NV	Netherlands	11
Consumer Cyclicals	Volkswagen AG	Germany	13
			100
Consumer Non-Cyclicals	Danone SA	France	13
Consumer Non-Cyclicals	Koninklijke Ahold Delhaize NV	Netherlands	13
Consumer Non-Cyclicals	L'Oreal SA	France	12
Consumer Non-Cyclicals	Pernod Ricard SA	France	13
			51
Energy	Eni SpA	Italy	13
Energy	Total Energies SE	Netherlands	12
			25
Healthcare	Bayer AG	Germany	12
Healthcare	Essilor Luxottica SA	Italy	5
Healthcare	Sanofi SA	France	13
			30
Industrials	Airbus SE	Netherlands	13
Industrials	Deutsche Post AG	Germany	13
Industrials	Safran SA	France	9
Industrials	Schneider Electric SE	France	13
Industrials	Siemens AG	Germany	13
Industrials	Vinci SA	France	13
Industrials	Wolters Kluwer NV	Netherlands	13
			87
Technology	Deutsche Telekom AG	Germany	13
Technology	Infineon Technologies AG	Germany	11
Technology	Nokia Oyj	Finland	13
			37
Utilities	Enel SpA	Italy	13
Utilities	Iberdrola SA	Spain	13
			26
Total	32	6	382

Appendix F.2 Time Period Overview

Company	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Adidas AG		X	X	X	X	X	X	X	X	X	X	X	X
Airbus SE	X	X	X	X	X	X	X	X	X	X	X	X	X
BASF SE	X	X	X	X	X	X	X	X	X	X	X	X	X
Bayer AG	X	X	X	X	X	X	X	X		X	X	X	X
Bayerische Motoren Werke AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Danone SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Deutsche Post AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Deutsche Telekom AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Enel SpA	X	X	X	X	X	X	X	X	X	X	X	X	X
Eni SpA	X	X	X	X	X	X	X	X	X	X	X	X	X
EssilorLuxottica SA				X	X	X	X		X				
Hermes International SCA											X	X	
Iberdrola SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Industria de Diseno Textil SA	X		X	X	X	X	X	X	X	X	X	X	X
Infineon Technologies AG			X	X	X	X	X	X	X	X	X	X	X
Kering SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Koninklijke Ahold Delhaize NV	X	X	X	X	X	X	X	X	X	X	X	X	X
L'Air Liquide Societe Anonyme	X	X	X	X	X	X	X	X	X	X	X	X	X
L'Oreal SA	X	X	X	X	X	X	X	X	X	X	X		X
LVMH Moet Hennessy Louis Vuitton SE		X	X		X	X	X		X	X	X	X	X
Mercedes Benz Group AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Nokia Oyj	X	X	X	X	X	X	X	X	X	X	X	X	X
Pernod Ricard SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Safran SA		X				X	X	X	X	X	X	X	X
Sanofi SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Schneider Electric SE	X	X	X	X	X	X	X	X	X	X	X	X	X
Siemens AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Stellantis NV	X	X	X	X	X	X	X	X	X	X			X
TotalEnergies SE		X	X	X	X	X	X	X	X	X	X	X	X
Vinci SA	X	X	X	X	X	X	X	X	X	X	X	X	X
Volkswagen AG	X	X	X	X	X	X	X	X	X	X	X	X	X
Wolters Kluwer NV	X	X	X	X	X	X	X	X	X	X	X	X	X

Appendix G Refinitiv Business Sector Definitions

Business Sector	**Definition**	**Sector Code**
Basic Materials	Companies involved in the extraction and processing of raw materials.	15
Consumer Cyclicals	Companies whose performance is closely tied to the economic cycle, such as retailers and automotive manufacturers.	20
Consumer Non-Cyclicals	Companies providing essential products that tend to have stable demand regardless of economic conditions, such as food and beverages.	25
Energy	Companies involved in the exploration, production, and distribution of energy resources such as oil, gas, and renewable energy.	55
Healthcare	Companies engaged in providing medical services, manufacturing pharmaceuticals, medical devices, and healthcare equipment.	45
Industrials	Companies involved in the production of goods, manufacturing, and industrial services. This sector includes aerospace, defence, machinery, and transportation companies.	60
Technology	Companies involved in the development, manufacturing, and distribution of technology products and services. This includes software, hardware, and IT services.	90
Utilities	Companies providing essential services such as electricity, water, and natural gas to residential, commercial, and industrial customers.	65

Note: Sector codes in Refinitiv serve as numerical identifiers for improved categorization of companies.
Source: Refinitiv Workspace.

Appendix H Calculation and Definition of Variables and Ratios

Variable	Equation	Definition
CCC	$DIO + DSO - DPO$	The CCC measures the time, mostly in days, it takes for a company to turn its operational investments into cash flows.
DIO	$\frac{Inventories\ at\ end\ of\ period_t}{Cost\ of\ Goods\ Sold\ during\ period_t}\ x\ 365$	DIO measures how long a company's inventory stays on hand before it is sold, therefore a lower DIO indicates that the company sells its inventory quickly.
DSO	$\frac{Accounts\ Receivables\ at\ end\ of\ period_t}{Sales\ during\ period_t}\ x\ 365$	DSO calculates the average number of days it takes for a company to collect payment after a sale has been made, therefore a lower DSO indicates that the company collects is payments quickly.
DPO	$\frac{Accounts\ Payables\ at\ end\ of\ period_t}{Cost\ of\ Goods\ Sold\ during\ period_t}\ x\ 365$	DPO assesses the average number of days a company takes to pay suppliers, therefore a lower DPO indicates that the company pays its suppliers quickly.
Size	$\ln\ (Total\ Assets_t)$	Evaluates a firms size based on ist total assets. The natural logarithm (ln) is used to transform the scale of the variable, making it more proportional and interpretable.
Leverage	$\frac{Debt_t}{Total\ Assets_t}$	The leverage ratio indicates the proportion of debt financing relative to the total assets of the firm, thereby providing insight into the firm's long-term liquidity.
CR	$\frac{Current\ Assets_t}{Current\ Liabilities_t}$	The current ratio indicates a company's ability to meet its short-term obligations. Those obligations are typically paid for using current assets.
GPM	$\frac{Sales_t - Cost\ of\ Goods\ Sold_t}{Sales_t}$	The gross profit margin is a metric used to assess a firm's financial health.
EBITM	$\frac{EBIT_t}{Sales_t}$	EBIT Margin represents operating earnings as a percentage of operating sales, providing insight into the true operational costs of a company,
MB Value	$\frac{Market\ Value_t}{Equity_t}$	The market to book value ratio for the whole company reflects how investors perceive its worth relative to its accounting value.
Asset Turnover	$\frac{Sales_t}{Total\ Assets_t}$	Asset turnover indicates how effectively companies are using their assets to generate sales.
ROA	$\frac{EBIT_t}{Total\ Assets_t}$	ROA indicates how effectively companies are using their assets to generate profit.

