



BI Norwegian Business School - campus Oslo

# GRA 19703

Master Thesis

Thesis Master of Science

What is the relationship between ESG Performance and  
Financial Constraints?

Evidence from Europe

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Start: 15.01.2021 09.00

Finish: 01.07.2021 12.00



BI Norwegian Business School

Oslo, Spring 2021

# **What is the relationship between ESG Performance and Financial Constraints?**

*Evidence from Europe*

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Master Thesis, Department of Finance

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This thesis was written as a part of the Master of Science in Finance at BI Norwegian Business School. Please note that neither the school, the supervisor nor the examiners are responsible for the methods used, results found, or conclusions drawn.

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## Acknowledgements

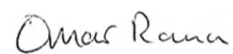
We would like to take the time to appreciate all the people who have supported us during the completion of our Master of Science in Finance at BI Norwegian Business School. We especially want to thank our supervisor Samuli Knüpfer, who provided us with constructive feedback and important suggestions on how to improve the quality of our thesis through the COVID-19 pandemic. Furthermore, we appreciate BI Norwegian Business School for enabling us to deliver our thesis on time during this difficult period. Finally, we thank each other, our friends and family, who all have given us unconditional motivation to complete this final semester.

Oslo, 25. June 2021



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## Abstract

The importance of the ESG and firm behavior connection has evolved rapidly in recent years. The introduction of EU's Green Deal in 2020 labeled Europe as a particularly interesting area for further research. Prior academic literature argued that ESG performance and financial constraints display a significant negative relation. This thesis investigates the relationship between ESG performance and financial constraints for listed European firms from 2010 to 2019. The investigation was extended by the deconstruction of ESG to each respective E, S and G pillar scores, and eventually to a sub-category component level. We find robust evidence of a time consistent negative relationship between ESG performance and the financial constraints indices, WW, KZ and SA index. Our evidence supports the proposition of high ESG scoring firms suffering less from financial constraints through a superior attraction of external capital. Furthermore, the results suggest Environmental and Social engagements to be the primary enablers of the exhibited superior access, with an especial emphasize on climate and employee enhancing activities.

**Key words:** *Financial Constraints, ESG Performance, Access to Finance, CSR, Environmental, Social and Governance (ESG), Europe*

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## List of Abbreviations

<i>SA</i>	Financial distress index created by Hadlock and Pierce in 2010
<i>KZ</i>	Financial distress index created by Kaplan and Zingales in 1997
<i>WW</i>	Financial distress index created by Whited and Wu in 2006
<i>MM</i>	Modigliani and Miller theorem on perfect capital markets
<i>SRI</i>	Socially Responsible Investing
<i>SIC</i>	Standard Industrial Classification
<i>CSR</i>	Corporate Social Responsibility
<i>VEP</i>	Voluntary Environmental Program
<i>ESG</i>	Environmental, Social and Governance
<i>GHG</i>	Greenhouse Gas
<i>KLD</i>	CSR tracking index, developed by KLD Research Analytics Inc.
<i>AUM</i>	Assets Under Management
<i>ISIN</i>	International Securities Identification Number
<i>ESGE</i>	Environmental pillar score
<i>ESGS</i>	Social pillar score
<i>ESGG</i>	Governance pillar score
<i>ESGC</i>	ESG Combined score, where firm controversies are included
<i>TRBC</i>	The Refinitiv Business Classification
<i>WRDS</i>	Wharton Research Data Services

## List of Symbols

$E$	Parameter representing the error term
$n$	Representing number of variables in sample
$\beta$	Coefficient for independent variables in the Fixed Effects Models
$T$	Parameter representing end of sample period (2019 )
$N$	Parameter for total number of included variable observations
$AI$	Measure of asymmetric information represented by bid-ask spread
$LR$	Parameter for leverage ratio
$IN$	Dummy variable representing industry-fixed effects
$YR$	Dummy variable representing time-fixed effects
$FC$	Dependent variable representing the WW, KZ and SA indices
$CH$	Measure of agency costs given by cash & liquid assets
$CO$	Dummy variable representing country-fixed effects
$ESG$	Parameter for overall ESG score
$ROA$	Parameter for Return-On-Assets
$AGE$	Parameter for economic age, represented by consecutive years listed
$ESGC$	Parameter for the enhanced ESG score
$ESG_P$	Parameter representing the individual E, S and G pillars
$ESG_{SU}$	Parameter representing the individual sub-categories
$AGE_{IN}$	Parameter for SA index age, represented by years since inception

# 1 Introduction

In a perfect capital market, there is no major difference between raising external and internal capital. In 1958, Modigliani and Miller argued that the financing structure would not affect firms' ultimate investment decisions. This argument applies for a frictionless financial world and has contributed to the creation of invaluable financial theories. However, frictions may occur in the more realistic imperfect market view. For instance, the presence of asymmetric information and agency conflicts between firms' stakeholders contradict the pronounced MM proposition. When markets are imperfect, the financing structure a firm choose is no longer irrelevant for the investment decisions and by carving the cash flows in different patterns, the clientele of investors who are willing to pay for these patterns change (Schleifer, 2000). The cost of external and internal finance is no longer equal with these frictions. In such a scenario, firms could be subject to financial constraints. The broad academic perception of financial constraints is firms' inability to fund and undertake all desired projects at any point in time. We define and research the concept financial constraints as firms' access to finance. In other words, their ability to raise and fund projects through external capital. Although, financial constraints do not directly imply financial distress, economic distress or the risk of bankruptcy, correlations between the states are highly acknowledged. We complement existing literature with observations of the effect from ESG performance on firms' access to finance and ability to fund positive NPV projects.

The academic research investigating the relationship between Corporate Social Responsibility (CSR) and relevant performance measures, has drastically increased since the introduction of Socially Responsible Investing (SRI) in the early 1970s. The greater interest is perfectly illustrated through a study conducted by KPMG in 2019. The study provided remarks concerning active SRI participating funds in the European capital markets. As of 2018, there were approximately 2800 SRI funds managing 12.5% of the total AUM, almost the double from 1500 participants in 2012 (KPMG, 2019). Boffo and Patalano (2020) presented another example of the escalated focus,

with institutional investor signatures for UN Principles of Responsible Investing (UN PRI) growing to 2300 participants in 2018. Lastly, in 2020 the European Green Deal was initiated as an action plan to construct a sustainable EU economy before 2050 by turning climate challenges into profitable opportunities (European Commission, 2020). The significance of ESG<sup>1</sup> as a variable of interest is ground-breaking and with the European Green Deal entering the market, the incorporation of ESG in investment decisions is all but more important.

We expand on two different branches of prior research and how they correlate with firms' ESG performance in the European region. Namely the imperfect market conditions: asymmetric information and agency conflicts. Stiglitz and Weiss (1981) argued firms' inability to fund new projects could be due to information asymmetry, while Jensen (1986) commercialized agency costs theories. Numerous academic studies have presented documentation of a relationship between ESG and firm performance. A better ESG rating is associated with an easier access to finance (Cheng et al., 2014), a lower cost of capital in terms of cheaper equity financing (El Ghouli et al., 2011) and a higher firm valuation (Cheung et al., 2012). We investigate these relationships further and develop our research question as:

*What is the relationship between ESG performance and financial constraints in Europe?*

We hypothesize the existence of a negative relationship between ESG performance and financial constraints for listed European firms. Factors reducing the market imperfections would ultimately decrease the likelihood of financial constraints. ESG is believed to be one of those factors and is treated as a mitigating mechanism (Chan et al., 2017; Garcia-Sanchez et al., 2019; Cheng et al., 2014; Samet et al., 2018). We draw inspiration from past research conducted by Samet et al. (2018) and Cheng et al. (2014). Samet et al. (2018) found evidence suggesting higher ESG rating is connected with lower asymmetric information and agency conflicts. Cheng et al.

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<sup>1</sup>ESG and CSR will be used interchangeably considering the fundamental meaning and understanding is equivalent.

(2014) presented similar observations and argued better ESG performance is closely related to an easier access to finance. Our thesis complements this ESG branch, where little previous research has solely concentrated on Europe and fewer on how ESG affect financial constraints. Consequently, our findings provide a deeper insight into how sustainability influences the European financial market. The region is already hugely ESG attentive, containing the Nordic countries ranked as global leaders<sup>2</sup> (Robeco, 2021). Furthermore, we initially perceive high ESG scoring entities as firms diverting a larger part of their free cash-flow toward responsible investments, produce a greater informational flow to the market and operate with less agency costs.

It was necessary to create a proxy parameter for our dependent variable, financial constraints. There is currently no common agreement on how to appropriately measure financial constraints. Previous research suggested using three different methods to construct the proxy index for each firm-year observation (Cheng et al., 2014). Our main implemented financial constraints index is the WW index, created by Whited and Wu (2006). There have been debates on which index is the most accurate measure of firms' financial constraints (Kim and Park, 2015). However, we apply two additional recognized proxy indices to control for measurement errors. The SA index (Hadlock and Pierce, 2010) and the synthetic KZ index (Lamont et al., 2001; first developed by Kaplan and Zingales, 1997) will be used as robustness tests to validate the results from our main regression analyzes. Our variables of interest are the ESG score, bid-ask spread (measure of information asymmetry) and cash & liquid assets (measure of cash holding liquidity). We collect the ESG scores from Thomson Reuters Refinitiv<sup>3</sup>, as it is acknowledged and to our understanding the most comprehensive database yet. The prior academic implementations are deemed as a justifying tool for the choice of ESG measure. We deploy both the legacy ESG score introduced by Thomson Reuters in the ASSET4 database and the enhanced

<sup>2</sup>The Nordic countries are in 2021 ranked: (1) Sweden, (2) Finland, (3) Norway, (4) Denmark and (5) Iceland according to Robeco.

<sup>3</sup>The measure is formally named *Refinitiv ESG*. However, to mitigate misunderstandings, we chose to reference the tool as *Thomson Reuters Refinitiv ESG*.



ESGC score developed by Refinitiv in 2018 (Thomson Reuters, 2018), to validate the investigation.

The question is further categorized into three segments, where our thorough analyzes aim to establish a comprehensive understanding of how ESG affect the financial constraints. Past studies have not investigated the complete range of all E, S and G relationships. For instance, Waddock and Graves (1997) and Samet et al., (2018) created a proxy index excluding the governance aspect. Segment 1 address the relationship through the mitigating factors, asymmetric information and agency costs in terms of cash holding liquidity. Segment 2 divide the ESG scores into the three main aggregated Environmental, Social and Governance pillars. Each pillar is regressed on the financial constraints index and hypotheses are individually created. In addition, segment 3 segregate the pillars into the complete range of included sub-category components. The segregation is used to examine the underlying forces and shed light on which of the sub-category components being the true drivers. Moreover, we replace the dependent WW index with the other two proxy measures, the KZ and SA index, where the equivalent analyzes for segment 1 through 3 are conducted. Finally, the robustness of our results is validated by regressing the main models using the enhanced ESGC score, study the time consistency and run pooled regressions to examine consolidated effects. To our knowledge, we are the first study deploying the enhanced ESG score, which incorporate controversies, when researching the relationship between ESG performance and financial constraints. The natural starting point is 2010 due to limited ESG measures for listed European firms before the most recent decade<sup>4</sup>, as well as improved quality and methodological transparency of newer estimated scores.

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<sup>4</sup>As of 2020 there are 2100 listed European firms in the Refinitiv ESG database (Refinitiv, 2020).

## 2 Literature Review

The neoclassical economic root of corporate social responsibility argued strategies concerning firms' responsibility was an unnecessary costly input factor, which positioned the firm under a competitive disadvantage. Friedman (1970), a strong supporter of this view, claimed that as long as firms operate within the framework of the law, engage in open competition without deception or fraud, their only responsibility would be toward the residual claimants. Companies' only social responsibility of business was to maximize the value for the shareholders by using resources and market activities as a profit enhancing tool. In a similar supporting vein, the shareholder value maximization theory argues firms operating with a multi-objective approach, do financially less well than firms who have implemented a single-objective value maximization (Tirole, 2001; Jensen, 2002).

On the contrary, Moskowitz (1972) conducted the very first academic research on the link between CSR and financial performance in the early 1970s. In the classic article, 14 companies believed to be socially responsible were studied through estimation of the rate of return and comparing the results to the Dow Jones, acting as the benchmarking index. The socially responsible stocks had appreciated more than the Dow Jones common stock index during a six-month trial period, evidently supporting the stakeholder view of firm value maximization. Other scholars reinforcing this vision, argued positive implications on the allocation of scarce corporate resources could be obtained through CSR (Waddock and Graves, 1997). CSR function as an effective advertising mechanism for products and services (Moskowitz, 1972) and help firms achieve a superior capital allocation from socially responsible investors (Kapstein, 2001). These conflicting perspectives on firms' social responsibility was the origin of a new era of research.

### 2.1 ESG and Financial Performance

Empirical studies who explored the relationship between ESG and financial performance using various accounting and stock measures, have resulted

in contradictory evidence. Cheung et al. (2012) researched the effect of how firms' CSR practices was rewarded by the market's investors during a four-year period between 2004-2007. A CSR benchmark index was created to measure the quality of CSR practices of 100 major listed Chinese firms. They found evidence supporting a positive value-adding factor when a socially responsible business approach was implemented. Supporting their results, Servaes and Tamayo (2013) argued there is a positive correlation between the firm value and CSR, based on panel data and construction of a correlation matrix consisting of 400 observations from 1991-2000. The authors implemented the KLD index used in Waddock and Graves (1997), and listed US firms' financial data to investigate the relationship between CSR, Tobins Q, R&D intensity and advertising intensity. The outcome illustrated a high CSR performance improved firm value through increased advertising effect and greater financial performance.

In one of the most acknowledged academic studies, "The price of sin: The effects of social norms on markets", Hong and Kacperczyk (2009) introduced a contradictory view of how ESG affect financial performance. The scholars defined sin stocks<sup>5</sup> as publicly traded companies involved in alcohol, tobacco and gambling. Institutional investors are found to shun sin stocks, where a downward pressure on the stock prices is developed. Consequently, the expected return increased due to a larger probability for the firms to face legal actions induced by societal norms. As a result, sin stocks were found to annually outperform common stocks by 2.5% on average. Another study promoting the contradictory view of implementing ESG strategies, illustrated voluntarily committing to corporate environmental activities may result in a lower firm value. The study investigated the phenomenon by comparing stock returns of a sample committing to the VEP's with a control group. The sample of responsible firms experienced negative abnormal returns following their commitment (Fisher-Vanden and Thorburn, 2011). The contradictory views present findings of how corporate incentives to reduce GHG-emissions appear to conflict with the Friedman proposed share-

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<sup>5</sup>Shares of companies involved in business activities which could be deemed as unethical by the majority of the public (Robeco, 2021).

holder value maximization theory and what the purpose of corporations should be.

More recent research focus on the intermediating mechanism of ESG, and how it could enable sustainable long-term value creation in the capital markets. Hoepner et al. (2019) provided evidence of engaging in E, S and G issues benefited shareholders by reducing the downside risk, measured by the partial movement and value at risk. The evidential benefits are proven to be most effective for engagements appealing to environmental issues, mainly climate change. Similarly, Ihlan et al. (2020) argued the option price for protection against tail-risk events is more expensive for carbon-intensive firms. The risk magnified when the interest in climate change increased from the public. These findings imply high carbon emitting firms with a lower ESG performance operate with a larger risk from investors point of view.

The association between firm performance and ESG is further demonstrated by responsible investors accepting lower returns to achieve a dual-objectified impact, meaning both a financial and social impact. Impact funds earn on average 4.7% less IRR ex post than traditional venture capital funds. The willingness-to-pay is higher among institutional investors, whereas average investors are willing to forego 2.5-3.7% IRR for a real-life effect (Barber et al., 2019). These findings are defended in the article "Do investors value sustainability". Hartzmark and Sussmann (2019) illustrated through an event study following Morningstar's publication of mutual funds' sustainability scores, that socially responsible investments attract a higher degree of financial capital. They argued an abnormal outflow occurred for funds being categorized as low sustainability, and vice versa for funds earning a high sustainability score following the publication. With the observed evidence, we conclude investors do indeed value sustainability and the access to finance should possess a negative relationship with ESG performance.

Our thesis contributes to the emerging literature by investigating the impact of ESG performance on firms' access to finance. More importantly, it is

essential to understand the consequences that follow. In the next section, we provide documentation of how financial constraints affect firms' operational activities and what implications it has on firm value.

## **2.2 Financial Constraints**

Positive NPV projects are used to improve firms' competitive advantage and profitability. Lamont et al. (2001) argued financial constraints are a direct result from several factors, for instance the inability to borrow or issue new equity. Hence, firms' ability to achieve a competitive advantage is a consequence from their financing strategy and financial constraints. Typically, insiders attain a superior access to firm specific information than ordinary market participants. As a result, the market has an asymmetric information imperfection, which is a central component for firms' inability to fund profitable ventures and is driver of project's cost of capital (Armstrong, 2011).

The development of a framework clarifying the role of asymmetric information for investment decisions through adverse selection and moral hazard, offered a fresh view on auxiliary costs (Jensen and Meckling, 1976; Schleifer and Vishny, 1997). Adverse selection is a consequence from a market less informed about the true aspects of a project, which could lead to an increased cost of capital (Stiglitz and Weiss, 1981). Furthermore, moral hazard is a result of insiders extrapolating common resources for their own private benefit. Dhaliwal et al. (2012) suggested by issuing CSR reports to the market, firms achieve a higher credit rating and a lower analyst forecast error, later supported by Attig et al. (2013). Dhaliwal et al. (2012) implemented the quantity of CSR reports as a proxy for non-financial firm information. They argued by decreasing the asymmetric information, the access to finance increased, implying a negative relationship between CSR transparency and financial constraints. In conclusion, the market reward transparency proxied by CSR reporting quantity (Garcia-Sanchez et al., 2019), and availability of credible financial disclosures through CSR activities, with lower capital constraints (Hubbard, 1998). Similarly, Ioannou

and Serafeim (2017) showed that increased transparency had a dual impact on firms' internal practices. The improved CSR reporting quality enhanced managerial operations and countered agency costs by reducing the probability of short-termism. Moreover, the evidence is supported by findings of high performing CSR firms replacing short-term debt with long-term debt at a lower cost in their financing structure (Gao and Zhu, 2015; Hamrouni et al., 2019) and financial institutions rewarding socially responsible firms with a lower cost of debt (Bacha et al., 2020).

Asymmetric information is one of the main reasons for agency problems, as previously discussed. From investors point of view, agency problems are preliminary signals of firms approaching undesirable paths of financial distress. The vertical agency problem defines conflicts between managers and shareholders (Jensen and Meckling, 1976; Jo and Harjoto, 2011), while the horizontal problem originate from conflict of interests between minority and majority shareholders (Schleifer and Vishny, 1997). In common, both conflicts consider effects from exploitation of firms' resources, either by the managers or large shareholders for private benefit. Borghesi et al. (2014) explained that firms with a larger free cash-flow<sup>6</sup> are more willing to engage in CSR activities. The diversion of free cash-flow work as a mitigating parameter for agency problems. Following the mitigation, CSR performance and firm value increased, as illustrated by Jensen (1986) and Waddock and Graves (1997).

### **2.3 The link between ESG and Financial Constraints**

The presence of market frictions causes an inflation in the cost of raising external capital. The implementation of mitigating strategies that reduce asymmetric information and agency costs, increase the ability to raise external funds. Put differently, greater access to finance lower firms' financial constraints. Cheng et al. (2014) explored the possibility of CSR activities enabling an easier access to finance through reduction of market frictions. The authors theorized the reduction is due to greater transparency from

<sup>6</sup>Free cash-flow in the governance context imply the capital available to managers for investment in positive NPV projects.

CSR disclosure and stakeholder engagements. They found that lower market frictions decreased financial constraints, primarily driven by the environmental and social pillar. More recent empirical studies from the European market supported these results. Samet et al. (2018) investigated the relationship between CSR and financial constraints during the sample period 2009-2014. They suggested better performing CSR firms suffered less from financial constraints through minimization of free cash-flow and asymmetric information. Other authors proved superior CSR performance led to an easier access to finance in terms of cheaper equity financing (El Ghouli et al., 2011, 2018; Dhaliwal et al., 2011), competitive cost of capital from lower equity premium (Sharfman and Fernando, 2008), less agency conflicts (Eccles et al., 2012), higher cash-flow liquidity where CSR is negatively linked with financial constraints (Chan et al., 2017) and contradictory that CSR activities impose additional capital constraints during economic downturns (Al-Dah et al., 2018).

We expect ESG performance to have a significant negative correlation with financial constraints, based on prior literature. The methodologies and proxy variables used in past academic research are abundant. However, the implemented procedures generally try to analyze the outcomes of asymmetric information and agency costs mitigation. Our thesis conducts further testing on how ESG performance affect the access to finance. Furthermore, we explore the true underlying ESG drivers behind the possible relationship. Construction of our hypotheses and empirical approach is further discussed in section 4.0 of this thesis.

### 3 Theory

The theories concerning the effects of ESG engagements on firm value, performance and capital allocation are still emerging. Two of the most common theories investigating the relationship between ESG and financial performance are the shareholder- and stakeholder theory. The shareholder theory argue the only purpose of a firm is to maximize shareholders welfare. On the contrary, stakeholder theory argues by considering all stakeholders the agency costs would be minimized, and in turn act as a value enhancing mechanism. This section introduces an argument for ESG engagements through the implementation of stakeholder theory and continue with an in-depth analysis of theories regarding financial constraints.

#### 3.1 Shareholder vs. Stakeholder Perspective

A stakeholder could be characterized as everything from an employee to a shareholder. The stakeholder would then be defined as all market participants affected by the company's operational activities. The view on companies' purpose differs between a shareholder and stakeholder utility maximizing perspective. From shareholders point of view, the objective should be to earn as much profit as possible, while operating within the laws of free competition and basic rules of society (Friedman 1970). In other words, the only obligation would be to maximize shareholders wealth. The obligation could be interpreted as a contingency on shareholders' *desire*, which generally is to gain an exponential amount of prosperity. Hence, firms should not engage in ESG related activities unless it generates a positive cash flow in terms of a net present value, or if ESG is a long-term enabler for future firm profit. The whole argument is rooted in the contingent shareholder desire. Consequently, this argument does not hold in practice if shareholders obtain other preferences than wealth maximization or if wealth accumulating activities become inseparable from ESG enhancing ventures.

From stakeholders' point of view, their preferences might deviate because of their different roles and relationships to the firm. For instance, an employee



might value social activities higher than financial motives, in line with his or her attachment to the local community. As an extension to the shareholder utility maximizing argument, the Principle of Shareholder Primacy, argue a firm should consider the preferences of other stakeholders only if this is in the long-term interest of the company and its shareholders (Goergen, 2018). According to Loderer et al. (2010), we frequently observe firms optimize social welfare alongside the shareholder utility, even in shareholder friendly countries such as in the US and UK. On the other hand, empirical evidence found that firms who focus on a multi-objective value maximization by considering all stakeholders, perform financially poorly compared to firms with a single-objective approach (Jensen 2002). Moreover, Jensen and Meckling (1976) displayed a dual impact by maintaining a large number of stakeholders. They argued it would naturally lower the risk of obtaining one large controlling shareholder but the probability of agency problems from potential conflicts of interest would simultaneously increase.

The relationship between the documented theories and ESG performance, show contradictory arguments for firm involvement. Engagements in ESG would be irrelevant for the firm value and should be delegated to the government or the individual consumer, given the shareholder theory hold (Friedman, 1970). A common preference for shareholder value maximization might not be present when all stakeholders' interests are considered during the decision-making process. These preferences could instead include ESG enhancing activities and social welfare improvements. Tirole (2001) argued the shareholder value maximization proposition worked efficiently only if the other stakeholders are controlled by complete contracts. However, evidence of incomplete contracts represents a counterargument against shareholder wealth maximization (Grossman and Hart, 1986). This argument supports the possibility of a relationship between ESG performance and financial constraints and imply ESG involvement could exert a positive effect on firm value. Overall, engaging in ESG ventures are dependent on whether it is viewed from a shareholder or stakeholder maximizing perspective. Nevertheless, conclusions from the emerging academic branch signal that ESG performance has a defining effect on utility and wealth accumulation.

## 3.2 Financial Constraints

The existence of financial constraints influences the overall economy, for instance during the financial crisis of 2008. When firms experience challenges in accessing finance and raising external capital, they are often not able to fulfil their ambitions for future growth, fund desired projects, invest in employee relationships and sufficiently conduct their daily business activities. As a consequence, financial constraints are an important factor from both a shareholder and stakeholder perspective. Furthermore, identifying reasons and consequences from financial constraints are crucial tasks in the literature to assist in policy interventions (Ferrando et al., 2020).

### 3.2.1 Definition and Academic Frameworks

The widespread definition of financial constraints could be traced back to Lamont et al. 2001, who claimed financial constraints indicated that a firm is not able to fund all their desired projects. The constraints might be due to credit constraints, inability to borrow, inability to issue fresh equity, the daily activities are dependent on bank loans or assets are illiquid. Several frameworks have been developed to try and explain how financial constraints, access to finance and the inability to fund projects affect all concerning stakeholders. These foundations quantified asymmetric information and agency costs to describe the overall effects on a variety of performance measures. Jensen and Meckling (1976) developed a well-recognized framework for the role of asymmetric information and how it affects financing decisions in terms of adverse selection and moral hazard. With adverse selection, the market is not perfectly informed of a project's quality. The consequence might be an increased cost of external financing and financial constraints (Stigleitz and Weiss, 1981). This argument was further supported by Armstrong et al. 2011, who suggested that asymmetric information play a key role when the cost of capital is determined.

Agency problems are more or less inevitable if there is a clear separation between ownership and control. Agency costs are present when managers or the controlling shareholders divert common firm resources for their own pri-

vate benefit. There are two main categories of agency problems that could occur, the horizontal and vertical agency problem. The horizontal agency problem cover conflicts between the controlling shareholder and minority shareholders, while the vertical agency problem define issues between managers and shareholders (Jensen and Meckling, 1976; Schleifner and Vishny, 1997). Jui et al. (2015), analyzed agency costs between the controlling shareholder and minority shareholders. They found that firms suffering from moral hazard are subject to higher cost of equity and financial constraints, where severe agency costs prevent firms to fund all positive NPV projects or conduct similar investments.

### **3.2.2 How Financial Constraints Theories Relate to ESG**

Numerous academic indices have been constructed following the documented consequences from financial constraints. The main objective has been to measure capital constraints with the highest possible accuracy. The most popular measures are the proxy variables WW, KZ and SA index. In common, they have been created to estimate financial constraints by combining observable firm characteristics, variables derived from investment models and estimates with a known correlation to the access of external finance (Ferrando et al., 2020). These measures were developed by Whited and Wu (2006), Kaplan and Zingales (1997) and Hadlock and Pierce (2010). On the other hand, a handful of unobservable firm characteristics such as, customer dependence and market's trust, also play a crucial part when determining financial constraints. As a result, other approaches for constraints estimation have been introduced. For instance, Ferrando et al. (2020) measured financial constraints as the profitability that firms forgo budget constraints when they are unable to use optimal levels of input and technology in production. Moreover, Campello et al. (2010) estimated capital constraints by directly questioning CFO's if their firm was constrained during the financial crisis of 2008. Financial constraints have been thoroughly investigated when we look beyond the chosen methodological approach, theories and repercussions. However, in recent years a new branch of literature has emerged with the eruption of ESG.

The broad financial constraints term is segregated into the main segments: credit rating, cost of capital, cost of equity and access to finance. El Ghouli et al. (2011), found that better performing ESG firms could access cheaper equity financing, an argument supported by Dhaliwahi et al. (2011). Furthermore, ESG performance has been acknowledged to reduce the cost of capital (El Ghouli et al., 2018). On the other hand, the relationship between ESG and the access to finance is less studied from an academic point of view. Samet et al. 2018 and Cheng et al. 2014, studied the mediating role of asymmetric information and agency costs when firms develop CSR strategies in light of capital constraints. Lower capital constraints are associated with a more financially healthy and better competitive positioned company. Both studies found evidence of a higher ESG performance resulting in a superior access to finance. The growth and development of new theories within this branch is interesting with the recent decade's immense expansion of ESG reporting and introduction of the EU Green Deal (European Commission, 2020).

## 4 Methodology and Hypotheses

The previous sections presented the relevant literature and theoretical frameworks. Further, we explain our regression variables, model structuring, hypotheses creation and validity of the model selections based on the research question: *What is the relationship between ESG performance and financial constraints in Europe?* The main question is deconstructed into three segments using a Fixed Effects Model approach. In addition, we conduct robustness testing by implementing the other indices, the ESGC score and year-by-year regressions, explained in section 7.0 of this thesis

### 4.1 Description of Regression Variables

In the following sub-section, we provide a description of the variables in our regression models, the methodology behind the inclusion and supporting empirical evidence.

#### 4.1.1 Dependent Variables

**Financial Constraints:** There is currently no common agreement on a superior measurement for the level of financial constraints. Various discrete factors such as credit rating, size, age and dividend payout could be used. However, they are just measuring a specific part of each firm entity and does not account for the broader aspect of capital constraints. We construct financial constraints indices to mitigate these factor specific limitations. Similar to Cheng et al. (2014) and Samet et al. (2018), the indices are estimated for every observed firm in each individual year. One of the most used indices in empirical research is the KZ index, first created by Kaplan and Zingales (1997) and later synthesized by Lamont et al. (2001). Hadlock and Pierce (2010), the designer of the SA index, questioned the validity of the KZ and WW index, created by Whited and Wu (2006). We are deploying all three financial constraints indices to minimize the measurement error from using a single index. The WW index is applied for the main regression analyzes, whereas the KZ and SA index are implemented for robustness and additional validity testing of our results. A full description of index

construction is found in Appendix A *Table 17* : see Part 1 for WW, Part 2 for KZ and Part 3 for SA.

#### 4.1.2 Independent Variables

**ESG Performance:** Prior research have often constructed an aggregated ESG index by using two out of the three main pillars of the overall ESG score (Waddock and Graves, 1997; Samet et al., 2018). Nevertheless, this thesis focus on the complete picture of how ESG performance affect firms' financial constraints, where the full ESG score is implemented. The ESG ratings are obtained from Thomson Reuters Refinitiv, prior known as the ASSET4 database. Thomson Reuters Refinitiv capture and calculate the overall ESG assessment based on 450 company-level measures, which is categorized in 10 groups and reformulated into three main pillar scores. As of 2020, the ESG controversies score (*ESGC*) is estimated from 23 controversies measures (Refinitiv, 2020). A comprehensive overview of the Thomson Reuters Refinitiv ESG measure is provided in section 5.3 of this thesis.

**Asymmetric Information:** There is no academic agreement on how to estimate the asymmetric information. We choose to implement one of the most commonly used variables in empirical research, the bid-ask spread (Cheng et al., 2011; Samet et al., 2018). The measure is calculated as the average annual bid-ask spread at the closing price.

**Cash Holding Liquidity:** We use the cash & liquid assets as a proxy for cash holding liquidity, following Borghesi et al. (2014) and Chan et al. (2017), who argued that firms involved in CSR activities have a higher free cash-flow. The variable is then a measure of the cash and assets available to be liquified within short notice at time  $t$ . Moreover, by diverting the cash holdings to ESG activities, the agency costs would be minimized and act as a value increasing factor (Jensen, 1986).

#### 4.1.3 Control Variables

We implement several control variables from previous literature known to affect the financial performance, market trust and ESG activities. The

Return-On-Assets (*ROA*) is deployed to control and measure the financial performance. We include a proxy for economic firm age (*AGE*) to limit a behavioral trust bias, estimated as the natural logarithm of consecutive years listed. The economic firm age is used in the estimation of the SA index. In order to avoid inconsistencies, it is replaced with the similar variable years since inception (*AGE<sub>IN</sub>*) when exploring the relationship between ESG and SA index. The decision is further discussed in section 7.1.2 of this thesis. The final control variable is the leverage ratio (*LR*), calculated as the long-term debt over total assets. The Fixed Effects Model was chosen to counter existing European variation by controlling for time, country and industry fixed effects with dummy variables.

## 4.2 Model Structure

We use a multi-step approach by constructing three specific segment models to analyze the relationship between ESG and financial constraints. The first segment investigates the relation through total ESG score, information asymmetry and agency costs. The second segment research individual pillar relationships for a deeper understanding. Lastly, the third segment aim to explore the true underlying drivers (see *Table 18* in Appendix B for full overview of hypotheses).

### 4.2.1 Segment 1: Total ESG Score Regressions

Following research conducted by Samet et al. (2018) and Cheng et al. (2014), we examine if financial constraints are mitigated by the reduction of asymmetric information and agency costs in terms of cash holding liquidity from higher ESG. The main hypothesis is deconstructed into two additional parts, explained in the sub-sections below. We form our primary Model (1) to investigate the main research question:

$$(1) \quad FC_{i,t} = \beta_1 \underset{n}{ESG}_{i,t} + \beta_2 \underset{n}{ROA}_{i,t} + \beta_3 \underset{n}{AGE}_{i,t} + \beta_4 LR_{i,t} \\ + \beta_j \underset{j=1}{Y} R_{i,t} + \beta_k \underset{k=1}{IN}_{i,t} + \beta_l \underset{l=1}{CO}_{i,t}$$

Where  $i = 1, \dots, N$  and  $t = 2010, \dots, T$

We hypothesize that firms with better ESG performance to be less financially constrained based on our theoretical beliefs and empirical evidence. Thus, we expect to observe a negative relationship between ESG performance and financial constraints.

The main hypothesis is formally presented as the following:

$$\mathbf{H0: } ESG_{i,t} = \mathbf{0} \text{ vs. } \mathbf{H1: } ESG_{i,t} \neq \mathbf{0}$$

### Reduction of Financial Constraints from Asymmetric Information

Previous research argued that by minimizing asymmetric information from ESG activities firms' financial constraints are reduced, and form the first part of our main hypothesis: *Does lower asymmetric information lead to an easier access to finance?* We predict that lower asymmetric information reduces financial constraints and increase the access to finance through ESG reporting activities. In other words, the effect should be positive if a correlation exists. We build our Model (2) based on the assumption and empirical evidence:

$$(2) \quad FC_{i,t} = \beta_1 ESG_{i,t} + \beta_2 AI_{i,t} + \beta_3 ROA_{i,t} + \beta_4 AGE_{i,t} + \beta_5 LR_{i,t} \\ + \sum_{j=1} \beta_j YR_{i,t} + \sum_{k=1} \beta_k IN_{i,t} + \sum_{l=1} \beta_l CO_{i,t}$$

Where  $i = 1, \dots, N$  and  $t = 2010, \dots, T$

Model (2) include the  $AI_{i,t}$  variable, which represent the asymmetric information to incorporate the entity related effects on financial constraints in the form of larger transparency. A smaller annual bid-ask spread at closing would indicate higher informational flow to the market, while a larger spread would imply a lower informational flow.