Note: Refinitiv calculates debt as the combination of short-term debt, the current portion of long-term debt, and long-term debt. Refinitiv calculates EBIT by taking the pre-tax income and adding back interest expense on debt and subtracting interest capitalized.

Appendix I Correlation Matrix

Spearman Rank Correlation Matrix

Pearson Correlation Matrix

	CCC	*Size*	*Lev*	*GPM*	*EBITM*	*MB Value*	*AT*	*ROA*	*PE Ratio*	*CR*	*ESGS*	*ENPS*	*SOPS*	*GOPS*
CCC	1	-0.11**	-0.16***	0.04	0.17***	0.14***	-0.23***	0.08*	0.06	0.43***	-0.11**	-0.03	-0.08	-0.17***
Size	-0.14***	1	0.51***	-0.49***	-0.27***	-0.64***	-0.32***	-0.51***	-0.39***	-0.27***	0.44***	0.40***	0.28***	0.25***
Lev	-0.10**	0.53***	1	-0.20***	-0.12**	-0.38***	-0.42***	-0.42***	-0.19***	-0.48***	0.15***	0.15***	-0.01	0.24***
GPM	0.06	-0.48***	-0.22***	1	0.71***	0.54***	-0.18***	0.41***	0.48***	0.07	-0.44***	-0.33***	-0.28***	-0.24***
EBITM	0.22***	-0.29***	-0.12**	0.68***	1	0.41***	-0.34***	0.48***	0.38***	0.16***	-0.42***	-0.31***	-0.25***	-0.30***
MB Value	0.14***	-0.51***	-0.39***	0.36***	0.42***	1	0.18***	0.53***	0.57***	0.12**	-0.44***	-0.32***	-0.23***	-0.30***
AT	-0.22***	-0.32***	-0.32***	-0.21***	-0.34***	0.12**	1	0.44***	-0.08	0.21***	0.12**	0.01	0.19***	0.05
ROA	0.04	-0.53***	-0.47***	0.37***	0.51***	0.55***	0.32***	1	0.11**	0.36***	-0.25***	-0.27***	-0.07	-0.16***
PERatio	0.02	-0.04	-0.06	0.02	-0.02	-0.01	-0.05	-0.07	1	0.11**	-0.31***	-0.22***	-0.13***	-0.26***
CR	0.38***	-0.40***	-0.47***	0.14***	0.34***	0.36***	0.07	0.49***	0.04	1	0.05	-0.03	0.11**	-0.03
ESGS	-0.14***	0.47***	0.19***	-0.41***	-0.49***	-0.31***	0.13***	-0.27***	0.01	-0.11**	1	0.68***	0.79***	0.63***
ENPS	0.01	0.49***	0.17***	-0.31***	-0.36***	-0.24***	0.04	-0.24***	-0.02	-0.12**	0.76***	1	0.53***	0.15***
SOPS	-0.01	0.35***	0.02	-0.35***	-0.43***	-0.21***	0.14***	-0.17***	0.02	-0.06	0.86***	0.63***	1	0.24***
GOPS	-0.30***	0.21***	0.26***	-0.23***	-0.28***	-0.21***	0.10**	-0.19***	0.03	-0.08*	0.63***	0.19***	0.25***	1

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1.*

Appendix J Shapiro-Wilk and Skewness and Kurtosis Tests

Variable	N	Shapiro-Wilk Test		Skewness and Kurtosis		
		W	p-value	Pr(skewness)	Pr(kurtosis)	p-value
CCC	382	0.89829	0.0000***	0.0000***	0.0000***	0.0000***
DIO	382	0.71363	0.0000***	0.0000***	0.0000***	0.0000***
DSO	382	0.96182	0.0000***	0.0000***	0.0074***	0.0000***
DPO	382	0.86978	0.0000***	0.0000***	0.0000***	0.0000***
ESGS	382	0.92413	0.0000***	0.0000***	0.0087***	0.0000***
ENPS	382	0.89567	0.0000***	0.0000***	0.0258**	0.0000***
SOPS	382	0.8354	0.0000***	0.0000***	0.0000***	0.0000***
GOPS	382	0.94583	0.0000***	0.0000***	0.0413**	0.0000***
Size	382	0.98336	0.0002***	0.0820*	0.0024***	0.0041***
Leverage	382	0.9856	0.0008***	0.3772	0.0502*	0.0990*
GPM	382	0.95946	0.0000***	0.2130	0.0000***	0.0000***
EBITM	382	0.97115	0.0000***	0.0000***	0.0910*	0.0000***
MB Value	382	0.75012	0.0000***	0.0000***	0.0000***	0.0000***
Asset Turnover	382	0.79373	0.0000***	0.0000***	0.0000***	0.0000***
ROA	382	0.93108	0.0000***	0.0001***	0.0000***	0.0000***
CR	382	0.87912	0.0000***	0.0000***	0.0000***	0.0000***

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1.*
W is the observed test statistic for the Shapiro-Wilk test, Pr(skewness) is the p-value for the skewness test and Pr(kurtosis) is the p-value for the kurtosis test.
When the p-value exceeds the selected significance level, it suggests that there is insufficient evidence to reject the null hypothesis, which states that the data follows a normal distribution. Conversely, if the p-value is lower than the chosen significance threshold, it implies evidence against the null hypothesis, indicating that the data deviates from a normal distribution.
Shapiro-Wilk Test H0: Data are drawn from a normally distributed population.
Skewness Test H0: The skewness of the data is equal to zero.
(Test evaluates whether the skewness of the data is consistent with that of a normal distribution)
Kurtosis Test H0: The kurtosis of the data is equal to three.
(Test evaluates whether the kurtosis of the data matches that of a normal distribution)
For all tests, the final sample (Appendix F) was used.