The first additional part of the main hypothesis is formally presented as the following:

$$\mathbf{H0 A1: } AI_{i,t} = \mathbf{0} \text{ vs. } \mathbf{H1 A1: } AI_{i,t} \neq \mathbf{0}$$



## Reduction of Financial Constraints from Agency Costs

The conflict between managers and shareholders is an agency cost originating from the free cash-flow. More specifically, the cash holding liquidity is optimally used for investments in profit maximizing projects and form the second part of our main hypothesis: *Does a higher cash flow liquidity lead to an easier access to finance?* Samet et al. (2018) argued that the agency costs are minimized when the free cash-flow is reduced from a higher degree of ESG activities. On the contrary, Chan et al. (2017) found evidence of firms exhibiting a high degree of CSR performance induced a larger cash flow liquidity. Our thesis investigates the relationship between agency costs and financial constraints in terms of the latter argument. We theorize that better ESG performing firms display a higher cash holding liquidity and obtain an easier access to finance. We build our Model (3) following the academic evidence:

$$(3) \quad FC_{i,t} = \beta_1 \underset{n}{ESG_{i,t}} + \beta_2 \underset{n}{CH_{i,t}} + \beta_3 \underset{n}{ROA_{i,t}} + \beta_4 \underset{n}{AGE_{i,t}} + \beta_5 \underset{n}{LR_{i,t}} \\ + \sum_{j=1} \beta_j YR_{i,t} + \sum_{k=1} \beta_k IN_{i,t} + \sum_{l=1} \beta_l CO_{i,t}$$

Where  $i = 1, \dots, N$  and  $t = 2010, \dots, T$

Model (3) replace the measure for asymmetric information,  $AI_{i,t}$ , with our proxy variable for cash holding liquidity,  $CH_{i,t}$ . Presented literature used a wide range of measures for the cash flow under management's control (Samet et al., 2018; Chan et al., 2017)<sup>7</sup>. However, we expect to observe a negative relation between cash holding liquidity and financial constraints, as discussed.

The second additional part of the main hypothesis is formally presented as the following:

$$\mathbf{H0 A2: } CH_{i,t} = \mathbf{0} \text{ vs. } \mathbf{H1 A2: } CH_{i,t} \neq \mathbf{0}$$

<sup>7</sup>Samet et al. (2018) presented the free cash-flow as the operating income less the sum of income taxes, interest expenses on debt, common stock dividend and preferred stock dividend. The measure was scaled by the book value of assets from each individual firm. Instead, we use a measure for cash holding liquidity to investigate the relationship between liquidity (*cash on hand*) and financial constraints.

#### 4.2.2 Segment 2: Individual E, S and G Pillar Regressions

The ESG score is a combined reflection of firms’ Environmental, Social and Governance efforts. We segregate the total ESG score into the respective E, S and G pillars for a deeper understanding of how ESG performance affect financial constraints. The environmental pillar exhibits the ability of a firm to deploy resources for the mitigation of environmental risks and creating sustainable solutions. The social pillar is a reflection of firms’ effect on societal responsibility and the governance pillar measures the degree of internal control measures for agency cost minimization. Following Samet et al. (2018), we individually create hypotheses and regress our models replacing the  $ESG_{i,t}$  variable from Model (1) with each individual pillar score. Specifically,  $ESGE_{i,t}$  is used as input in Model (4),  $ESGS_{i,t}$  is used as input in Model (5) and  $ESGG_{i,t}$  is used as input in Model (6). The subsequent models are structured, where  $ESGP_{i,t}$  is the variable representing individual pillar scores:

$$(4) \quad FC_{i,t} = \beta_1 ESGP_{i,t} + \beta_2 ROA_{i,t} + \beta_3 AGE_{i,t} + \beta_4 LR_{i,t} + \beta_j YR_{i,t} + \beta_k IN_{i,t} + \beta_l CO_{i,t}$$

Where  $i = 1, \dots, N$  and  $t = 2010, \dots, T$

Models (4)-(6) could be viewed as tools, built to examine the individual pillar relationships on firms’ financial constraints and establish evidence of the respective effects. A selection of past research failed to investigate the relationship between the Governance pillar and financial constraints (Chan et al., 2017; El Ghouli et al., 2011; Cheng et al., 2014), where the ESG variable has been based on an equally weighted Environmental and Social score. We study all main pillar relationships to complement existing research and expect negative effects for the Environmental, Social and Governance pillars on financial constraints. A higher individual pillar score should enable a superior access to external finance.

The individual pillar hypotheses are formally presented as the following:

$$H0 \mathbf{B}_n: ESGP_{i,t} = \mathbf{0} \text{ vs. } H1 \mathbf{B}_n: ESGP_{i,t} \neq \mathbf{0}$$

### 4.2.3 Segment 3: Extended Sub-category Regressions

Our research finally pursues to analyze the ESG sub-category components. We believe that not all components are statistically significant and have an effect on firms' financial constraints. Previous studies have suggested that ESG engagements (Cheng et al., 2014), ESG reporting (Dhaliwal et al., 2011) and product responsibility (Samet et al., 2018) exert negative relationships with constraints. We build our final models to examine the following ten sub-category components: Resource Use ( $ESG\_RU_{i,t}$ ) in Model (7), Emission ( $ESG\_EM_{i,t}$ ) in Model (8), Environmental Innovation ( $ESG\_EI_{i,t}$ ) in Model (9), Workforce ( $ESG\_WF_{i,t}$ ) in Model (10), Human Rights ( $ESG\_HR_{i,t}$ ) in Model (11), Community ( $ESG\_CO_{i,t}$ ) in Model (12), Product Responsibility ( $ESG\_PR_{i,t}$ ) in Model (13), Management ( $ESG\_MA_{i,t}$ ) in Model (14), Equal Shareholder Rights ( $ESG\_ES_{i,t}$ ) in Model (15) and CSR Strategy ( $ESG\_CS_{i,t}$ ) in Model (16). The  $ESG_{SU_{i,t}}$  variable is a measure of every individual sub-category and replace the total ESG score from Model (1):

$$(5) \quad FC_{i,t} = \beta_1 \frac{ESG_{SU_{i,t}}}{n} + \beta_2 \frac{ROA_{i,t}}{n} + \beta_3 \frac{AGE_{i,t}}{n} + \beta_4 LR_{i,t} \\ + \sum_{j=1} \beta_j YR_{i,t} + \sum_{k=1} \beta_k IN_{i,t} + \sum_{l=1} \beta_l CO_{i,t}$$

Where  $i = 1, \dots, N$  and  $t = 2010, \dots, T$

The reason for the sub-category extension is to uncover the true underlying drivers, which is unobservable when the ESG score is only divided into E, S and G pillar scores. We are able to study the complete picture of how ESG performance affect financial constraints in Europe through the presented methodology and structured models.

The sub-category hypotheses are formally presented as the following:

$$\mathbf{H0 C_n: } ESG_{SU_{i,t}} = \mathbf{0} \text{ vs. } \mathbf{H1 C_n: } ESG_{SU_{i,t}} \neq \mathbf{0}$$

## 4.3 Model Validity

We apply measures to counter specific issues originating from endogeneity and near multicollinearity to secure validity of our Fixed Effect Models.

A potential endogeneity bias stemming from an omitted variable, reverse causality or measurement error is a common concern when using ESG in regression analysis. We discuss the consequences if endogeneity is present, how to minimize the probability of an endogeneity issue and address our countermeasure for near multicollinearity.

#### **4.3.1 Omitted Variable**

The estimated coefficients would be biased and inconsistent, along with upward biased standard errors with an omitted variable issue. For such an issue to arise, changes in the omitted variable need to also cause changes in both the dependent variable, and one or more of the independent variables. If we omit an explanatory variable, the variation would instead be captured by the error term and create inaccurate estimations (Brooks, 2014). Our independent and control variables are carefully selected based on fundamental financial theory, economic significance and evidence provided by past academic research (Samet et al., 2018; Cheng et al., 2014; Chan et al., 2017). Analyzing how ESG performance affect financial constraints are a relatively new interest. Consequently, which variables truly driving the relationships are not yet fully discovered.

We have chosen a parsimonious model approach. The reason being, when including too many control variables in our regressions, the number of degrees of freedom would increase and overcomplicate the models. However, the approach could increase the probability of an omitted variable bias. We are aware of the potential issue, but we believe our measures in place are satisfactory to achieve valid results.

#### **4.3.2 Reverse Causality**

The next possible implication for the validity of our results is a reverse causality issue. The issue occurs when  $X$  cause  $Y$ , while  $Y$  simultaneously cause  $X$ . Previous literature used different measures to counter a reverse causality issue when studying the effects of ESG performance (Dhaliwal et al., 2011; El Ghoul et al., 2011; Waddock and Graves, 1997; Samet et al., 2018; Cheng et al., 2014). Waddock and Graves (1997) argued that

the corporate social performance is positively related to prior financial performance and concluded the relationship run both directions. A better performing ESG firm could indicate lower financial constraints, but lower financial constraints could also be the cause from a higher ESG performance. The ESG score in year  $t$  is based on all available information in fiscal year  $t - 1$  (Cheng et al., 2014). The updated ratings more or less coincide with publication of the annual reports. As a result, the information disclosed follow the firm events the prior fiscal year. Furthermore, each company receive a score benchmarked against the rest of the entities within its own business category. The coefficients would be biased and inconsistent with the presence of reverse causality but adjusting for the issue is outside the scope of this thesis. However, our independent ESG variable is by design lagged one period and function as a countermeasure.

#### 4.3.3 Measurement Error

A measurement error in the dependent or independent variables lead to biased and inconsistent coefficients (Brooks, 2014). The occurrence is due to errors in the data sample, or if the data is reported inaccurately. To our best knowledge, there is no mistreatment of the data sample. Hence, the first concern is directed toward potential errors in the independent variables, mainly from the estimation of ESG scores. The ESG scores are based on Thomson Reuters Refinitiv, where the reporting is voluntary with no standardized framework (Cheng et al., 2014; Dhaliwal et al., 2011; Garcia-Sanchez et al., 2018; Waddock and Graves, 1997). Accounting for these issues is still under global discussions and outside the scope of this thesis. Moreover, our conclusions are only valid for the chosen ESG measure. We try to limit a potential problem by also implementing the enhanced ESGC score. However, probability of a measurement error in the ESG scores still exist in the current state.

The second measurement error could originate from the proxy indices. Following prior research, we construct indices for each sample entity in every observable year (Whitted and Wu, 2006; Hadlock and Pierce, 2010; Kaplan and Zingales, 1997; Lamont et al., 2001). We deploy all three acknowledged

indices in order to minimize the possibility of measurement errors in our dependent variables.

#### 4.3.4 Multicollinearity

Multicollinearity appear in two different forms, perfect and near perfect multicollinearity. Perfect multicollinearity arise when one or more of the independent variables are a linear function of another independent variable (Brooks, 2014). The consequence of perfect multicollinearity is that the coefficients are not possible to estimate. However, this issue has a low probability of occurring when performing regression analysis. On the other hand, near perfect multicollinearity is a more common problem. Signs of near perfect multicollinearity are a high r-squared, large standard errors of the estimated coefficients and high sensitivity when a variable is dropped or added. The explanatory power of the model is high but independent coefficients are not significant when near multicollinearity is present. The issue could be detected through an especially high correlation between the dependent variable and independent variables (Brooks, 2014).

We detected a possible issue with one of our preliminary control variables<sup>8</sup> during early correlation analysis. The variable is given by the natural logarithm of firms' total assets and controlled for a large firm bias. The variable was dropped from our regression models in order to avoid near perfect multicollinearity. Exclusion of the highly correlated variable is one of the mitigating tools used as a countermeasure (Brooks, 2014). We conclude that the correlation between our regression variables is not large enough to cause further issues after the exclusion. The final correlations are discussed and presented in section 5.4.3.

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<sup>8</sup>The control variable, SIZE, was excluded to establish consistency and robustness of our results. The correlation matrix illustrating the potential issue can be found in Appendix D Table 26.

## 5 Data

The data is described through four parts to provide extensive explanations of our sample and procedures. The first part elaborates on the content of our data sample and chosen merging approach. We then move to discussions of the cleaning and screening procedure for the merged sample. The third part is a comprehensive overview of Thomson Reuters Refinitiv ESG methodology. Finally, we introduce descriptive statistics and correlations between our regression variables.

### 5.1 Data Sample

We retrieved accounting information and ESG performance data from Thomson Reuters Eikon. The Eikon database has a time-series offering where the screening tool allow for application of filters to efficiently narrow the sample size through selection of time period, geographical area and variables of interest, as well as access to an extensive ESG database. We collect the total ESG score, ESGC score, Environmental, Social and Governance pillar scores, and all sub-category components scores. The accountable weights for each retrieved factor in the total ESG estimation from the Thomson Reuters Refinitiv methodology are found in section 5.3. Another advantage of using Eikon for both accounting and ESG performance data collection is the mitigation of matching methods for the two distinct data categories.

A proxy for the economic firm age was needed in order to estimate the SA financial constraints index, as mentioned earlier. The variable is a measurement of consecutive fiscal years each individual firm has been listed on an official exchange. The annual common shares outstanding measure the number of years listed and was gathered from the Wharton Research Data Services' (WRDS) database COMPUSTAT. The entity specific ISIN code from Eikon was applied to accurately implement the correct market data used in the measure. Furthermore, we conducted numerous ISIN, ticker and manual matching techniques<sup>9</sup> to merge the accounting and ESG performance data with the economic age estimate.

<sup>9</sup>The techniques were mainly conducted using Power Query. Other possible methods

## 5.2 Screening and Cleaning of Merged Sample

We implement a complex screening procedure, where methods and practices from prior empirical studies are incorporated. A ten-year sample period from 2010 until 2019 is used as the baseline for this thesis. The choice of period is due to increased ESG reporting quality, development of the enhanced ESG controversies score and the need for a sufficiently long time-period to validate our findings. Financial institutions are omitted from the sample because of their leverage level not being comparable to companies operating in other industries. Moreover, the inclusion of financial institutions could have created biased results, since the leverage ratio is a controlling variable. We apply the global metric, The Refinitiv Business Classification (TRBC), to identify financial institutions under the defined economic sector *Financials* (The Refinitiv Business Classification, 2020).

Complete datapoints for each entity were needed to properly test our hypotheses, estimate the financial constraints indices and conduct the extended sub-category analyzes. Companies not listed on official exchanges in Europe are excluded, along with firm year observations missing crucial accounting values for the estimation of the WW, SA and KZ index. More specifically, if a company fail or are unable to report one of the accounting or stock variables used in each index estimation, the observation is omitted from the sample. Further, companies missing annual ESG performance data for the total ESG score, ESGC score and three main E, S and G pillars are not further analyzed and excluded from the data. We decided to still include companies with a zero value sub-category score. The reason for the inclusion was that the entity was still studied by Thomson Reuters Refinitiv in the given year when a zero sub-category score is combined with an E, S and G pillar score. Moreover, this inclusion is a contributing factor to retain a sufficiently large sample set. Lastly, significantly large outliers from financial constraints estimations and visual analyzes were removed.

The outcome from our complex screening procedure is an unbalanced panel

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could be to use public Python or MatLab codes. However, Power Query is one of the most time efficient methods for merging datasets based on common identifiers.



dataset consisting of 1,838 datapoints for every regression variable, observations from 25 distinct European countries and 387 unique firm entities (the complete company list can be found in Appendix F *Table 32*). This correspond to a total of 53,302 firm year observations<sup>10</sup> (see section 5.4 for the overview of descriptive statistics).

### 5.3 Thomson Reuters Refinitiv ESG

Veenstra and Ellemers (2020) argued that there is an abundance of companies offering ESG ratings at the moment. Acknowledged agencies such as MSCI, Sustainalytics, Bloomberg, KLD and Refinitiv all provide information to the market. Furthermore, issues due to the different applicable methodologies and output quality are common concerns with ESG ratings, where there is no standardized framework for either reporting by companies or how agencies decide to measure ESG performance (Cheng et al., 2014; Dhaliwal et al., 2011; Garcia-Sanchez et al., 2019; Waddock and Graves, 1997). However, accounting for these irregularities is outside the scope of this thesis. We chose Thomson Reuters Refinitiv ESG scores as our measure because of their unique transparency regarding applied methodology and frequent use in past research (Samet et al., 2018; Chan et al., 2017; Cheng et al., 2014).

The Thomson Reuters ESG performance metric from Eikon was known as ASSET4 until 2016 when it was changed to Thomson Reuters ESG score and recently updated to the Refinitiv ESG score in 2020. The reporting tool currently cover 10 000 companies worldwide and 80% of the global market cap, with a history all the way back to 2002. The ESG scores are an aggregated measure from over 450 ESG metrics divided between 186 underlying estimates based on comparability, industry specific relevance and availability of ESG data. Individual companies' ESG ratings are updated annually in line with the ESG disclosure from their annual reports. The underlying

<sup>10</sup>Included in firm year observations are 24 regression variables and 5 informational datapoints with 1,838 observations each. The informational datapoints are industry identification, business identification, company name, year of observation and country of origin, where the panel id is not included in the calculation.

measures are grouped in ten sub-categories that structure the three main pillars: Resource Use, Emission, Innovation, Workforce, Human Rights, Community, Product Responsibility, Management, Equal Shareholders Rights and CSR strategy (see *Table 19* in Appendix C for definitions of the sub-category components). The Environmental, Social and Governance pillar scores are used to calculate the total ESG score. **Table 1** illustrates the assigned weightings for each pillar and sub-category component in the total ESG score estimation.