Appendix K Summary Statistics of Financial Statement Items and Other Variables

Variable	N	Mean	Median	SD	Min	Max	p5	p95
Total Revenue	382	54,745	37,639	50,249	3,308	279,232	6,389	164,154
COGS	382	36,831	18,049	41,341	1,264	226,162	2,704	129,627
EBIT	382	5,797	4,112	5,443	- 162	56,423	866	17,121
EBT	382	4,760	3,254	5,419	- 17,250	40,446	306	15,845
Income taxes	382	1,444	862	2,174	- 2,172	20,783	38	4,927
Net Income	382	3,285	2,447	3,796	- 10,495	23,006	- 340	10,848
Total Assets	382	91,543	60,096	89,187	5,898	564,013	9,510	259,831
Current Assets	382	31,215	19,497	34,033	1,579	224,159	3,934	102,052
Cash and Equivalent	382	6,347	3,794	6,745	246	46,433	593	20,662
Non Current Assets	382	60,328	39,261	58,259	2,282	339,854	5,105	160,006
Inventory	382	7,465	3,289	9,014	65	52,274	396	28,653
Accounts Receivable	382	7,134	5,584	6,923	106	43,925	498	19,205
Total Liabilities	382	76,964	54,523	69,587	4,788	385,686	6,799	215,566
Current Liabilities	382	27,400	15,536	30,913	1,530	182,723	2,914	84,457
Non Current Liabilities	382	49,564	36,435	42,641	1,386	218,062	3,112	139,307
Accounts Payable	382	7,245	5,293	6,443	123	38,634	624	22,031
Debt	382	28,731	14,592	38,184	2	207,383	1,241	117,686
Equity	382	28,044	20,100	24,320	1,538	151,256	4,664	80,500
DIO *(days)*	382	107.36	71.02	114.33	2.66	677.59	13.37	296.75
DSO *(days)*	382	54.08	49.31	30.11	2.81	164.14	6.43	113.71
DPO *(days)*	382	98.58	88.96	52.04	28.19	316.02	37.92	213.53
Book Value	382	28,044	20,100	24,320	1,538	151,256	4,664	80,500
Market Value	382	54,470	47,235	40,110	1,855	366,959	10,229	111,726
MB-Value	382	2.80	2.15	2.32	0.25	17.25	0.77	7.19
Asset Turnover	382	0.68	0.58	0.36	0.22	2.41	0.31	1.40
ROA	382	0.08	0.07	0.04	0.00	0.26	0.03	0.16

Note: Financial Statement Items and Market Value in €Mio.

Appendix L Data Requirements for Regression Analysis

According to Sarstedt and Mooi (2014), four data requirements must be taken into consideration before performing regression analysis:

1.) *Sample Size*

Def.: As a general guideline, Green (1991) proposes that when testing the significance of individual parameters (such as determining if a specific coefficient is significant), the sample size should be at least 104 plus the number of independent and control variables involved.

$$Rule\ of\ tumb\ for\ min.sample\ size = 104 + k(number\ of\ independent\ variables)$$

$$Min.sample\ size = 104 + 6 = 110 < 382 = actual\ samlpe\ size$$

2.) *Variability of Variables*

Def.: A regression model requires variability in its variables to be estimable. Without any change in the dependent variable (meaning it is a constant), regression analysis is unnecessary because the value of the dependent variable is already known. Similarly, an independent variable that lacks variation cannot account for any changes in the dependent variable.

→ *Variability is given in the sample, which is visible in the summary statistics (Appendix K).*

3.) *Scale Type of the Dependent Variable*

Def.: The third data requirement is that the dependent variable needs to be interval or ratio scaled. Should the data not meet this scaling criterion, alternative regression methods such as binary logistic regression or multinomial logistic regression would be more appropriate.

Interval Scale	**Ratio Scale**
An interval scale measures variables where the distance between values is meaningful and equidistant, but there is no true zero point. Examples include temperature in Celsius or Fahrenheit.	A ratio scale measures variables like an interval scale but with the addition of a meaningful zero point, which allows for the calculation of ratios. Common examples include weight, height, and income.

→ *The dependent variable CCC is measured on a ratio scale. This is because it quantifies the number of days it takes for a company to convert resources into cash flows from sales, and it has a meaningful zero point.*

4.) *Absence of Collinearity*

Def.: The fourth data requirement is minimal or no collinearity among variables. Collinearity occurs when two or more independent variables are highly correlated, which can compromise the reliability of regression analysis. This issue may cause significant parameters to appear insignificant, and in severe cases, it can even result in changes to the signs of the estimated regression coefficients. By calculating the VIF, collinearity can be determined. A VIF value of 10 or higher typically signals a concern for multicollinearity (Hair et al. 2019). For smaller sample sizes under 200 and an R2 value equal to or less than 0.25, collinearity becomes more problematic (Mason and Perreault 1991), and a VIF threshold of 5 is recommended.

→ *The tables below show that the threshold of 10 and even 5 is not surpassed.*

Model 5.A

Variable	VIF
ESGS	1.48
AT	1.60
CR	1.35
EBITM	1.60
Lev	1.44
Size	1.89
Mean VIF	1.56

Model 5.B

Variable	VIF
ENPS	1.31
AT	1.57
CR	1.30
EBITM	1.54
Lev	1.44
Size	1.91
Mean VIF	1.51

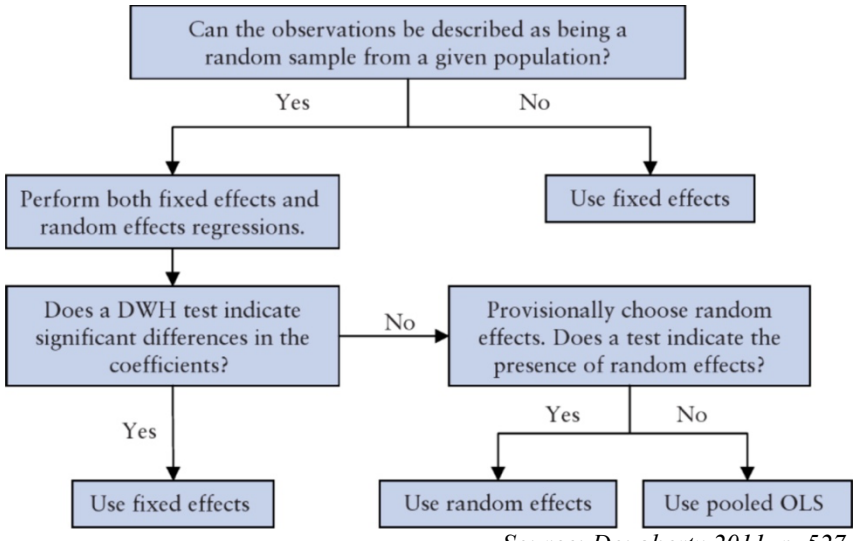
Model 5.C

Variable	VIF
SOPS	1.26
AT	1.59
CR	1.30
EBITM	1.54
Lev	1.48
Size	1.81
Mean VIF	1.50

Model 5.D

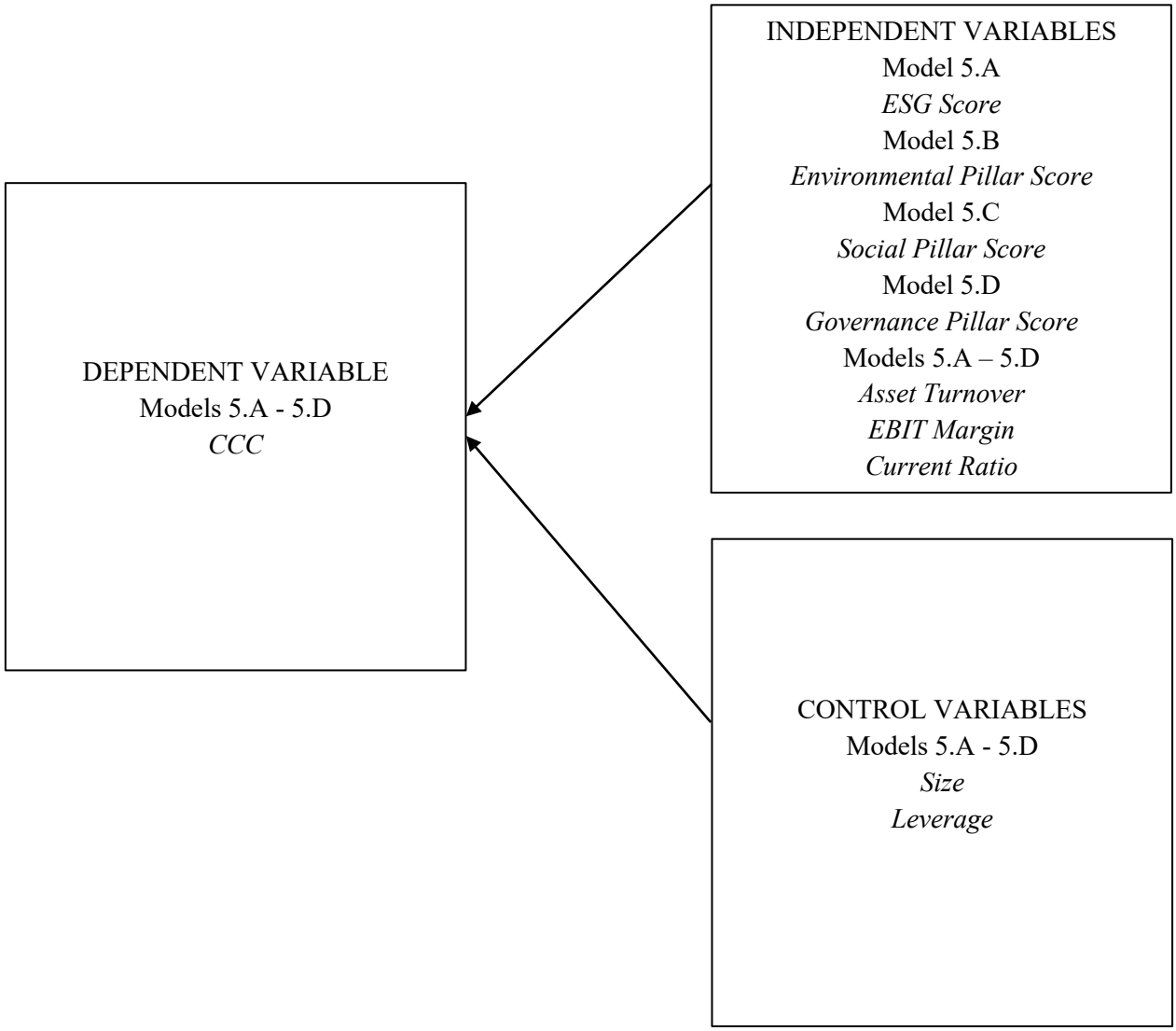
Variable	VIF
GOPS	1.20
AT	1.55
CR	1.31
EBITM	1.66
Lev	1.50
Size	1.54
Mean VIF	1.46

Appendix M Guide for Choice of Regression Model for Panel Data



Source: Dougherty 2011, p. 527

Appendix N Generalized Research Model for Multivariate Analysis



Note: As outlined in the study, the analysis was conducted following the research model presented above, utilizing Fixed Effects (FE) Regression. This statistical approach was chosen to control for industry-specific variability, which could otherwise bias the results. By employing FE Regression, the model effectively isolates the impact of changes in independent variables within the same industry over time. This approach enhances the validity by assessing the influence of independent variables while accounting for any inherent industry-specific heterogeneity.