**Table 1: Weightings for Thomson Reuters Refinitiv ESG score**

Pillar	Category score	Weight	Sum of weights
Environmental	Emissions	0.15	0.44
	Resource Use	0.15	
	Innovation	0.13	
Social	Community	0.09	0.31
	Human Rights	0.05	
	Product Responsibility	0.04	
	Workforce	0.13	
Governance	Shareholders	0.05	0.26
	CSR Strategy	0.03	
	Management	0.17	

In 2018, the new controversies measure was introduced to form the enhanced ESG score. The controversies score is estimated from 23 controversy topics adjusted for firm size. The objective is to minimize the probability of an estimation bias by assigning a severity rate based on market capitalization, since larger firms attract more media attention in the occurrence of a scandal. The *ESGC* score will be equal to the total *ESG* score with no negative event (Refinitiv, 2020). More than 150 content research analysts manually collect the input data from annual reports, NGO websites, CSR reports, stock exchange filings, company websites and various news sources. Finally, the humanly intervened ESG ratings are quality checked by approximately 300 algorithmic screeners.

The total ESG score together with the Environmental and Social pillar scores are benchmarked using TRBC. The purpose is to measure firms with similar characteristics against one another. The Governance pillar is an exception, where the country of incorporation is deployed as the benchmarked identifier. Moreover, each category score is calculated within a zero to one hundred range and translated into a letter grading between D- to A+ (See *Table 20* in Appendix C for thresholds). To summarize the Thomson Reuters Refinitiv ESG methodology, the scores are based on a data-driven approach adjusting for industry, company size and transparency biases (Refinitiv, 2020).

## 5.4 Descriptive Statistics

In the following section, we report the descriptive statistics of our sample data, as well as the correlations between our main dependent variable and independent variables during the 2010-2019 period. The section begins by describing the annual distribution of observations, industry specific observations and country specific observations. Thereafter, we present summary statistics for our regression variables and discuss the correlations between them.

### 5.4.1 Sample Distribution

**Table 2** summarize the distribution for the number of observations per individual regression variable from 2010 to 2019. The cumulative number of observations per regression variable for the whole sample duration is 1,838. The maximum number of observations in any given year is 259, while the average number of observations per included sample year is 184. Moreover, annual observations increase approximately to the double of 259 in 2018, from the low point of 132 in 2012. We argue that the significant accumulation is due to increased ESG reporting, a higher degree of transparency concerning firms' environmental impact and greater coverage from newer established ESG analysts.

**Table 2: Observations across sample period**

		<i>Average:</i>	<i>184</i>
<b>Year</b>	<b>Observations</b>	<b>%</b>	
2010	165	8.98%	
2011	137	7.45%	
2012	132	7.18%	
2013	166	9.03%	
2014	178	9.68%	
2015	204	11.10%	
2016	213	11.59%	
2017	210	11.43%	
2018	259	14.09%	
2019	174	9.47%	
<b>Total</b>	<b>1,838</b>	<b>100.00%</b>	

**Table 3** illustrate the industry specific sample composition. Panel A present the distribution of observations across all included business sectors. Industrial & Commercial Services, Energy-Fossil Fuel and Industrial Goods represent the largest portion of observations. However, the other business sectors are satisfactory populated. Panel B aggregate the observations per business sectors into the main industry sectors according to TRBC. Approximately 25% of the total sample consist of the Industrials sector. The population between the other industry sectors are again satisfactory, except for the Real Estate industry which contain only 10 observations. We argue that the low number of observations would not impact our conclusions, since this thesis analyze the ESG performance on an aggregated industry level. Furthermore, our sample represent ten out of the total eleven industry sectors incorporated in the TRBC due to the removal of the *Financials* industry sector. See *Table 21* in Appendix D for unique firm entity distribution across business and industry sectors.

**Table 3: Sample distribution for industry and business sectors**

Panel A: Business sector distribution		
<b>Business Sector</b>	<b>Observations (N)</b>	<b>%</b>
Industrial & Commercial Services	209	11.37%
Industrial Goods	181	9.85%
Utilities	87	4.73%
Automobiles & Auto Parts	44	2.39%
Mineral Resources	165	8.98%
Technology Equipment	61	3.32%
Telecommunications Services	97	5.28%
Healthcare Services & Equipment	46	2.50%
Energy - Fossil Fuels	217	11.81%
Pharmaceuticals & Medical Research	88	4.79%
Retailers	67	3.65%
Cyclical Consumer Services	87	4.73%
Personal & Household Products & Services	14	0.76%
Software & IT Services	44	2.39%
Food & Beverages	95	5.17%
Chemicals	57	3.10%
Cyclical Consumer Products	79	4.30%
Transportation	62	3.37%
Food & Drug Retailing	52	2.83%
Renewable Energy	5	0.27%
Applied Resources	55	2.99%
Consumer Goods Conglomerates	16	0.87%
Real Estate	10	0.54%
<b>Total</b>	<b>1,838</b>	<b>100.00%</b>
Panel B: Industry sector distribution		
<b>Industry Sector</b>	<b>Observations (N)</b>	<b>%</b>
Industrials	452	24.59%
Utilities	87	4.73%
Consumer Cyclicals	277	15.07%
Basic Materials	277	15.07%
Technology	202	10.99%
Healthcare	134	7.29%
Energy	222	12.08%
Consumer Non-Cyclicals	177	9.63%
Real Estate	10	0.54%
<b>Total</b>	<b>1,838</b>	<b>100.00%</b>

**Table 4** show the distribution of observations across the included European countries. The sample observations are divided between 25 unique countries, with approximately 50% of the sample originating from France and the UK. See *Table 22* in Appendix D for unique firm entity distribution across the included countries.

**Table 4: Observations per included European country**

Country of origin	Observations (N)	%
Austria	28	1.52%
Belgium	51	2.77%
Cyprus	3	0.16%
Czech Republic	1	0.05%
Denmark	46	2.50%
Finland	83	4.52%
France	413	22.47%
Germany	5	0.27%
Greece	29	1.58%
Hungary	11	0.60%
Ireland	48	2.61%
Isle of Man	1	0.05%
Italy	13	0.71%
Jersey	7	0.38%
Luxembourg	22	1.20%
Netherlands	66	3.59%
Norway	20	1.09%
Poland	47	2.56%
Portugal	38	2.07%
Russia	98	5.33%
Spain	77	4.19%
Sweden	51	2.77%
Switzerland	144	7.83%
Ukraine	4	0.22%
United Kingdom	532	28.94%
<b>Total</b>	<b>1,838</b>	<b>100.00%</b>

We see a significant skewed sample distribution, where more observations originate from ESG attentive nations because of ESG reporting being a voluntary disclosure of firm specific information. Only firms who have reported

their ESG activities are observed and could give rise to a sample selection bias (Brooks, 2014). We highlight the importance of including all countries to promote economically significant conclusions considering the ESG topic is relatively new. It is important to be aware of a potential sample selection bias which could affect our final conclusions.

#### 5.4.2 Regression Variables

Table 5 summarizes the descriptive statistics of our main regression variables and are estimated for the whole sample duration.

**Table 5: Descriptive statistics of main regression variables**

This table summarizes the descriptive statistics of our main regression variables for the entire sample period. *Mean* is the average value. *Min* is the minimum value. *25th* is the first quartile. *Median* is the median observed value. *75th* is the third quartile. *Max* is the maximum observed value. *std* is the standard deviation. *N* is the total included sample observations for each variable. Our main model's dependent variable (*FC (WW)*) is calculated for every unique entity at the end of each observed year. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *ESGC* is the enhanced total ESG score where controversies are included. *ESGE* is the Environmental pillar score. *ESGS* is the Social pillar score. *ESGG* is the Governance pillar score. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *ROA* is the return on assets given by the book value. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *LR* is the leverage ratio given by the long-term debt over total assets.

Variable	Mean	Min	25th	Median	75th	Max	Std	N
FC (WW)	-0.38	-0.57	-0.43	-0.38	-0.43	0.09	0.07	1,838
ESG	57.56	5.74	44.12	58.07	44.12	94.00	18.53	1,838
ESGC	54.16	5.74	42.38	53.91	42.38	93.47	16.96	1,838
ESGE	56.06	1.04	38.71	56.79	38.71	98.74	23.82	1,838
ESGS	60.76	0.44	43.97	63.52	43.97	98.64	22.31	1,838
ESGG	54.40	2.28	37.35	56.01	37.35	97.75	22.38	1,838
AI	-0.12	-9.22	-0.09	-0.03	-0.09	3.17	0.50	1,838
CH	698.25	0.00	76.86	223.99	76.86	14679.74	1326.45	1,838
ROA	0.05	-0.60	0.02	0.05	0.02	0.37	0.06	1,838
AGE	2.89	0.00	2.71	3.09	2.71	3.50	0.59	1,838
LR	0.20	0.00	0.11	0.19	0.11	1.11	0.13	1,838

\*Minimum value for *CH* is 0.0020 and *LR* is 0.00002, due to the use of two decimal points the minimum value is illustrated as 0.00. Moreover, the reported zero minimum economic age is explained by the natural logarithm being estimated at zero if a firm has only been listed for one consecutive year on an official exchange.

We have a mean total *ESG* score of 54.16 with a standard deviation of 18.53. This implies a large variation across firms regarding the ESG performance. More specifically, the ESG performance range from 94.00 as the highest, to 5.74 for the least sustainable firm. The financial constraints measure (*FC*) has a mean of -0.38 and a standard deviation of 0.07, indicating a modest variation of the estimated scores across our sample. Further, the sample firms have an average annual bid-ask spread (*AI*) of -0.12 and Cash Holding Liquidity (*CH*) of 698.25.

Table 6 report the average values of our regression variables for each represented sample country.

**Table 6: Average variable values across European countries**

This table present the average values of the main regression variables for each country included in our sample. *Country of origin* illustrate the headquarter of the included firm observation and its values. Our main model's dependent variable (*FC (WW)*) is calculated for every unique entity at the end of each observed year. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *ESGC* is the enhanced total ESG score where controversies are included. *ESGE* is the Environmental pillar score. *ESGS* is the Social pillar score. *ESGG* is the Governance pillar score. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *ROA* is the return on assets given by the book value. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *LR* is the leverage ratio given by the long-term debt over total assets.

Country of origin	FC (WW)	ESG	ESGC	ESGE	ESGS	ESGG	AI	CH	ROA	AGE	LR
Austria	-0.38	47.79	47.14	48.00	51.85	40.20	-0.09	353.43	0.04	2.80	0.18
Belgium	-0.33	47.79	47.73	46.95	48.05	49.93	-0.15	153.47	0.02	2.70	0.33
Cyprus	-0.35	68.59	68.59	64.88	58.34	91.46	-0.04	13.75	0.07	2.53	0.42
Czech Republic	-0.38	43.58	43.58	18.14	55.64	38.89	-0.01	192.13	0.13	2.64	0.03
Denmark	-0.30	46.39	45.24	49.98	46.91	40.20	-0.16	394.55	0.04	3.10	0.08
Finland	-0.36	60.39	58.77	63.51	60.88	54.80	-0.02	382.58	0.05	2.95	0.17
France	-0.40	59.91	56.59	65.12	65.51	47.20	-0.29	1126.54	0.04	3.05	0.19
Germany	-0.42	51.97	51.97	40.68	61.07	51.07	-0.04	741.32	0.07	3.08	0.23
Greece	-0.34	57.79	54.14	50.65	63.84	54.71	-0.03	516.94	0.01	2.92	0.26
Hungary	-0.38	73.88	71.56	74.31	77.44	65.17	-0.03	127.94	0.04	3.00	0.17
Ireland	-0.37	55.38	54.97	48.42	54.73	64.75	-0.12	308.16	0.04	2.62	0.25
Isle of Man	-0.35	43.60	43.60	14.63	53.24	43.99	-0.02	661.64	0.00	2.64	0.30
Italy	-0.39	70.04	62.74	67.95	75.44	65.63	-0.02	828.79	0.01	3.27	0.21
Jersey	-0.38	61.65	53.01	64.76	58.95	61.88	-0.03	626.15	0.03	2.57	0.11
Luxembourg	-0.43	58.34	51.28	54.37	67.08	48.52	-0.34	915.30	0.03	2.64	0.18
Netherlands	-0.42	69.29	59.72	70.13	73.73	62.50	-0.07	1217.67	0.04	2.98	0.25
Norway	-0.42	71.45	63.59	71.08	78.46	59.12	-0.02	412.11	0.05	2.88	0.20
Poland	-0.34	37.04	36.49	33.33	33.61	44.02	-0.07	176.19	0.01	2.32	0.13
Portugal	-0.35	62.26	60.92	66.58	62.76	54.72	-0.07	170.97	0.04	2.97	0.28
Russia	-0.41	45.01	44.71	41.61	39.15	58.54	-0.02	755.09	0.10	1.67	0.23
Spain	-0.41	69.42	68.28	74.40	76.37	53.41	-0.09	823.83	0.03	2.79	0.25
Sweden	-0.39	64.11	60.93	62.67	75.24	46.95	-0.01	550.19	0.07	3.18	0.22
Switzerland	-0.40	64.59	58.77	58.71	71.60	60.32	-0.24	1114.35	0.07	2.92	0.16
Ukraine	-0.32	37.82	37.82	24.56	35.41	56.58	-0.09	90.11	0.09	2.35	0.19
United Kingdom	-0.35	54.90	50.74	48.03	56.97	59.10	-0.03	469.38	0.05	3.03	0.20

We observe that country of origin is an important determinant for a signif-



ificant number of our variable values. The ESG performance is, as expected, different between the European countries. Hungary followed by Norway, exhibit the highest average ESG score of 73.88 and 71.45 respectively. See *Table 23* , *Table 24* and *Table 25* in Appendix D for full descriptive statistics of all regression variables.

### 5.4.3 Correlation Matrix

**Table 7** outline the results from a Pearson correlation matrix. The correlations are calculated against our main dependent variable, the WW index. The additional correlation matrices are illustrated in Appendix E. The matrices for the KZ index and SA index are presented in *Table 27* and *Table 28* , whereas the full correlation matrix for the WW index is located in *Table 29* . Furthermore, a complete correlation matrix illustrating all relationships between our regression variables, including the correlations between the financial constraints indices, is presented in *Table 30* .

#### **Table 7: Correlation matrix for WW index and main variables**

This table present the results from a Pearson correlation matrix, where the correlations are estimated against the dependent variable, WW index. Our main model's dependent variable (*FC (WW)*) is calculated for every unique entity at the end of each observed year. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *ESGC* is the enhanced total ESG score where controversies are included. *ESGE* is the Environmental pillar score. *ESGS* is the Social pillar score. *ESGG* is the Governance pillar score. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *ROA* is the return on assets given by the book value. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *LR* is the leverage ratio given by the long-term debt over total assets.

Variable	FC (WW)	ESG	ESGC	ESGE	ESGS	ESGG	CH	AI	AGE	ROA	LR
FC (WW)	1.00										
ESG	-0.59	1.00									
ESGC	-0.42	0.87	1.00								
ESGE	-0.58	0.85	0.74	1.00							
ESGS	-0.51	0.88	0.77	0.69	1.00						
ESGG	-0.31	0.64	0.56	0.33	0.34	1.00					
CH	-0.57	0.38	0.19	0.36	0.34	0.19	1.00				
AI	0.01	0.04	0.02	0.02	0.01	0.08	0.01	1.00			
AGE	-0.08	0.26	0.24	0.21	0.34	0.02	0.12	-0.07	1.00		
ROA	-0.11	-0.03	0.00	-0.05	0.00	-0.02	-0.03	-0.03	-0.02	1.00	
LR	0.04	0.04	0.07	0.01	0.02	0.08	-0.09	0.02	-0.05	-0.08	1.00

The first thing to notice is the high correlation between the total *ESG* score and the three main pillars. The correlation with the Environmental (*ESGE*) and Social (*ESGS*) pillar is especially high, estimated at 0.85 and 0.88. The correlation between the total *ESG* score and the Governance (*ESGG*) pillar is lower at 0.64, indicating that the other two pillars have a larger impact on the overall ESG performance than the governance aspect. Moreover, we observe a substantial negative relationship between the total *ESG* score and financial constraints (*FC (WW)*). This is as expected, where a higher ESG performance should indicate fewer capital constraints and an easier access to finance.

Other important notices are the large negative -0.57 correlation between Cash Holding Liquidity (*CH*) and financial constraints, as well as the variable's high positive correlation with the total *ESG* score. We observe a low positive correlation between Asymmetric Information (*AI*) and financial constraints. These relationships are supported through previous studies. Chan et al. (2017) and Borghesi et al. (2014) illustrated that firms with lower financial constraints exhibit a higher cash flow liquidity, while other authors have argued a smaller degree of asymmetric information decrease the level of financial constraints (Samet et al., 2018; Cheng et al., 2014; Dhaliwal et al., 2011; Garcia-Sanchez et al., 2019). To conclude the discussion, the included control variables all correlate with expected signs to financial constraints. The correlation matrix is not a valid tool to draw any definite conclusions concerning accurate relationships between the regression variables. However, we are able to theorize that our findings support prior academic literature.

## 6 Results

In this section, we present the results from our regression models when implementing the WW index as the proxy measure for financial constraints. The main investigation intends to establish preliminary conclusions to our research question. First, we study the interaction between ESG performance on financial constraints by intermediating the effects from asymmetric information and cash holding liquidity. Second, we deconstruct the overall ESG score into the respective E, S and G pillars to examine each individual economic significance and uncover underlying roles. Finally, the evidence from the sub-category component analysis is presented.

### 6.1 ESG, Asymmetric Information and Cash Holding Liquidity on Financial Constraints

The regression results from segment 1 are presented in Table 8. The models were developed to investigate if there is a significant negative relationship between ESG performance and financial constraints. Our results indicate that there exists a statistically significant negative relationship, which support our first hypothesis. The *ESG* coefficient in Model (1) is highly significant and estimated at -0.0023. We observe that an increase of one standard deviation in ESG lead to a 4% decrease in financial constraints. Hence, the relationship is of economic significance for the market participants in Europe. The evidence is consistent with prior research conducted on the topic (Cheng et al., 2014; Samet et al., 2018; Chan et al., 2017). The significant negative relationship holds for Model (2) and Model (3) with the respective estimates of -0.0024 and -0.0018.

Model (2) investigate the possibility that better performing ESG firms exploit the increased transparency to decrease the asymmetric information. Dhaliwal et al. (2012) and Garcia-Sanchez et al. (2019) argued higher performing ESG firms are rewarded for their informational transparency by the market. The *AI* coefficient estimated at 0.0016 illustrate the positive relationship with financial constraints expressed in our second hypothesis. Even

though our positive effect is in line with prior research, the coefficient is not statistically significant at the 10% level. We argue a rational explanation is that the variation is already accounted for by the ESG variable, given that literature have provided evidence of a link between CSR transparency and financial constraints (Samet et al., 2018). Our argument is built upon the proposition that ESG reporting provide the market with information previously only available to firm insiders. This newly public information replaces the effect expected to be illustrated by the *AI* parameter.

Model (3) illustrate that better performing ESG firms experience lower financial constraints and a higher liquidity. The coefficient *CH* representing firms' cash holding liquidity is estimated at -0.00002 and significant at the 1% level. The evidence supports our third hypothesis and suggest the market reward ESG focused firms when higher cash liquidity is achieved. Firms with a greater holding exhibit an ability to contribute with a larger collateral value and superior security. Furthermore, our finding is consistent with Chan et al. (2017), who argued that better performing ESG firms have a higher liquidity in combination with lower financial constraints. The results from prior empirical literature suggest these firms are subject to the lower financial constraints due to minimization of agency costs (Jensen and Meckling, 1976; Jensen, 1986), and increased capital liquidity to be used for ESG enhancing activities (Borghesi et al., 2014).

Lastly, all controlling variables are highly significant for Model (1) through (3). The *ROA* and *AGE* parameters are negatively linked to financial constraints, while *LR* exert a positive relationship. These findings are as expected, where a firm with lower bankruptcy costs, higher operating performance and more public trust should attract greater external capital to fund positive NPV projects. Samet et al. (2018) found similar effects for *ROA* and *AGE* as their controlling variables when studying the financial constraints. Moreover, the positive *LR* relationship indicate that financially constrained firms have a higher leverage ratio, and in turn a larger cost of debt followed by more severe bankruptcy costs. This interesting observation is further supported by Gao and Zhu (2015) and Hamrouni et al. (2019).

**Table 8: Results from total ESG score regressions**

This table reports the results from the cross-sectional regressions for our main models (1)-(3) during the period 2010-2019 on the *WW* financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (1) the overall ESG score is the variable of interest. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. In regression model (2) the asymmetric information (*AI*) is the variable of interest. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. In regression model (3) the cash holding liquidity (*CH*) is the variable of interest. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

<b>Variable</b>	<b>Model (1)</b>	<b>Model (2)</b>	<b>Model (3)</b>
<i>ESG</i>	-0.0023*** (0.00008)	-0.0024*** (0.00008)	-0.0018*** (0.00007)
<i>AI</i>		0.0016 (0.0025)	
<i>CH</i>			-0.00002*** (0.0000009)
<i>AGE</i>	-0.0120*** (0.0027)	-0.0120*** (0.0027)	-0.0077*** (0.0024)
<i>ROA</i>	-0.1374*** (0.0215)	-0.1366*** (0.0215)	-0.1505*** (0.0191)
<i>LR</i>	0.0382*** (0.0104)	0.0382*** (0.0104)	0.0232** (0.0113)
<b>YEAR FE</b>	Yes	Yes	Yes
<b>INDUSTRY FE</b>	Yes	Yes	Yes
<b>COUNTRY FE</b>	Yes	Yes	Yes
<b>OBSERVATIONS</b>	1,838	1,838	1,838
<b>ADJUSTED R2</b>	0.5145	0.5143	0.6159

## 6.2 How Environmental, Social and Governance Performance affect Financial Constraints

We continue the main analysis by studying which pillars primarily drive the significant negative relationship. **Table 9** present the extended regression analysis for Models (4)-(6). The models are estimated by replacing the total ESG score with the E, S and G pillar scores. The variables of interest are the Environmental score (*ESGE*) in Model (4), the Social score (*ESGS*) in Model (5) and the Governance score (*ESGG*) in Model (6). The total ESG score represent a weighted view of the entity's performance in the Environmental, Social and Governance area. We expect to find a significant negative relationship with all three pillar scores, where Environmental and Social performance are the superior contributors, as previously argued by Samet et al. (2018)<sup>11</sup>. Model (4) show that the Environmental pillar is negative at -0.0017 and significant at the 1% level. Model (5) illustrate the Social pillar is, as expected, negative at -0.0017 and significant at the 1% level. These results confirm prior literature who argued the ESG relationship on financial constraints is driven by both Environmental and Social activities. Moreover, Model (6) provide evidence that the Governance dimension could also be a driving factor for the minimization of financial constraints. The coefficient is estimated at -0.0011 and significant at the 1% level, confirming findings from Cheng et al. (2014). The evidence from the extended pillar analysis supports our segment 2 hypotheses. However, we discover a lower effect from improved Governance performance than from the other two respective pillars.

The environmental pillar exerts the ability of a firm to deploy resources intended towards the mitigation of environmental risks and creating sustainable solutions. The social pillar is a reflection of firms' societal responsibility and the governance pillar assess the degree of internal control measures for agency cost minimization. The lower effect of Governance suggests

<sup>11</sup>Samet et al. (2018) based their CSR measure on an equally weighted index estimated from the Environmental and Social pillar, while excluding the Governance pillar in their analysis.

the Environmental and Social performance contribute to a lower financial constraints at a higher degree. These findings rationalize why a selection of prior research have chosen to exclude the Governance performance from their empirical analysis<sup>12</sup>. The observations are further strengthened by our sub-category component analysis presented below in section 6.3. In terms of our control variables, similar expected relationships and significance levels are once more observed.

### Table 9: Results from individual E, S and G pillar regressions

This table reports the results from the E, S and G cross-sectional regressions for the period 2010-2019 on the *WW* financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (4) the Environmental pillar (*ESGE*) is the variable of interest. In regression model (5) the Social pillar (*ESGS*) is the variable of interest. In regression model (6) the Governance pillar (*ESGG*) is the variable of interest. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (4)	Model (5)	Model (6)
<i>ESGE</i>	-0.0017*** (0.00006)		
<i>ESGS</i>		-0.0017*** (0.00007)	
<i>ESGG</i>			-0.0011*** (0.00007)
<i>AGE</i>	-0.0159*** (0.0028)	-0.0124*** (0.0029)	-0.0251*** (0.0031)
<i>ROA</i>	-0.1286*** (0.0221)	-0.1156*** (0.0232)	-0.1421*** (0.0248)
<i>LR</i>	0.0302*** (0.0107)	0.0356*** (0.0112)	0.0327*** (0.0120)
<i>YEAR FE</i>	Yes	Yes	Yes
<i>INDUSTRY FE</i>	Yes	Yes	Yes
<i>COUNTRY FE</i>	Yes	Yes	Yes
<i>OBSERVATIONS</i>	1,838	1,838	1,838
<i>ADJUSTED R2</i>	0.4855	0.4344	0.3530

<sup>12</sup>See Appendix G Table 33 for combined *ESGE*, *ESGS* and *ESGG* regression results from all three financial constraints indices.

### 6.3 Sub-category extension and true underlying drivers of Financial Constraints

The final extension to our analysis is to deconstruct the total ESG score into the sub-category components. We study each individual link between the components and financial constraints to identify the true drivers of the observed relationship. The underlying effects remain hidden when the aggregated ESG score is investigated. Hence, we find it highly relevant to study which of the components that drive the illustrated negative relationship between ESG performance and financial constraints. Prior research deployed an incomplete component analysis, where only a selection of the individual sub-categories contributing to the overall ESG score have been investigated (El Ghouli et al., 2011; Dhaliwal et al., 2011; Chan et al., 2017; Cheng et al., 2014; Samet et al., 2018). We complement the existing research by examining the complete range of sub-category scores available in the Thomson Reuters Refinitiv database. The following ten sub-categories are analyzed: Resource Use (*ESG\_RU*) in Model (7), Emission (*ESG\_MA*) in Model (8), Environmental Innovation (*ESG\_EI*) in Model (9), Workforce (*ESG\_WF*) in Model (10), Human Rights (*ESG\_HR*) in Model (11), Community (*ESG\_CO*) in Model (12), Product Responsibility (*ESG\_PR*) in Model (13), Management (*ESG\_MA*) in Model (14), Equal Shareholder Rights (*ESG\_ES*) in Model (15) and CSR Strategy (*ESG\_CS*) in Model (16).

**Table 10** present the results obtained from the extended analysis and provide evidence of a negative relationship for nine out of the total ten sub-category components. These nine sub-categories are Resource Use, Emission, Environmental Innovation, Workforce, Human Rights, Community, Product Responsibility, Management and CSR Strategy, all significant at the 1% level. We argue societal activities are a driving component of the negative relationship between ESG performance and financial constraints, contradicting remarks from Samet et al. (2018), who found Community performance to be insignificant.



**Table 10: Results from extended sub-category regressions**

This table reports the results from the sub-category cross-sectional regressions for the period 2010-2019 on the *WW* financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. *ESG\_RU* is the sub-category Resource Use score in model (7). *ESG\_EM* is the sub-category Emission score in model (8). *ESG\_EI* is the sub-category Environmental Innovation score in model (9). *ESG\_WF* is the sub-category Workforce score in model (10). *ESG\_HR* is the sub-category Human Rights score in model (11). *ESG\_CO* is the sub-category Community score in model (12). *ESG\_PR* is the sub-category Product Responsibility score in model (13). *ESG\_MA* is the sub-category Management score in model (14). *ESG\_ES* is the sub-category Equal Shareholder Rights score in model (15). *ESG\_CS* is the sub-category CSR Strategy Score in model (16). *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)
<i>ESG_RU</i>	-0.0013*** (0.00005)									
<i>ESG_EM</i>		-0.0014*** (0.00005)								
<i>ESG_EI</i>			-0.0008*** (0.00005)							
<i>ESG_WF</i>				-0.0013*** (0.00008)						
<i>ESG_HR</i>					-0.0009*** (0.00005)					
<i>ESG_CO</i>						-0.0009*** (0.00005)				
<i>ESG_PR</i>							-0.0008*** (0.00005)			
<i>ESG_MA</i>								-0.0008*** (0.0005)		
<i>ESG_ES</i>									0.0001 (0.00007)	
<i>ESG_CS</i>										-0.0011*** (0.00005)
<i>AGE</i>	-0.0170*** (0.0029)	-0.0141*** (0.0029)	-0.0241*** (0.0031)	-0.0224*** (0.0031)	-0.0162*** (0.0031)	-0.0204*** (0.0031)	-0.0208*** (0.0032)	-0.0253*** (0.0032)	-0.0277*** (0.0033)	-0.0182*** (0.0030)
<i>ROA</i>	-0.0922*** (0.0232)	-1.004*** (0.0229)	-0.1496*** (0.0248)	-0.0957*** (0.0249)	-0.1074*** (0.0246)	-0.1346*** (0.0249)	-0.1135*** (0.0251)	-0.1314*** (0.0253)	-0.1173*** (0.0266)	-0.1509*** (0.0238)
<i>LR</i>	0.0325*** (0.0133)	0.0333*** (0.0111)	0.0088 (0.1204)	0.0251** (0.0120)	0.0273** (0.0119)	0.0319*** (0.0120)	0.0273** (0.0121)	0.0333*** (0.0122)	0.0242* (0.0129)	0.0257** (0.0115)
YEAR FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838
ADJUSTED R2	0.4347	0.4461	0.3517	0.3476	0.3616	0.3493	0.3359	0.3276	0.2505	0.4038

Our observations indicate that firms with a superior performance in terms of Emission, Environmental Innovation, Workforce, Human Rights, Community, Product Responsibility, Management and CSR Strategy exhibit an easier access to finance. On the other hand, the estimated coefficient for Equal Shareholder Rights is interestingly positive and insignificant at the 10% level. The finding support the lower Governance effect presented in the segment 2 analysis. The evidence suggests that treating all shareholders equal does not contribute to lower financial constraints. This is partly a contradiction to the minority vs. majority, and managers vs. shareholders agency conflicts discussed by Schleifer and Vishny (1997). As our sub-category components analysis illustrates, such activities are less important for firms' financial decisions and ultimately their access to finance. The largest absolute effect on financial constraints originates from Emission (-0.0014), Resource Use (-0.0013) and Workforce (-0.0013). These effects imply investors emphasize climate risks, climate opportunities and employee relations as the primary drivers of financial constraints, further validated in section 7.0. Furthermore, the aforementioned sub-category components aggregate to the Environmental and Social pillar scores<sup>13</sup>.

We conclude that the findings from segment 1 through 3 anticipate preliminary support for the main research question of this thesis. The next section presents the results from our additional testing, and numerous robustness checks to validate these findings.

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<sup>13</sup>See Appendix C *Table 19* for the full overview of which sub-category components aggregate to the respective Environmental, Social and Governance pillar scores.

## 7 Validity and Robustness

We conduct supplementary testing for segment 1 through 3 by replacing the WW index with the KZ and SA index as the estimate for financial constraints. In addition, we examine the robustness of our primary results by deploying the enhanced ESGC score, analyzing year-by-year regressions and run pooled sample regressions for all three financial constraints indices.

### 7.1 Additional Testing

#### 7.1.1 KZ Index

We begin our additional testing to further investigate the relationship between ESG performance and financial constraints by implementing the first comparable measure, the KZ index. The methodology from the main analysis is equivalently applied in order to validate our primary findings. **Table 11** report the results from the segment 1 regression analysis using the KZ index as the dependent variable. We expect to observe a significant negative relationship between ESG performance and financial constraints. Throughout Models (1)-(3), the *ESG* parameter is negative and significant at the 1% level. It is estimated at -0.0159 in Model (1), -0.0164 in Model (2) and -0.0168 in Model (3). A much stronger effect from a one standard deviation increase of ESG for the financial constraints is observed when comparing the economic significance to the WW index. The financial constraints decrease by 29% due to a larger standard deviation present in the KZ index. The results are in strong support of our main question and are further explored with robustness tests.

We observe a significant *AI* parameter at the 5% level and estimated at 0.2461 in Model (2), contradicting our primary results. The evidence provide reinforcement for the analysis conducted by Dhaliwal et al. (2012) and Garcia-Sanchez et al. (2019). Furthermore, the mixed evidence is also illustrated in the *CH* parameter, estimated at 0.00004 and insignificant at the 10% level. These findings are opposite of what was uncovered in the previous section and suggest that further testing is needed to arrive at definite

conclusions. There are deviations in how the financial constraints indices are estimated for each individual entity for every included year. The variation observed in the variables of interest could be explained by the different accounting parameters included in the index estimation. Similar relationships and significance levels for the *ROA* and *LR* parameters as with the *WW* index are demonstrated. The early evidence from the additional analysis strengthens the support of our hypothesis and suggest the existence of a negative relationship between ESG performance and financial constraints. However, the contradictory results regarding asymmetric information and cash holding liquidity underline the need for further testing.

### Table 11: Results from total ESG score regressions with KZ index

This table reports the results from the cross-sectional regressions for our main models (1)-(3) during the period 2010-2019 on the *KZ* financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (1) the overall ESG score is the variable of interest. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. In regression model (2) the asymmetric information (*AI*) is the variable of interest. *AI* is the parameter measuring Asymmetric Information in terms of the annual bid-ask spread at closing. In regression model (3) the cash holding liquidity (*CH*) is the variable of interest. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)	Model (2)	Model (3)
<i>ESG</i>	-0.0159*** (0.0034)	-0.0164*** (0.0034)	-0.0168*** (0.0036)
<i>AI</i>		0.2461** (0.1157)	
<i>CH</i>			0.00004 (0.00005)
<i>AGE</i>	-0.1058 (0.1239)	-0.0939 (0.1239)	-0.1134 (0.1244)
<i>ROA</i>	-14.319*** (0.9758)	-14.201*** (0.9764)	-14.295*** (0.9764)
<i>LR</i>	3.323*** (0.4725)	3.3151*** (0.5678)	3.3494*** (0.4739)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.2873	0.2887	0.2871

The segment 2 analysis conducted with the KZ index as the dependent variable, report approximately equal results as the main regressions. **Table 12** show the estimates from the individual Environmental, Social and Governance pillar regressions. The variables of interest are, as previously, the Environmental score (*ESGE*) in Model (4), the Social score (*ESGS*) in Model (5) and the Governance score (*ESGG*) in Model (6). The results we obtain are consistent with the findings provided by Cheng et al. (2014) and act as a strong affirmation toward the evidence from the primary analysis. We observe similar negative and statistically significant relationships at the 1% level for all variables of interest. The Governance pillar is again the parameter with the least exhibited negative effect on financial constraints. The Environmental pillar is estimated at -0.0119 in Model (4), the Social pillar is estimated at -0.0112 in Model (5) and the Governance pillar is estimated at -0.0107 in Model (6).