Appendix O Test if CCC significantly deviates through Industries

Table O.1 Kruskal–Wallis equality-of-populations rank test – CCC/Industries

Industry	Obs	Rank sum
Basic Materials	26	5,272
Consumer Cyclicals	100	22,235
Consumer Non-Cyclicals	51	7,649
Energy	25	3,318
Healthcare	30	9,344
Industrials	87	16,453
Technology	37	6,288
Utilities	26	2,594

chi2(7) = 77.180
Prob = 0.0001

chi2(7) with ties = 77.180
Prob = 0.0001

Note:
H_0: There is no significant difference in the median CCC among the different industries
There is evidence to reject the null hypothesis, suggesting that there are significant differences in the median CCC across industries.

Table O.2 One-way ANOVA – CCC/Industries

Source	SS	df	MS	F	Prob > F
Between groups	578,266.54	7	82,609.51	8.02	0.0000
Within groups	3,850,692.22	374	10,295.97		
Total	4,428,958.76	381	11,624.56		

Note:
H_0: There is no significant difference in the mean CCC among the different industries.
There is evidence to reject the null hypothesis, suggesting that there are significant differences in the mean CCC across industries.

Appendix P Test if ESGS significantly deviates through Industries

Table P.1 Kruskal–Wallis equality-of-populations rank test – ESGS/Industries

Industry	Obs	Rank sum
Basic Materials	26	4,882
Consumer Cyclicals	100	23,361
Consumer Non-Cyclicals	51	7,490
Energy	25	5,850
Healthcare	30	6,323
Industrials	87	10,840
Technology	37	7,049
Utilities	26	7,358

chi2(7) = 77.321
Prob = 0.0001

chi2(7) with ties = 77.321
Prob = 0.0001

Note:
H_0: There is no significant difference in the median ESGS among the different industries
There is evidence to reject the null hypothesis, suggesting that there are significant differences in the median ESGS across industries.

Table P.2 One-way ANOVA – ESGS/Industries

Source	SS	df	MS	F	Prob > F
Between groups	7,029.92	7	1,004.27	11.60	0.0000
Within groups	32,379.10	374	86.58		
Total	39,409.02	381	103.44		

Note:
H_0: There is no significant difference in the mean ESGS among the different industries.
There is evidence to reject the null hypothesis, suggesting that there are significant differences in the mean ESGS across industries.

Appendix Q Test if ESGS significantly deviates through the years

Table Q.1 Kruskal–Wallis equality-of-populations rank test – ESGS/years

Year	Obs	Rank sum
2010	26	4,104
2011	28	4,775
2012	29	5,061
2013	29	5,216
2014	30	5,241
2015	31	5,831
2016	31	5,865
2017	29	5,696
2018	30	6,037
2019	30	6,527
2020	30	6,419
2021	29	6,046
2022	30	6,335

chi2(12) = 10.012
Prob = 0.6149

chi2(12) with ties = 10.012
Prob = 0.6149

Note:
H_0: There is no significant difference in the median ESGS throughout the years.
There is no evidence to reject the null hypothesis.

Table Q.2 One-way ANOVA – ESGS/years

Source	SS	df	MS	F	Prob > F
Between groups	1,446.45	12	120.54	1.17	0.3017
Within groups	37,962.57	369	102.88		
Total	39,409.02	381	103.44		

Note:
H_0: There is no significant difference in the mean ESGS throughout the years.
There is no evidence to reject the null hypothesis.

Appendix R Test if CCC significantly deviates through the years

Table R.1 Kruskal–Wallis equality-of-populations rank test – CCC/years

Year	Obs	Rank sum
2010	26	4,408
2011	28	5,493
2012	29	5,144
2013	29	5,273
2014	30	5,605
2015	31	5,966
2016	31	5,959
2017	29	5,365
2018	30	5,679
2019	30	5,925
2020	30	6,333
2021	29	6,077
2022	30	5,926

chi2(12) = 3.844
Prob = 0.9861

chi2(12) with ties = 3.844
Prob = 0.9861

Note:
H_0: There is no significant difference in the median CCC throughout the years.
There is no evidence to reject the null hypothesis.

Table R.2 One-way ANOVA – CCC/years

Source	SS	df	MS	F	Prob > F
Between groups	28,550.96	12	2379.25	0.20	0.9984
Within groups	4,400,407.81	369	11925.22		
Total	4,428,958.76	381	11624.56		

Note:
H_0: There is no significant difference in the mean CCC throughout the years.
There is no evidence to reject the null hypothesis

The tests conducted above were aimed at identifying which factors need to be controlled for in the regression analysis, specifically to determine whether deviations across industries or years are more significant.

Appendix S Evolvement of Variable Averages per Industry

Table S.1 CCC Average per Industry								
Year	BAMA	COCY	CONCY	ENY	HEALTH	IND	TECH	UTI
2010	54.96	43.35	86.58	22.95	128.73	35.04	2.91	-10.93
2011	51.43	95.97	89.08	29.30	140.20	53.54	16.96	-10.69
2012	46.78	75.00	90.19	-9.54	138.38	26.86	15.31	-10.52
2013	51.89	57.38	79.68	30.03	143.97	28.14	25.24	-5.65
2014	54.03	82.29	102.12	-1.97	150.69	25.60	30.14	-16.52
2015	52.95	78.37	97.72	14.42	137.89	45.51	37.29	-8.32
2016	70.70	80.28	93.00	6.49	152.81	36.68	42.90	-21.21
2017	66.86	76.32	89.11	19.03	133.46	32.72	38.08	-8.29
2018	67.01	92.57	89.90	-8.39	122.17	42.26	29.49	-5.23
2019	61.91	92.33	89.07	2.57	165.83	51.73	48.09	-2.72
2020	53.93	125.43	105.64	2.95	169.37	55.70	61.49	-11.29
2021	46.21	100.98	149.18	-4.34	159.37	46.64	49.88	6.06
2022	49.05	85.71	90.56	-1.62	151.78	48.98	46.50	17.32