The estimates support the theory concerning Environmental and Social activities being the primary drivers of firms' overall ESG performance, while the Governance factor contribute to the overall score at a subordinate level. The findings are in a strong support of our previous presented argument. Investors weigh these activities to a larger extent when evaluating the possibility of firms' moving into distressed situations and are unable to fund positive NPV projects. Furthermore, the relationships have currently been discovered using two different estimates with unique firm performance characteristics. We cannot state any defining conclusions about the primary drivers at this stage. However, the preliminary conclusion discussed above can be reached.

Our final arguments are presented in the next section where the pillar relationships have been fully analyzed through the implementation of all three acknowledged financial constraints indices. The results from the segment 2 analysis are further strengthened by the additional sub-category component analysis when applying the KZ index as the proxy measure.

**Table 12: Results from E, S and G regressions with KZ index**

This table reports the results from the E, S and G cross-sectional regressions for the period 2010-2019 on the KZ financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (4) the Environmental pillar (*ESGE*) is the variable of interest. In regression model (5) the Social pillar (*ESGS*) is the variable of interest. In regression model (6) the Governance pillar (*ESGG*) is the variable of interest. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (4)	Model (5)	Model (6)
<i>ESGE</i>	-0.0119*** (0.0026)		
<i>ESGS</i>		-0.0112*** (0.0030)	
<i>ESGG</i>			-0.0107*** (0.0027)
<i>AGE</i>	-0.1306 (0.1232)	-0.1123 (0.1250)	-0.1861 (0.1221)
<i>ROA</i>	-14.26*** (0.9760)	-14.172*** (0.9774)	-14.414*** (0.9785)
<i>LR</i>	3.2688*** (0.4724)	3.3019*** (0.4735)	3.3071*** (0.4732)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.2865	0.2842	0.2851

The observations from the segment 3 analysis using the KZ index as the dependent variable are reported in *Table 34* in Appendix G. The following ten sub-categories are once more studied: Resource Use (*ESG\_RU*) in Model (7), Emission (*ESG\_MA*) in Model (8), Environmental Innovation (*ESG\_EI*) in Model (9), Workforce (*ESG\_WF*) in Model (10), Human Rights (*ESG\_HR*) in Model (11), Community (*ESG\_CO*) in Model (12), Product Responsibility (*ESG\_PR*) in Model (13), Management (*ESG\_MA*) in Model (14), Equal Shareholder Rights (*ESG\_ES*) in Model (15) and CSR Strategy (*ESG\_CS*) in Model (16). The extended regression results show a significant negative relationship for eight out of the total ten sub-category components. More specifically, the significant components are Resource Use, Emission, Workforce, Human Rights, Community, Product Responsibility, Management and CSR Strategy. We display contradictory arguments regarding the Community component found insignificant

by Samet et al. (2018), for the second time. The sub-category component, Equal Shareholder Rights, is positive and insignificant. The finding suggests again that treating all shareholders equal does not contribute to lower financial constraints. Moreover, the component Environmental Innovation, is as well insignificant and help to explain the lower Environmental pillar effect when the KZ index is deployed. The largest absolute effect on financial constraints originates from Emission (-0.0144), Resource Use (-0.0128) and Workforce (-0.0166). We observe corresponding evidence concerning the emphasize on climate risks, climate opportunities and employee relations in terms of financial constraints, as in the primary regressions.

We conclude that the results when applying the KZ index indicate additional support for the main research question of this thesis. However, we anticipate inconclusive evidence concerning the auxiliary effects of asymmetric information and cash holding liquidity.

### 7.1.2 SA Index

The final part of additional testing replaces the WW index with the SA index as the measure for financial constraints. The methodology from the main analysis is again equivalently applied to validate our primary findings. **Table 13** report the results from the segment 1 regression analysis, using the SA index as the dependent variable. We expect to observe a significant negative relationship between ESG performance and financial constraints once more. The *ESG* parameter is negative and significant at the 1% level, consistent with previous observations. It is estimated at -0.0012 in Model (1), -0.0013 in Model (2) and -0.0020 in Model (3). Moreover, we see a 2% decrease in financial constraints from a one standard deviation increase in ESG. We argue the economic significance is still of importance, although the effect is smaller than the other indices.

A significant *AI* parameter at the 5% level estimated at 0.0278 in Model (2) is observed, contradicting the main results. The finding is in line with the analysis conducted by Dhaliwal. (2012) and Garcia-Sanchez et al. (2019), for a second time during the additional testing phase. Furthermore, the

mixed evidence is again present in the *CH* parameter, estimated at 0.00003 and significant at the 1% level. We expected to observe a negative relationship, as in the primary analysis. However, the parameter exerts an opposing positive effect on financial constraints, supporting the findings of Jensen and Meckling (1976) and Jensen (1986). The *AGE* control variable is replaced with *AGE<sub>IN</sub>* to minimize a potential multicollinearity issue when regressing the SA index<sup>14</sup>. Both the *ROA* and *AGE<sub>IN</sub>* parameters are negative and significant at the 1% level, supporting Samet et al. (2018). On the other hand, *LR* is negative and significant in Model (1) and (2), contradicting the evidence from the primary regressions and prior academic research.

**Table 13: Results from total ESG score regressions with SA index**

This table reports the results from the cross-sectional regressions for our main models (1)-(3) during the period 2010-2019 on the SA financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (1) the overall ESG score is the variable of interest. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. In regression model (2) the asymmetric information (*AI*) is the variable of interest. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. In regression model (3) the cash holding liquidity (*CH*) is the variable of interest. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *AGE<sub>IN</sub>* is the firm age control proxy variable, given as the total number of years since inception of each specific entity. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)	Model (2)	Model (3)
<i>ESG</i>	-0.0012*** (0.0003)	-0.0013*** (0.0003)	-0.0020*** (0.0004)
<i>AI</i>		0.0278** (0.0114)	
<i>CH</i>			0.00003*** (0.000005)
<i>AGE<sub>IN</sub></i>	-0.1365*** (0.0072)	-0.1359*** (0.0072)	-0.1338*** (0.0072)
<i>ROA</i>	-0.2656*** (0.0957)	-0.2518*** (0.0958)	-0.2518*** (0.0949)
<i>LR</i>	-0.0933** (0.0467)	-0.0938** (0.04666)	-0.0702 (0.0464)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.4654	0.4669	0.4757

<sup>14</sup>See Appendix A Table 17 : Part 3 for SA index estimation and variable inclusion.



The segment 2 regressions with the SA index as the dependent variable, report similar results as in the main regressions. The variables of interest in **Table 14** are once more, the Environmental score (*ESGE*) in Model (4), the Social score (*ESGS*) in Model (5) and the Governance score (*ESGG*) in Model (6). Similar negative and statistically significant relationships for the Environmental and Social pillars are observed. The Environmental pillar is estimated at -0.0119 in Model (4) and the Social pillar is estimated at -0.0112 in Model (5). The evidence is consistent with the findings by Cheng et al. (2014) and support the results previously obtained. However, the Governance pillar is insignificant and estimated at -0.0107 in Model (6). We witness once again a comparable pattern regarding the Environmental and Social activities being the primary drivers of firms' overall ESG performance and minimization of financial constraints.

**Table 14: Results from E, S and G regressions with SA index**

This table reports the results from the E, S and G cross-sectional regressions for the period 2010-2019 on the SA financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (4) the Environmental pillar (*ESGE*) is the variable of interest. In regression model (5) the Social pillar (*ESGS*) is the variable of interest. In regression model (6) the Governance pillar (*ESGG*) is the variable of interest. *AGE<sub>IN</sub>* is the firm age control proxy variable, given as the total number of years since inception of each specific entity. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (4)	Model (5)	Model (6)
<i>ESGE</i>	-0.0005** (0.0003)		
<i>ESGS</i>		-0.0016*** (0.0003)	
<i>ESGG</i>			-0.0001 (0.0003)
<i>AGE<sub>IN</sub></i>	-0.1379*** (0.0072)	-0.1349*** (0.0072)	-0.1386*** (0.0072)
<i>ROA</i>	-0.2607*** (0.0960)	-0.2504*** (0.0953)	-0.2616*** (0.0963)
<i>LR</i>	-0.0993** (0.0468)	-0.0894* (0.0465)	-0.1004** (0.0469)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.4624	0.4707	0.4612

The estimates from the final additional analysis when the SA index is used, are reported in Appendix G *Table 35*. The following ten sub-categories are examined one last time: Resource Use (*ESG\_RU*) in Model (7), Emission (*ESG\_MA*) in Model (8), Environmental Innovation (*ESG\_EI*) in Model (9), Workforce (*ESG\_WF*) in Model (10), Human Rights (*ESG\_HR*) in Model (11), Community (*ESG\_CO*) in Model (12), Product Responsibility (*ESG\_PR*) in Model (13), Management (*ESG\_MA*) in Model (14), Equal Shareholder Rights (*ESG\_ES*) in Model (15) and CSR Strategy (*ESG\_CS*) in Model (16). The sub-category regressions illustrate a significant negative relationship for eight out of the total ten sub-category components. The sub-categories Resource Use, Emission, Workforce, Human Rights, Community, Product Responsibility, Equal Shareholder Rights and CSR Strategy are found to be significant.

Our observations suggest contradictory evidence regarding the Community component perceived insignificant by Samet et al. (2018), once more. The sub-category component Environmental Innovation is insignificant and again explain the lower Environmental pillar effect. Furthermore, the insignificance of the Management component support the evidence of Governance being a subordinate driver. The largest absolute effect on financial constraints originates from Emission (-0.0009), Resource Use (-0.0009) and Human Resources (-0.0012). The relationships reaffirm that the market mostly value the Environmental and Social activities when firms' financial constraints are evaluated. We conclude the additional testing with the SA index anticipate strong support for the main research question of this thesis.

### 7.1.3 Discussion of Key Evidence

The application of two additional financial constraints measures provides validity and minimize the probability of a measurement error. The negatively significant *ESG* score hold for all indices and establish the fundament for conclusions to our research question: *What is the relationship between ESG performance and financial constraints in Europe?*. The observations regarding the relationship is in strong support of the majority of previous findings on the topic (El Ghouli et al., 2011; Dhaliwal et al., 2011; Chan et

al., 2017; Cheng et al., 2014; Samet et al., 2018).

The evidence that Environmental and Social activities are the primary drivers of the ESG performance is consistent. These findings are persistent with the research conducted by Samet et al. (2018) and Cheng et al. (2014). Furthermore, we conclude the sub-category components predominantly causing the relationships are Resource Use, Emission and Workforce. Samet et al. (2018) argued the existence of an insignificant relationship between community activities and financial constraints. In this thesis, the discovery is contradicted by all three indices. Our evidence implies instead that activities improving firms' societal image is in fact of importance.

We observe mixed results for the mitigating effects of ESG performance on asymmetric information and increased cash holding liquidity. Any final conclusions cannot be drawn from these results, since the observations indicated smaller asymmetric information for firms subject to a lower financial constraints in two out of three instances. However, we complement the literature from Dhaliwal et al. (2012) and Garcia-Sanchez et al. (2019), who illustrated a similar relationship, with some findings that higher ESG scoring firms distribute more information to the market and advice further research to be carried out. Additionally, the cash liquidity aspect of higher ESG performance generated mixed and inconclusive results. Thus, we are not able to disregard nor confirm Chan et al. (2017) and Borghesi et al. (2014) observations. The suggestions for further research and limitations regarding our executed methodology are discussed in section 7.3.

## **7.2 Robustness Checks**

The robustness of our empirical evidence is investigated through exhaustive testing. First, we examine the relationship between ESG performance on financial constraints using the WW index with the enhanced ESGC score to validate our results. Second, we run year-by-year regressions for each individual year from 2010-2019 to confirm the time consistency of the documented negative relationship. Finally, the main hypotheses are stud-

ied without controlling for time, industry and geographical effects using a pooled regression approach.

### 7.2.1 Enhanced ESGC Regressions

The first robustness check deploys the ESGC score as a replacement for the total ESG score. To our understanding, we are the first empirical study to implement the enhanced ESGC score when the relationship between ESG performance and financial constraints is explored. **Table 15** report the regression results from the regressions.

**Table 15: Robustness results using the enhanced ESGC score**

This table reports the results from the cross-sectional regressions for our main models (1)-(3) during the period 2010-2019 on the *WW* financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. In regression model (1) the enhanced ESGC score is the variable of interest. *ESGC* is the combined score for the E, S and G pillars with controversies included from the Thomson Reuters Refinitiv ESG measure. In regression model (2) the asymmetric information (*AI*) is the variable of interest. *AI* is the parameter measuring Asymmetric Information in terms of the annual bid-ask spread at closing. In regression model (3) the cash holding liquidity (*CH*) is the variable of interest. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables are illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)	Model (2)	Model (3)
<i>ESGC</i>	-0.0016*** (0.00009)	-0.0016*** (0.00009)	-0.0013*** (0.00008)
<i>AI</i>		-0.0016 (0.0029)	
<i>CH</i>			-0.00003*** (0.000001)
<i>AGE</i>	-0.0193*** (0.0031)	-0.0193*** (0.0031)	-0.0107*** (0.0026)
<i>ROA</i>	-0.1169*** (0.0246)	0.1177*** (0.0246)	-0.1397*** (0.0207)
<i>LR</i>	0.0389*** (0.0119)	0.0390*** (0.0119)	0.0210** (0.0101)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.3614	0.3612	0.5489

The findings are approximately equivalent to our primary results for all

included regression variables. The *ESGC* estimate is negative and significant at the 1% level throughout Models (1)-(3). It is estimated at -0.0016 in Model (1), -0.0016 in Model (2) and -0.0013 in Model (3). Moreover, the similar negative and significant relationship between *CH* and financial constraints is once more observed, as well as an insignificant *AI* parameter. We conclude that the presented evidence validates the robustness of the observations from our main regressions and previously discussed literature for the ESG parameter.

### 7.2.2 Year-by-Year Regressions

We examine the effect of ESG performance on financial constraints through time, to validate the consistency of our documented negative relationship. Separate year-by-year regressions for the complete sample period are performed to confirm that the relation does not change over time. The dependent variable is given by the *WW* index. **Table 16** report the result for each separate regression sorted by year. The following ten total ESG scores during the 2010-2019 sample period are investigated: the ESG score for 2010 (*ESG\_2010*) in Model (1), the ESG score for 2011 (*ESG\_2011*) in Model (2), the ESG score for 2012 (*ESG\_2012*) in Model (3), the ESG score for 2013 (*ESG\_2013*) in Model (4), the ESG score for 2014 (*ESG\_2014*) in Model (5), the ESG score for 2015 (*ESG\_2015*) in Model (6), the ESG score for 2016 (*ESG\_2016*) in Model (7), the ESG score for 2017 (*ESG\_2017*) in Model (8), the ESG score for 2018 (*ESG\_2018*) in Model (9) and the ESG score for 2019 (*ESG\_2019*) in Model (10). The control variables *AGE*, *ROA* and *LR* only contain values from the respective year of interest in all regression models.

The time segregation limits the number of observations per model. The number of observations per regression variable and thus for every model, follow the yearly sample distribution. We do not address potential issues concerning the different number of included observations any further, since the coefficients for ESG performance exhibit a negative effect and are statistically significant at the 1% level for all performed regressions.

**Table 16: Results from the 2010-2019 Year-by-Year regressions**

This table reports the results from the time specific ESG regressions for the full sample period on the WW financial constraints index. Every model is separately run using the respective time fixed variables for the year 2010 through 2019. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. *ESG\_2010* includes the observed ESG scores for year 2010 in model (1). *ESG\_2011* includes the observed ESG scores for year 2011 in model (2). *ESG\_2012* includes the observed ESG scores for year 2012 in model (3). *ESG\_2013* includes the observed ESG scores for year 2013 in model (4). *ESG\_2014* includes the observed ESG scores for year 2014 in model (5). *ESG\_2015* includes the observed ESG scores for year 2015 in model (6). *ESG\_2016* includes the observed ESG scores for year 2016 in model (7). *ESG\_2017* includes the observed ESG scores for year 2017 in model (8). *ESG\_2018* includes the observed ESG scores for year 2018 in model (9). *ESG\_2019* includes the observed ESG scores for year 2019 in model (10). *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)
<i>ESG_2010</i>	-0.0024*** (0.0002)									
<i>ESG_2011</i>		-0.0022*** (0.0002)								
<i>ESG_2012</i>			-0.0026*** (0.0003)							
<i>ESG_2013</i>				-0.0029*** (0.0003)						
<i>ESG_2014</i>					-0.0028*** (0.0002)					
<i>ESG_2015</i>						-0.0026*** (0.0003)				
<i>ESG_2016</i>							-0.0027*** (0.0003)			
<i>ESG_2017</i>								-0.0022*** (0.0003)		
<i>ESG_2018</i>									-0.0025*** (0.0002)	
<i>ESG_2019</i>										-0.0029*** (0.0003)
<i>AGE</i>	-0.0369*** (0.0072)	-0.0398*** (0.0075)	-0.0203** (0.0089)	-0.0333*** (0.0082)	-0.0313*** (0.0079)	-0.0316*** (0.0077)	-0.0334*** (0.0078)	-0.0414*** (0.0070)	-0.0426*** (0.0066)	-0.0342*** (0.0077)
<i>ROA</i>	-0.1963*** (0.0744)	-0.3409*** (0.0883)	-0.1275 (0.0956)	-0.1354* (0.0774)	-0.2489*** (0.0781)	-0.1216* (0.0708)	-0.1809** (0.0891)	-0.0376 (0.0584)	-0.0459 (0.0716)	-0.2609** (0.1017)
<i>LR</i>	-0.0273 (0.0343)	-0.0155 (0.0382)	0.0456 (0.0394)	-0.0299 (0.0369)	0.0063 (0.0360)	-0.0496 (0.0382)	0.0514 (0.0340)	0.0182 (0.0321)	0.0327 (0.0281)	-0.0311 (0.0388)
<i>INDUSTRY FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>COUNTRY FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>OBSERVATIONS</i>	165	137	132	166	178	204	213	210	259	174
<i>ADJUSTED R2</i>	0.6174	0.6418	0.5474	0.5713	0.5756	0.4421	0.5045	0.5390	0.5228	0.5268

The reported time persistent relationship is consistent with previous conducted research. Samet et al. (2018) found a consistent negative relationship when applying a similar methodology between the CSR performance and the KZ index for the sample period 2009-2014. On the other hand, El Ghoulet et al. (2011) found partial consistency for the period 1992-2007 while studying the relationship between the Cost of Equity and CSR performance. The results provide large support regarding the presented evidence for our main hypothesis. We conclude that the negative relationship is robust for the complete duration of our chosen sample period.