Figure S.1 CCC Average per Industry

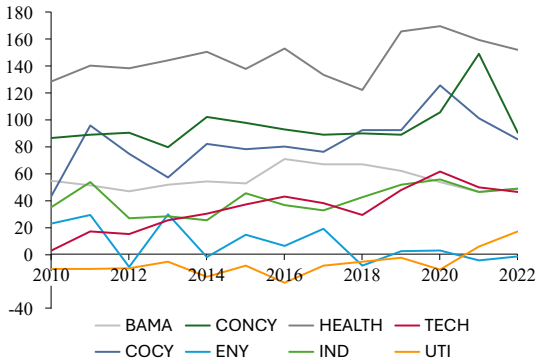


Figure S.2 ESGS Average per Industry

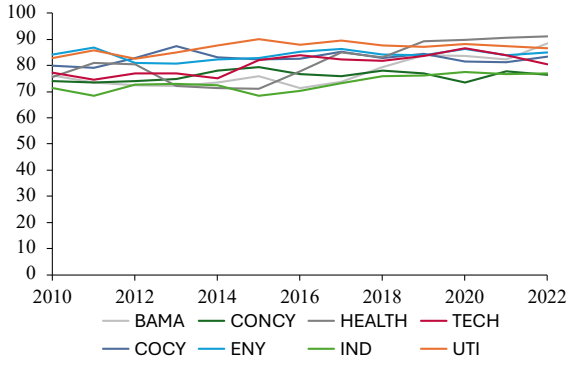


Table S.2 ESG Score Average per Industry								
Year	BAMA	COCY	CONCY	ENY	HEALTH	IND	TECH	UTI
2010	76.07	79.84	74.11	84.20	75.51	71.41	77.26	82.90
2011	73.47	79.14	73.42	86.76	81.03	68.31	74.58	85.82
2012	72.34	82.84	73.94	81.09	80.31	72.79	76.91	82.61
2013	72.21	87.26	74.76	80.61	72.11	72.88	77.06	85.09
2014	73.44	83.00	78.07	82.43	71.34	72.44	74.95	87.55
2015	75.82	82.23	79.47	82.83	71.11	68.43	81.99	90.10
2016	71.29	82.68	76.70	85.21	77.76	70.36	84.02	87.99
2017	73.63	85.14	75.81	86.43	85.09	73.33	82.43	89.49
2018	79.25	82.76	77.93	84.21	83.21	75.76	81.80	87.63
2019	83.83	84.47	76.98	83.86	89.16	76.02	83.63	86.98
2020	83.72	81.58	73.47	86.27	89.73	77.39	86.46	88.21
2021	82.38	81.24	77.78	83.88	90.53	76.64	83.92	87.40
2022	88.36	83.24	76.44	85.05	91.08	77.07	80.41	86.55

Appendix T Results for pooled OLS Regression

Model for pooled OLS Regression:

In the pooled OLS regression dummy variables have been implemented to account for variations across the eight industries, given evidence from the sample that ESG scores significantly vary by industry (Appendix P). Thus, seven dummy variables were utilized: *BAMA* (Basic Materials), *COCY* (Consumer Cyclicals), *CONCY* (Consumer Non-Cyclicals), *HEALTH* (Healthcare), *IND* (Industrials), *TECH* (Technology) and *UTI* (Utilities) with ENY (Energy) being the reference industry.

Models:

$$CCC_{i,t} = \beta_0 + \beta_1 ESGS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \beta_7 BAMA_{i,t} + \beta_8 COCY_{i,t} + \beta_9 CONCY_{i,t} + \beta_{10} HEALTH_{i,t} + \beta_{10} IND_{i,t} + \beta_{11} TECH_{i,t} + \beta_{12} UTI_{i,t} + \varepsilon_{i,t} \quad [6.A]$$

$$CCC_{i,t} = \beta_0 + \beta_1 ENPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \beta_7 BAMA_{i,t} + \beta_8 COCY_{i,t} + \beta_9 CONCY_{i,t} + \beta_{10} HEALTH_{i,t} + \beta_{10} IND_{i,t} + \beta_{11} TECH_{i,t} + \beta_{12} UTI_{i,t} + \varepsilon_{i,t} \quad [6.B]$$

$$CCC_{i,t} = \beta_0 + \beta_1 SOPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \beta_7 BAMA_{i,t} + \beta_8 COCY_{i,t} + \beta_9 CONCY_{i,t} + \beta_{10} HEALTH_{i,t} + \beta_{10} IND_{i,t} + \beta_{11} TECH_{i,t} + \beta_{12} UTI_{i,t} + \varepsilon_{i,t} \quad [6.C]$$

$$CCC_{i,t} = \beta_0 + \beta_1 GOPS_{i,t} + \beta_2 AT_{i,t} + \beta_3 EBITM_{i,t} + \beta_4 CR_{i,t} + \beta_5 Size_{i,t} + \beta_6 Lev_{i,t} + \beta_7 BAMA_{i,t} + \beta_8 COCY_{i,t} + \beta_9 CONCY_{i,t} + \beta_{10} HEALTH_{i,t} + \beta_{10} IND_{i,t} + \beta_{11} TECH_{i,t} + \beta_{12} UTI_{i,t} + \varepsilon_{i,t} \quad [6.D]$$

Model 6.A

CCC	Coefficient	Robust std. err.	t	P-Value
ESGS	-2.51	0.53	-4.74	0.0000***
AT	-87.17	14.86	-5.87	0.0000***
EBITM	172.69	95.04	1.82	0.0700*
CR	93.40	18.21	5.13	0.0000***
Size	12.81	4.71	2.72	0.0070***
Lev	46.45	52.20	0.89	0.3740
COCY	-84.59	10.15	-8.33	0.0000***
IND	-49.50	15.41	-3.21	0.0010***
CONCY	-104.63	21.50	-4.87	0.0000***
BAMA	-38.56	14.27	-2.7	0.0070***
HEALTH	-95.25	10.80	-8.82	0.0000***
TECH	0.63	12.10	0.05	0.9590
UTI	2.36	11.16	0.21	0.8320
Intercept	342.09	67.27	5.09	0.0000***
R-squared = 0.44 Prob > F = 0.0000***				

Model 6.B

CCC	Coefficient	Robust std. err.	t	P-Value
ENPS	-0.48	0.50	-0.96	0.3350
AT	-100.27	15.87	-6.32	0.0000***
EBITM	272.01	94.57	2.88	0.0040***
CR	85.40	17.81	4.8	0.0000***
Size	5.90	5.34	1.1	0.2700
Lev	43.33	58.67	0.74	0.4610
COCY	-85.25	13.06	-6.53	0.0000***
IND	-62.19	14.82	-4.19	0.0000***
CONCY	-109.94	23.09	-4.76	0.0000***
BAMA	-41.90	13.04	-3.21	0.0010**
HEALTH	-87.21	10.85	-8.04	0.0000***
TECH	3.31	11.88	0.28	0.7810
UTI	15.54	13.98	1.11	0.2670
Intercept	261.82	69.43	3.77	0.0000***
R-squared = 0.41 Prob > F = 0.0000***				

Model 6.C

CCC	Coefficient	Robust std. err.	t	P-Value
SOPS	-0.64	0.58	-1.1	0.2700
AT	-96.11	15.94	-6.03	0.0000***
EBITM	271.27	94.59	2.87	0.0040***
CR	83.97	17.28	4.86	0.0000***
Size	5.76	4.80	1.2	0.2310
Lev	35.43	53.18	0.67	0.5060
COCY	-81.64	10.29	-7.94	0.0000***
IND	-56.07	14.20	-3.95	0.0000***
CONCY	-102.95	22.43	-4.59	0.0000***
BAMA	-37.18	13.68	-2.72	0.0070***
HEALTH	-89.20	10.55	-8.46	0.0000***
TECH	2.16	11.13	0.19	0.8460
UTI	18.53	10.30	1.8	0.0730
Intercept	259.32	67.99	3.81	0.0000***
R-squared = 0.41 Prob > F = 0.0000***				

Model 6.D

CCC	Coefficient	Robust std. err.	t	P-Value
GOPS	-1.48	0.26	-5.61	0.0000***
AT	-92.05	14.75	-6.24	0.0000***
EBITM	151.22	94.86	1.59	0.1120
CR	93.39	17.50	5.34	0.0000***
Size	2.11	4.43	0.48	0.6340
Lev	111.91	55.02	2.03	0.0430**
COCY	-61.68	10.72	-5.75	0.0000***
IND	-50.34	15.37	-3.28	0.0010**
CONCY	-91.52	21.98	-4.16	0.0000***
BAMA	-52.83	10.88	-4.86	0.0000***
HEALTH	-89.51	10.93	-8.19	0.0000***
TECH	13.23	13.76	0.96	0.3370
UTI	24.65	9.90	2.49	0.0130**
Intercept	302.19	66.31	4.56	0.0000***
R-squared = 0.45 Prob > F = 0.0000***				

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1*
Similar to the results with FE, these results suggest that there is a significant (negative) effect of ESGS on CCC, thus CCC seems to decrease with increasing ESGS. The results also suggest that this effect is mainly attributable to the governance pillar, as a negative significant relationship between GOPS and CCC is evident but no significant relationship between ENPS and CCC, and GOPS and CCC.

Appendix U Results for Robustness Tests

To conclude robust results, another analysis was conducted for two specific industries, Consumer Cyclicals (*COCY)* and Industrials (*IND)*, to determine whether the findings remain consistent across different industries. These industries were chosen due to their pronounced differences in operational characteristics, which provides a varied context to test the consistency of the findings. Despite exhibiting similar patterns in ESG scores, COCY and IND show notable variations in their CCC, as observable in Appendix S. This contrast is crucial for evaluating whether the observed relationships hold across industries with different economic dynamics and financial behaviors. For this analysis, Models 5.A to 5.D were modified, and fixed effects regression with robust standard errors were utilized instead of clustered standard errors (due to too small cluster size) to test Hypotheses 1 through 4 for the two industries.

Appendix U.1 Consumer Cyclicals Regression Results

Def.: The industry Consumer Cyclicals refers to businesses that are significantly impacted by economic cycles, including businesses such as retail and automotive manufacturing. These companies typically see fluctuations in performance based on the overall economic climate.

Model 5.A

CCC	Coefficient	P-Value
ESGS	-2.53	0.0250**
AT	-56.97	0.2520
CR	-46.56	0.0000***
EBITM	431.62	0.0010***
Size	-32.54	0.0000***
Lev	308.88	0.0000***
Intercept	617.81	0.0000***
R-squared = 0.62		
Prob > F = 0.0000***		

Model 5.B

CCC	Coefficient	P-Value
ENPS	-5.33	0.0000***
AT	-106.81	0.0030***
CR	-95.00	0.0000***
EBITM	542.13	0.0000***
Size	-38.41	0.0000***
Lev	203.47	0.0000***
Intercept	1076.46	0.0000***
R-squared = 0.71		
Prob > F = 0.0000***		

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1.*

Model 5.C

CCC	Coefficient	P-Value
SOPS	-2.53	0.0190**
AT	-71.41	0.0990*
CR	-57.88	0.0000***
EBITM	516.31	0.0000***
Size	-31.02	0.0000***
Lev	231.86	0.0000***
Intercept	654.31	0.0000***
R-squared = 0.63		
Prob > F = 0.0000***		

Model 5.D

CCC	Coefficient	P-Value
GOPS	-0.65	0.1910
AT	-93.49	0.0550*
CR	-38.82	0.0040***
EBITM	446.09	0.0010***
Size	-34.72	0.0000***
Lev	276.83	0.0020***
Intercept	500.92	0.0000***
R-squared = 0.60		
Prob > F = 0.0000***		

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1.*
See Appendix F.1 for the list of companies included in the analysis.