### 7.2.3 Pooled Regressions

In addition, we deploy a pooled regression approach for the ESG performance, asymmetric information and cash holding liquidity as the final validating test. The WW, KZ and SA index are implemented to examine the combined effects across all our financial constraints measures. The pooled regression is used to perform analyzes on the effects between the dependent and independent variables, while not accounting for time- or entity specific effects (Brooks, 2014). The results from the pooled regressions for Models (1)-(3)', Models (1)-(3)" and Models (1)-(3)"<sup>15</sup> are reported in Appendix G *Table 36* . The consistency regarding the negative and statistically significant relationship at the 1% level for ESG performance on financial constraints is once more validated. The negative effect holds for all nine pooled regression models for all three financial constraints indices. The *ESG* parameter is estimated at -0.0025, -0.0025 and -0.0018, for Models (1)-(3)'. The parameter estimates for Models (1)-(3)" are -0.0141, -0.0143 and -0.1659. Lastly, Models (1)-(3)" provide the following estimates for the *ESG* parameter, -0.0019, -0.0020 and -0.0029.

The asymmetric information effect is positive and significant for the WW index and the SA index, while positive and insignificant for the KZ index.

The cash holding liquidity exert a negative significant effect for the WW

<sup>15</sup>Symbol notation: ' represent the WW index as the dependent variable, " represent the KZ index as the dependent variable and "" represent the SA index as the dependent variable.

index, and a positive significant effect for the KZ and SA index. These findings validate the previous interesting mixed evidence concerning the relationships between the *AI* and *CH* parameter on financial constraints, as well as confirming the different views regarding cash on hand. Jensen and Meckling (1976) and Jensen (1986) argued the diversion of free cash-flow work as a mitigating factor for agency costs and in turn favoring lower financial constraints. In comparison, Borghesi et al. (2014) found evidence of firms with a higher cash liquidity are more willing to engage in ESG enhancing activities. Chan et al. (2017) illustrated a similar negative relationship between ESG performance on financial constraints and argued better ESG scoring firms display a higher cash liquidity.

We are not able to reach definite conclusions concerning the asymmetric information and cash holding liquidity effects. However, we conclude that the significant negative relation between ESG performance and financial constraints is robust and exhibit strong support for our main research question.

### **7.3 Suggestions for Further Research and Limitations**

The information ESG offer regarding financing decisions is a relatively new phenomenon. Our sample consist only of a small portion of listed European firms due to the early ESG reporting phase. Nevertheless, we argue the size to be on the larger end of the scale compared to previous studies exploring the relationship between ESG performance and financial constraints. The results from this thesis are only valid in terms of the European geographic area. We cannot draw any conclusions concerning the investigated correlations in other global financial markets. The sample countries are not evenly populated because of the different emphasize on ESG within Europe. Approximately 50% of the total sample originate from France and the UK, making the distribution skewed. We only observe firms with the means to disclose the information willingly to the market, since the ESG disclosure is voluntary. Thus, there could be a sample selection bias in our data. There are numerous vendors offering ESG scores who apply different methodologies when estimating individual entity performance (Veenstra and Ellemers,



2020). Thomson Reuters Refinitiv was chosen on account of their transparent methodological process, independence and global recognition. If ESG ratings are found to be conflicting at a later stage, the evidence presented in this thesis may prove to be inconsistent and highly dependent on the selected vendor.

There is no common agreement on the best financial constraints measure. The indices contain a variety of accounting and stock variables that all affect the dependent relationships. Our thesis does not control for the appropriateness of financial constraints measures. However, we implement three different recognized indices used in prior academic research to minimize the probability of a measurement error. Furthermore, the consistency of the documented negative relationship between ESG performance and financial constraints verify the explanatory power of our deployed indices. Similar arguments hold true for the asymmetric information and cash holding liquidity estimates.

We suggest repeating a similar analysis when the ESG rating coverage and reporting quality have matured. The consistency across vendors should be investigated by conducting our analyzes using other validated ESG scores. Another possible branch of research could be the implementation of additional measures for financial constraints, asymmetric information and cash holding liquidity, or exploring other variables of interest, to confirm or contradict our findings. Lastly, we recommend replicating the study for other financial markets to uncover how the correlations vary across different regions. More evidence and research within this branch are needed before one can understand the full range of how ESG enhancing activities affect firms' financing decisions, capital allocation processes' and ultimately their access to finance.

## 8 Conclusion

The purpose of this thesis was to investigate the relationship between ESG performance on European firms' access to finance and explore the underlying mechanisms of financial constraints. Our selected sample and adopted methodology were created to answer the research question: *What is the relationship between ESG performance and financial constraints in Europe?*. The representative sample consisted of listed European firms for the time period 2010-2019. First, the adopted methodology explored the direct effects of ESG performance, asymmetric information and agency costs in terms of cash holding liquidity on financial constraints. Second, we study the underlying contributing effects through Environmental, Social and Governance pillar performance. Finally, the sub-categories of each individual pillar were used to uncover the true drivers of how ESG performance affect firms' access to finance.

We find a negative relationship between ESG performance and financial constraints in the European market, supporting our main hypothesis. The relation implies that higher ESG scoring firms achieve an easier access to finance and suffer less from financial constraint. This finding is further validated through additional constraints measures, the KZ and SA index. Further, our robustness tests indicate the relationship is time consistent, with supplementary affirmation from the enhanced ESGC score analysis. The empirical results are persistent with recent observations from Samet et al. (2018) and Cheng et al. (2014). Additionally, we suggest Environmental and Social activities to be the true underlying contributors for a greater access to finance, primarily driven by climate risks and employee relationships. Prior research by Cheng et al. (2014) found a negative relationship between Governance performance on financial constraints. Partially contradicting their result, we conclude that the Governance performance is a subordinate contributor.

Another implication of ESG performance is the possible effects on reduction of the market imperfections, asymmetric information and agency costs.

Previous literature argued that ESG performance act as a mitigating tool for agency costs by increasing the capital used in ESG enhancing activities, as well as improving the informational flow between firm insiders and outsiders. Dhaliwahl et al. (2012) illustrated a greater transparency from ESG reporting increased firms' credit rating, associated with lower capital constraints. Moreover, Chan et al. (2017) proposed that higher ESG performing firms exhibited a larger cash liquidity. We cannot find concluding evidence of ESG performance affecting firms' financing through the direct mitigation of asymmetric information and agency costs, despite prior academic observations. The primary analysis and additional robustness tests impose conflicting results. Thus, conducting further research within this field is encouraged. In addition, we argue the asymmetric information component is already being captured by the ESG factor, since firms increase their financial and non-financial transparency through ESG reporting activities. The mixed evidence concerning the cash holding liquidity aspect of ESG is consistent with the contradictory views from past studies (Borghesi et al., 2014; Chan et al., 2017; Samet et al., 2018; Cheng et al., 2014). Therefore, we emphasize the need for further empirical testing before definite conclusions are reached.

The key inference of this thesis is the presentation of results insinuating ESG performance directly affect firms' access to finance, primarily driven by the utilization of climate risks and employee enhancing activities. Implications regarding managerial practices could be derived based on our empirical findings. The negative relationship implies ESG enhancing activities are an efficient tool for firms' ability to undertake positive NPV projects and improve their access to capital from responsible investors. Firms incorporating these activities align the interests of insiders and outsiders to a larger extent by facilitating a transparent informational environment. Furthermore, managers have an incentive to maintain a higher Environmental and Social performance in order to achieve a superior access to finance.

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# Appendix

## Appendix A: Financial Constraints Indices

**Table 17: Construction of financial constraints indices**

This table reports the included variables in each of the financial constraints indices and illustrates the methodology for construction. Part 1 presents the methodology and variables for the *WW* index. Part 2 presents the methodology and variables for the *KZ* index. Part 3 presents the methodology and variables for the *SA* index.

### Panel A: WW index

Following Whited and Wu (2006), the *WW* index is constructed for each firm entity:

$$(1) \quad WW_{i,t} = -0.091CF - 0.062DIV\ POS + 0.021T\ LT\ D - 0.44LN\ TA \\ + 0.102ISG - 0.35SG$$

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$$CF = \frac{Income\ Before\ Extra\ Ordinary\ Items + Depreciation}{Total\ Assets}$$

*DIV POS* = Dummy variable set to **1** if firm pays dividend (*Common + Preferred*)

$$T\ LT\ D = \frac{Long - term\ Debt}{Total\ Assets}$$

$$LN\ TA = \ln(Total\ Assets)$$

*ISG* = Average industry sales growth for each TRBC business sector every year

$$SG = \frac{Sales_t}{Sales_{t-1}}$$


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**Panel B: KZ index**

Following Lamont et al. (2001), the KZ index is constructed for each firm entity:

$$(2) \quad KZ_{i,t} = 0.283Q - 1.002CF/K + 3.139Debt/Capital - 39.368Div/K \\ - 1.315Cash/K$$


---

$$Q = \frac{Total\ Assets + (Fiscal\ Year\ End\ Price \times Common\ Shares \\ Outstanding) - Common\ Equity - Deferred\ Tax}{PPE}$$

$$CF/K = \frac{Income\ Before\ Extra\ Ordinary\ Items + Depreciation}{PPE_{t-1}}$$

$$Debt/Capital = \frac{Long - term\ Debt + Debt\ in\ Current\ Liabilities}{Long - term\ Debt + Debt\ in\ Current\ Liabilities + Stockholder's\ Equity}$$

$$Div/K = \frac{Common\ Dividends + Preferred\ Dividends}{PPE_{t-1}}$$

$$Cash/K = \frac{Cash\ Holdings \& Short - term\ Investments}{PPE_{t-1}}$$


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**Panel C: SA index**

Following Hadlock and Pierce (2010), the SA index is constructed for each firm entity:

$$(3) \quad SA_{i,t} = -0.737Size + 0.043Size^2 - 0.040Age$$


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$$Size = \ln(Total\ Assets)$$

$$Age = \text{Number of consecutive years listed on COMPUSTAT}$$


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## Appendix B: Hypotheses Overview

**Table 18: Formal description of hypotheses**

This table reports an overview of our hypotheses with the formal expression for segment 1 through segment 3. *ESG* is the variable for overall ESG score. *AI* is the variable representing the asymmetric information in terms of bid-ask spread. *CH* is the Cash Holding Liquidity variable. *ESGE* is the Environmental pillar score. *ESGS* is the Social pillar score. *ESGG* is the Governance pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy score.

Segment	Model	Hypothesis (H1)	H1 Expression
	1	H1: There is a relationship between ESG and FC. Expected to be negative	$ESG \neq 0$
Segment 1	2	H1 A1: There is a relationship between AI and FC. Expected to be positive	$AI \neq 0$
	3	H1 A2: There is a relationship between CH and FC. Expected to be negative	$CH \neq 0$
	4	H1 B1: There is a relationship between ESGE and FC. Expected to be negative	$ESGE \neq 0$
Segment 2	5	H1 B2: There is a relationship between ESGS and FC. Expected to be negative	$ESGS \neq 0$
	6	H1 B3: There is a relationship between ESGG and FC. Expected to be negative	$ESGG \neq 0$
	7	H1 C1: There is a relationship between ESG_RU and FC	$ESG\_RU \neq 0$
	8	H1 C2: There is a relationship between ESG_EM and FC	$ESG\_EM \neq 0$
	9	H1 C3: There is a relationship between ESG_EI and FC	$ESG\_EI \neq 0$
	10	H1 C4: There is a relationship between ESG_WF and FC	$ESG\_WF \neq 0$
Segment 3	11	H1 C5: There is a relationship between ESG_HR and FC	$ESG\_HR \neq 0$
	12	H1 C6: There is a relationship between ESG_CO and FC	$ESG\_CO \neq 0$
	13	H1 C7: There is a relationship between ESG_PR and FC	$ESG\_PR \neq 0$
	14	H1 C8: There is a relationship between ESG_MA and FC	$ESG\_MA \neq 0$
	15	H1 C9: There is a relationship between ESG_ES and FC	$ESG\_ES \neq 0$
	16	H1 C10: There is a relationship between ESG_CS and FC	$ESG\_CS \neq 0$



## Appendix C: Thomson Reuters Refinitiv Methodology

**Table 19: Explanation of TRBC sub-categories**

This table reports the definitions of The Refinitiv Business Classification (*TRBC*) sub-category system. The sub-categories Resource Use, Emission and Environmental Innovation makes up the Environmental pillar (*ESGE*). The sub-categories Workforce, Human Rights, Community and Product Responsibility makes up the Social pillar (*ESGS*). The sub-categories Management, Equal Shareholder Rights and CSR Strategy makes up the Governance pillar (*ESGG*).

Sub-Category	Definition
<i>Resource Use</i>	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
<i>Emission</i>	The emission reduction score measures a company's commitment and effectiveness towards reducing environmental emissions in its production and operational processes.
<i>Environmental Innovation</i>	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.
<i>Workforce</i>	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.
<i>Human Rights</i>	The human rights score measures a company's effectiveness in terms of respecting fundamental human rights conventions.
<i>Community</i>	The community score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics.
<i>Product Responsibility</i>	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.
<i>Management</i>	The management score measures a company's commitment and effectiveness towards following best practice corporate governance principles.
<i>Equal Shareholder Rights</i>	The shareholders score measures a company's effectiveness towards equal treatment of shareholders and the use of anti-takeover devices.
<i>CSR Strategy</i>	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.



**Table 20: Grading system for Thomson Reuters Refinitiv ESG**

This table reports the grading criteria for Thomson Reuters Refinitiv ESG reporting tool. The grading ranges from *D-* to *A+*, which is assigned based on a score range between 0 and 1. In the Description column, the subjective grading approach is further explained.

Score range	Grade	Description
0.0 <= Score <= 0.083333	<i>D-</i>	"D" grading score indicates a poor
0.083333 <score <= 0.166666	<i>D</i>	ESG performance with an insufficient degree
0.166666 <score <= 0.250000	<i>D+</i>	of transparency in public reporting material
0.250000 <score <= 0.333333	<i>C-</i>	"C" grading score indicates satisfactory
0.333333 <score <= 0.416666	<i>C</i>	ESG performance with a moderate degree
0.416666 <score <= 0.500000	<i>C+</i>	of transparency in reporting material
0.500000 <score <= 0.583333	<i>B-</i>	"B" grading score indicates good ESG
0.583333 <score <= 0.666666	<i>B</i>	performance with an above average
0.666666 <score <= 0.750000	<i>B+</i>	degree of transparency in reporting material
0.750000 <score <= 0.833333	<i>A-</i>	"A" grading score indicates excellent
0.833333 <score <= 0.916666	<i>A</i>	ESG performance with a high degree of
0.916666 <score <= 1	<i>A+</i>	transparency in reporting material



## Appendix D: Descriptive Statistics

**Table 21: Distribution of sample firms across industries**

This table reports the descriptive statistics for the total number of unique firms, distributed between business and industry sectors. Panel A reports the distribution between business sectors in The Refinitiv Business Classification (*TRBC*) metric. Panel B reports the distribution between industry sectors in The Refinitiv Business Classification (*TRBC*) metric.

Panel A: Business sector distribution		
Business Sector	Firm Entities	%
Industrial & Commercial Services	38	9.82%
Industrial Goods	35	9.04%
Utilities	20	5.17%
Automobiles & Auto Parts	11	2.84%
Mineral Resources	31	8.01%
Technology Equipment	18	4.65%
Telecommunications Services	19	4.91%
Healthcare Services & Equipment	10	2.58%
Energy - Fossil Fuels	37	9.56%
Pharmaceuticals & Medical Research	19	4.91%
Retailers	15	3.88%
Cyclical Consumer Services	22	5.68%
Personal & Household Products & Services	5	1.29%
Software & IT Services	13	3.36%
Food & Beverages	20	5.17%
Chemicals	15	3.88%
Cyclical Consumer Products	15	3.88%
Transportation	13	3.36%
Food & Drug Retailing	8	2.07%
Renewable Energy	1	0.26%
Applied Resources	13	3.36%
Consumer Goods Conglomerates	3	0.78%
Real Estate	6	1.55%
<b>Total</b>	<b>387</b>	<b>100.00%</b>
Panel B: Industry sector distribution		
Industry Sector	Firm Entities	%
Industrials	85	21.96%
Utilities	21	5.43%
Consumer Cyclical	63	16.28%
Basic Materials	59	15.25%
Technology	50	12.92%
Healthcare	29	7.49%
Energy	38	9.82%
Consumer Non-Cyclicals	36	9.30%
Real Estate	6	1.55%
<b>Total</b>	<b>387</b>	<b>100.00%</b>





**Table 22: Distribution of sample firms across countries**

This table reports the descriptive statistics for the total number of unique firm entities, distributed between the 25 European countries included in our data sample.