Appendix U.2 Industrials Regression Results

Def.: The industry Industrials refers to companies engaged in the manufacture and production of goods, as well as the providing of industrial services. This encompasses a wide range of business activities including aerospace, defense, machinery, and transportation.

Model 5.A

CCC	Coefficient	P-Value
ESGS	2.49	0.0240**
AT	-171.01	0.0000***
CR	117.43	0.0140**
EBITM	-170.64	0.3930
Size	-67.70	0.0000***
Lev	-939.76	0.0000***
Intercept	827.00	0.0000***
R-squared = 0.55		
Prob > F = 0.0000***		

Model 5.B

CCC	Coefficient	P-Value
ENPS	-0.75	0.3370
AT	-140.86	0.0000***
CR	112.12	0.0210**
EBITM	-279.18	0.1820
Size	-38.76	0.0270**
Lev	-773.47	0.0000***
Intercept	712.53	0.0000***
R-squared = 0.53		
Prob > F = 0.0000***		

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

Model 5.C

CCC	Coefficient	P-Value
SOPS	3.11	0.0000***
AT	-188.42	0.0000***
CR	96.26	0.0240**
EBITM	-200.34	0.3330
Size	-53.63	0.0000***
Lev	-760.77	0.0000***
Intercept	619.96	0.0000***
R-squared = 0.64		
Prob > F = 0.0000***		

Model 5.D

CCC	Coefficient	P-Value
GOPS	-0.11	0.8640
AT	-140.33	0.0000***
CR	125.86	0.0160**
EBITM	-200.15	0.2900
Size	-47.10	0.0040***
Lev	-790.64	0.0000***
Intercept	733.37	0.0000***
R-squared = 0.53		
Prob > F = 0.0000***		

*Note: ***: p-value <0.01; **: p-value <0.05; *: p-value <0.1.*
See Appendix F.1 for the list of companies included in the analysis.

Appendix V Stata Code

Descriptive Statistics – Summary Statistics
tabstat CCC, stat(N, mean, median, sd, min, max, p5, p95)
(performed analogous for every variable needed)

Average of Variables CCC and ESGS per Year
tabstat CCC ESGScore, statistics(mean) by(Year)

Median of Variables CCC and ESGS per Year
tabstat CCC ESGScore, statistics(median) by(Year)

Average of Variables CCC, ESGS, DIO, DSO and DPO per Year and Business Sector
collapse (mean) mean_CCC = CCC mean_ESGScors = ESGScore mean_DIO = DIO mean_DSO = DSO mean_DPO = DPO, by(Sector Year)
list Sector Year mean_CCC mean_ESGScors mean_DIO mean_DSO mean_DPO

Median of variables CCC, ESGS, DIO, DSO and DPO per Year and Business Sector
collapse (median) median_CCC = CCC median_ESGScors = ESGScore median_DIO = DIO median_DSO = DSO median_DPO = DPO, by(Sector Year)
list Sector Year median_CCC median_ESGScors median_DIO median_DSO median_DPO

Correlation Matrix
Pearson Matrix
Pwcorr CCC Size Leverage GrossProfitMargin EBITMargin MBRatio AssetTurnover ReturnonAssets PERatio CurrentRatio ESGScore EnvironmentalPillarScore SocialPillarScore GovernancePillarScore
Spearman Rank Matrix
Spearman CCC Size Leverage GrossProfitMargin EBITMargin MBRatio AssetTurnover ReturnonAssets PERatio CurrentRatio ESGScore EnvironmentalPillarScore SocialPillarScore GovernancePillarScore, stats(rho p)

Shapiro–Wilk normality Test
swilk CCC DIO DSO DPO ESGScore EnvironmentalPillarScore SocialPillarScore GovernancePillarScore Size Leverage GrossProfitMargin EBITMargin MBRatio AssetTurnover ReturnonAssets CurrentRatio

Skewness and Kurtosis Tests
sktest CCC DIO DSO DPO ESGScore EnvironmentalPillarScore SocialPillarScore GovernancePillarScore Size Leverage GrossProfitMargin EBITMargin MBRatio AssetTurnover ReturnonAssets CurrentRatio

Kruskal–Wallis equality-of-populations rank test
kwallis ESGScore, by(Sector)
kwallis CCC, by(Sector)
kwallis ESGScore, by(Year)
kwallis CCC, by(Year)

One-way ANOVA
oneway ESGScore Sector
oneway CCC Sector
oneway ESGScore Year
oneway CCC Year

Calculation of VIF
vif

OLS Regression
regress CCC ESGScore AssetTurnover EBITMargin CurrentRatio Size Leverage COCY IND CONCY BAMA HEALTH TECH UTI, robust

regress CCC EnvironmentalPillarScore AssetTurnover EBITMargin CurrentRatio Size Leverage COCY IND CONCY BAMA HEALTH TECH UTI, robust

regress CCC SocialPillarScore AssetTurnover EBITMargin CurrentRatio Size Leverage COCY IND CONCY BAMA HEALTH TECH UTI, robust

regress CCC GovernancePillarScore AssetTurnover EBITMargin CurrentRatio Size Leverage COCY IND CONCY BAMA HEALTH TECH UTI, robust

FE Regression
reghdfe CCC ESGScore AssetTurnover CurrentRatio EBITMargin Size Leverage, abs(Sector) vce(cl CompanyName)

reghdfe CCC EnvironmentalPillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, abs(Sector) vce(cl CompanyName)

reghdfe CCC SocialPillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, abs(Sector) vce(cl CompanyName)

reghdfe CCC GovernancePillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, abs(Sector) vce(cl CompanyName)

Robustness Test
reghdfe CCC ESGScore AssetTurnover CurrentRatio EBITMargin Size Leverage, vce(robust)

reghdfe CCC EnvironmentalPillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, vce(robust)

reghdfe CCC SocialPillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, vce(robust)

reghdfe CCC GovernancePillarScore AssetTurnover CurrentRatio EBITMargin Size Leverage, vce(robust)

Note: Remaining Analyses were conducted using Microsoft Excel