<b>Country of origin</b>	<b>Firm Entities</b>	<b>%</b>
Austria	9	2.33%
Belgium	13	3.36%
Cyprus	1	0.26%
Czech Republic	1	0.26%
Denmark	9	2.33%
Finland	16	4.13%
France	80	20.67%
Germany	3	0.78%
Greece	9	2.33%
Hungary	2	0.52%
Ireland	9	2.33%
Isle of Man	1	0.26%
Italy	3	0.78%
Jersey	1	0.26%
Luxembourg	4	1.03%
Netherlands	16	3.88%
Norway	4	1.03%
Poland	13	3.36%
Portugal	8	2.07%
Russia	19	4.65%
Spain	17	4.39%
Sweden	9	2.33%
Switzerland	30	6.72%
Ukraine	1	0.26%
United Kingdom	109	29.72%
<b>Total</b>	<b>387</b>	<b>100.00%</b>



**Table 23: Descriptive statistics for all regression variables**

This table reports the descriptive statistics for all variables used in the set of regression models. The descriptive statistics reported is the mean, minimum, first quartile, median, third quartile, maximum, standard deviation and number of total observations for each variable. *FC (WW)* is the financial constraints index WW. *FC (SA)* is the financial constraints index SA. *FC (KZ)* is the financial constraints index KZ. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Variable	Mean	Min	25th	Median	75th	Max	Std	N
FC (WW)	-0.38	-0.57	-0.43	-0.38	-0.43	0.09	0.07	1,838
FC (SA)	-3.87	-4.47	-4.11	-3.92	-4.11	-2.77	0.32	1,838
FC (KZ)	-0.69	-9.94	-1.95	0.11	-1.95	9.68	2.81	1,838
ESG	57.56	5.74	44.12	58.07	44.12	94.00	18.53	1,838
ESGC	54.16	5.74	42.38	53.91	42.38	93.47	16.96	1,838
ESGE	56.06	1.04	38.71	56.79	38.71	98.74	23.82	1,838
ESG_RU	61.95	0.00	43.73	65.81	43.73	99.83	27.25	1,838
ESG_EM	64.07	0.00	44.74	68.96	44.74	99.81	26.95	1,838
ESG_EI	37.43	0.00	0.00	35.56	0.00	99.81	32.83	1,838
ESGS	60.76	0.44	43.97	63.52	43.97	98.64	22.31	1,838
ESG_WF	72.72	1.04	59.55	77.77	59.55	99.85	21.34	1,838
ESG_HR	52.60	0.00	19.96	61.07	19.96	98.98	34.26	1,838
ESG_CO	57.81	0.00	32.35	61.43	32.35	99.81	29.63	1,838
ESG_PR	59.28	0.00	35.31	67.80	35.31	99.60	31.04	1,838
ESGG	54.40	2.28	37.35	56.01	37.35	97.75	22.38	1,838
ESM_MA	54.45	0.33	32.49	55.53	32.49	99.84	28.12	1,838
ESG_ES	45.83	0.00	50.00	51.61	50.00	87.50	24.82	1,838
ESG_CS	54.74	0.00	32.47	57.55	32.47	99.88	28.35	1,838
CH	698.25	0.00	76.86	223.99	76.86	14679.74	1326.45	1,838
AI	-0.12	-9.22	-0.09	-0.03	-0.09	3.17	0.50	1,838
AGE	2.89	0.00	2.71	3.09	2.71	3.50	0.59	1,838
ROA	0.05	-0.60	0.02	0.05	0.02	0.37	0.06	1,838
LR	0.20	0.00	0.11	0.19	0.11	1.11	0.13	1,838



**Table 24: Average values for all variables across countries**

This table reports the average value for all regression variables for each of the 25 European countries included in our sample. Panel A reports the average value for regression variables 1 through 12. Panel B reports the average values for regression variables 13 through 24. *FC (WW)* is the financial constraints index WW. *FC (SA)* is the financial constraints index SA. *FC (KZ)* is the financial constraints index KZ. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Panel A: Regression Variables 1-12												
Country of origin	FC (WW)	FC (SA)	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR
Austria	-0.38	-3.80	-0.17	47.79	47.14	48.00	48.83	51.46	33.73	51.85	61.57	42.01
Belgium	-0.33	-3.78	0.20	47.79	47.73	46.95	49.44	57.49	24.22	48.05	61.15	32.12
Cyprus	-0.35	-3.65	-1.50	68.59	68.59	64.88	84.96	77.89	0.00	58.34	96.50	36.20
Czech Republic	-0.38	-3.71	-2.35	43.58	43.58	18.14	18.38	10.27	26.85	55.64	41.59	18.75
Denmark	-0.30	-3.96	0.61	46.39	45.24	49.98	60.74	44.05	36.58	46.91	53.63	64.82
Finland	-0.36	-3.93	-1.99	60.39	58.77	63.51	65.74	70.87	51.52	60.88	70.55	59.83
France	-0.40	-3.94	-0.24	59.91	56.39	65.12	72.45	76.08	45.48	65.51	84.83	59.02
Germany	-0.42	-3.93	-0.22	51.97	51.97	40.68	64.76	25.86	15.13	61.07	69.60	48.69
Greece	-0.34	-3.85	1.67	57.79	54.14	50.65	51.63	68.49	31.01	63.84	71.98	57.92
Hungary	-0.38	-3.95	0.38	73.88	71.56	74.31	71.74	91.30	57.56	77.44	79.97	78.01
Ireland	-0.37	-3.82	-0.31	55.38	54.97	48.42	48.41	58.40	33.48	54.73	59.61	42.32
Isle of Man	-0.35	-3.71	-2.86	43.60	43.60	14.63	0.21	65.53	0.00	53.24	61.02	68.54
Italy	-0.39	-4.18	1.27	70.04	62.74	67.95	74.79	74.96	44.71	75.44	79.73	71.01
Jersey	-0.38	-3.69	-1.33	61.65	53.01	64.76	51.77	79.00	55.58	58.95	70.19	33.33
Luxembourg	-0.43	-3.71	0.41	58.34	51.28	54.37	63.43	58.45	30.90	67.08	63.27	68.02
Netherlands	-0.42	-3.88	0.37	69.29	59.72	70.13	73.83	74.12	57.78	73.73	75.69	66.63
Norway	-0.42	-3.86	-1.81	71.45	63.59	71.08	69.55	74.07	60.39	78.46	80.63	75.64
Poland	-0.34	-3.56	0.37	37.04	36.49	33.33	29.51	41.83	23.85	33.61	43.57	19.80
Portugal	-0.35	-3.87	0.92	62.26	60.92	66.58	67.64	68.93	60.24	62.76	74.90	40.53
Russia	-0.41	-3.34	-0.67	45.01	44.71	41.61	50.12	52.46	12.28	39.15	63.91	16.67
Spain	-0.41	-3.81	0.79	69.42	68.28	74.40	79.57	83.24	54.85	76.37	87.32	69.41
Sweden	-0.39	-4.10	-2.21	64.11	60.93	62.67	70.96	71.12	41.21	75.24	76.24	78.14
Switzerland	-0.40	-3.86	-2.22	64.59	58.77	58.71	67.30	66.70	34.99	71.60	77.46	63.68
Ukraine	-0.32	-3.53	0.14	37.82	37.82	24.56	30.81	23.22	0.00	35.41	52.82	44.41
United Kingdom	-0.35	-3.94	-1.29	54.90	50.74	48.03	54.85	54.84	30.03	56.97	68.09	47.34
Panel B: Regression Variables 13-24												
Country of origin	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR	
Austria	56.35	51.04	40.20	34.93	54.44	40.60	353.43	-0.09	2.80	0.04	0.18	
Belgium	46.34	56.21	49.93	50.03	51.16	41.52	153.47	-0.15	2.70	0.02	0.33	
Cyprus	71.05	7.38	91.46	94.70	50.79	93.68	13.75	-0.04	2.53	0.07	0.42	
Czech Republic	92.86	78.98	38.89	16.67	50.00	83.33	192.13	-0.01	2.64	0.13	0.03	
Denmark	37.12	26.38	40.20	38.78	42.05	46.50	394.55	-0.16	3.10	0.04	0.08	
Finland	52.55	55.07	54.80	55.64	57.81	55.48	382.58	-0.02	2.95	0.05	0.17	
France	51.56	67.08	47.20	46.40	31.66	49.64	1126.54	-0.29	3.05	0.04	0.19	
Germany	46.51	78.97	51.07	52.95	50.18	47.35	741.32	-0.04	3.08	0.07	0.23	
Greece	54.95	71.06	54.71	50.06	53.05	59.43	516.94	-0.03	2.92	0.01	0.26	
Hungary	93.45	66.44	65.17	64.77	62.95	70.45	127.94	-0.03	3.00	0.04	0.17	
Ireland	55.09	57.65	64.75	66.13	49.69	58.38	308.16	-0.12	2.62	0.04	0.25	
Isle of Man	56.70	35.42	43.99	43.75	56.25	64.29	661.64	-0.02	2.64	0.00	0.30	
Italy	71.21	87.30	65.63	65.52	61.40	65.71	828.79	-0.02	3.27	0.01	0.21	
Jersey	87.42	56.85	61.88	62.15	50.34	83.18	626.15	-0.03	2.57	0.03	0.11	
Luxembourg	72.49	66.76	48.52	50.69	51.03	40.67	915.30	-0.34	2.64	0.03	0.18	
Netherlands	85.68	62.70	62.50	63.00	51.47	64.59	1217.67	-0.07	2.98	0.04	0.25	
Norway	88.99	68.83	59.12	59.82	52.60	81.26	412.11	-0.02	2.88	0.05	0.20	
Poland	29.91	40.01	44.02	44.18	42.88	46.13	176.19	-0.07	2.32	0.01	0.13	
Portugal	63.58	71.11	54.72	53.49	53.82	54.01	170.97	-0.07	2.97	0.04	0.28	
Russia	41.58	39.11	58.54	60.14	50.00	57.89	755.09	-0.02	1.67	0.10	0.23	
Spain	72.58	75.27	53.41	53.27	49.80	55.67	823.83	-0.09	2.79	0.03	0.25	
Sweden	72.59	65.30	46.95	45.67	26.62	59.55	550.19	-0.01	3.18	0.07	0.22	
Switzerland	72.97	68.28	60.32	62.23	47.98	58.16	1114.35	-0.24	2.92	0.07	0.16	
Ukraine	28.00	17.82	56.58	44.04	51.28	61.03	90.11	-0.09	2.35	0.09	0.19	
United Kingdom	57.73	54.74	59.10	59.60	51.07	56.55	469.38	-0.03	3.03	0.05	0.20	

**Table 25: Average values for all regression variables across industries**

This table reports the descriptive statistics for all regression variables distributed between The Refinitiv Business Classification (TRBC) metric for business sector and industry sector. Panel A reports the descriptive statistics for regression variables 1 through 12 between business sectors. Panel B reports the descriptive statistics for regression variables 1 through 12 between industry sectors. Panel C reports the descriptive statistics for regression variables 13 through 24 between business sectors. Panel D reports the descriptive statistics for regression variables 13 through 24 between industry sectors. FC (WW) is the financial constraints index WW. FC (SA) is the financial constraints index SA. FC (KZ) is the financial constraints index KZ. ESG is the variable for overall ESG score. ESGC is the variable for combined overall ESG score with the controversy's adjustment. ESGE is the Environmental pillar score. ESG\_RU is the sub-category Resource Use score. ESG\_EM is the sub-category Emission score. ESG\_EI is the sub-category Environmental Innovation score. ESGS is the Social pillar score. ESG\_WF is the sub-category Workforce score. ESG\_HR is the sub-category Human Rights score. ESG\_CO is the sub-category Community score. ESG\_PR is the sub-category Product Responsibility score. ESGG is the Governance pillar score. ESG\_MA is the sub-category Management score. ESG\_ES is the sub-category Equal Shareholder Rights score. ESG\_CS is the sub-category CSR Strategy Score. CH is the parameter measuring agency costs in terms of Cash Holding Liquidity. AI is the parameter measuring Asymmetric Information in terms of the bid-ask spread. AGE is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. ROA is the return-on-assets, measuring financial performance on the book value of assets. LR is the leverage-ratio, measured by long-term debt over total assets.

Panel A: Business sector distribution, Regression Variables 1-12

Business sector	FC (WW)	FC (SA)	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR
Industrial & Commercial Services	-0.36	-3.96	-0.80	50.82	50.00	46.75	55.00	58.59	35.14	56.83	69.00	44.03
Industrial Goods	-0.36	-4.02	-1.31	56.15	53.66	54.94	53.99	50.28	57.51	59.31	67.61	56.04
Utilities	-0.45	-3.60	0.66	60.16	56.70	62.85	63.10	69.12	54.96	60.69	72.96	52.69
Automobiles & Auto Parts	-0.42	-4.00	0.05	64.89	58.66	70.96	73.73	74.40	67.52	66.86	79.65	67.56
Mineral Resources	-0.38	-3.75	-0.02	56.71	53.76	54.86	62.30	68.34	16.64	55.48	72.48	45.55
Technology Equipment	-0.32	-3.88	-2.11	51.58	49.84	45.92	47.42	41.05	45.25	54.99	63.19	50.35
Telecommunications Services	-0.40	-3.76	0.29	59.39	54.01	55.13	57.41	59.12	47.97	60.91	64.53	54.53
Healthcare Services & Equipment	-0.35	-3.94	-0.37	55.35	55.16	47.28	66.14	58.06	14.13	63.45	79.19	55.63
Energy - Fossil Fuels	-0.40	-3.68	0.43	60.46	53.64	61.72	66.95	74.00	32.37	61.08	79.13	48.09
Pharmaceuticals & Medical Research	-0.40	-3.83	-3.13	66.92	57.84	63.06	69.28	68.75	25.72	71.50	80.52	62.13
Retailers	-0.35	-3.84	-1.97	55.18	53.52	54.40	58.29	64.09	35.72	57.57	75.49	50.27
Cyclical Consumer Services	-0.38	-3.93	-1.73	62.40	60.41	59.14	69.84	67.56	29.10	70.69	81.19	59.44
Personal & Household Products & Services	-0.42	-3.90	-4.13	71.99	63.91	66.98	75.60	75.87	42.89	77.43	85.92	73.01
Software & IT Services	-0.36	-3.97	-2.61	55.26	54.97	54.15	67.12	72.35	35.05	67.43	85.29	63.32
Food & Beverages	-0.37	-3.95	-1.21	57.54	53.61	59.32	61.99	62.16	34.49	61.01	68.14	55.17
Chemicals	-0.38	-3.88	-0.05	58.29	56.39	55.75	62.41	70.45	35.21	57.54	67.11	53.39
Cyclical Consumer Products	-0.38	-4.05	-1.23	51.72	51.08	51.00	65.98	69.13	35.47	60.03	76.40	58.48
Transportation	-0.36	-3.94	0.23	53.30	48.86	49.95	66.24	61.79	19.35	55.89	68.43	41.15
Food & Drug Retailing	-0.43	-3.95	0.97	70.49	63.48	70.85	72.52	76.60	55.58	74.39	81.57	63.03
Renewable Energy	-0.34	-3.82	1.09	76.68	76.68	80.57	88.35	96.29	55.63	88.58	93.48	85.81
Applied Resources	-0.33	-3.89	0.20	51.88	50.99	51.49	53.38	57.41	44.31	51.13	52.75	49.03
Consumer Goods Conglomerates	-0.35	-4.19	-3.76	59.96	59.65	53.51	61.87	59.50	42.04	62.64	70.18	60.51
Real Estate	-0.32	-3.83	2.63	48.65	48.42	58.82	56.56	62.74	55.29	49.01	78.74	25.91

Panel B: Industry sector distribution, Regression Variables 1-12

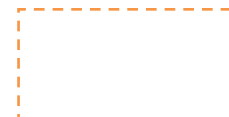
Industry sector	FC (WW)	FC (SA)	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR
Industrials	-0.36	-3.98	-0.87	53.29	51.31	50.47	56.14	55.70	41.93	57.70	68.36	48.45
Utilities	-0.45	-3.60	0.66	60.16	56.70	62.85	63.10	69.12	54.96	60.69	72.96	52.69
Consumer Cyclical	-0.38	-3.95	-1.36	58.01	55.80	57.55	66.57	68.26	38.62	63.87	78.20	58.24
Basic Materials	-0.37	-3.80	0.02	56.08	53.75	54.37	60.55	66.60	25.96	55.04	67.46	47.85
Technology	-0.37	-3.84	-1.07	56.13	52.96	52.14	56.51	56.54	44.34	60.55	68.65	55.18
Healthcare	-0.39	-3.87	-2.18	62.95	56.92	57.64	68.20	65.08	21.74	68.74	80.07	59.90
Energy	-0.40	-3.68	0.44	60.82	54.15	62.14	67.44	74.50	32.90	61.70	79.46	48.94
Consumer Non-Cyclicals	-0.39	-3.97	-1.03	62.71	57.87	62.79	66.15	67.24	42.03	66.38	73.68	59.37
Real Estate	-0.32	-3.83	2.63	48.65	48.42	58.82	56.56	62.74	55.29	49.01	78.74	25.91

Panel C: Business sector distribution, Regression Variables 13-24

Business sector	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR
Industrial & Commercial Services	58.43	59.64	46.50	44.39	43.34	44.45	402.13	-0.15	3.03	0.04	0.25
Industrial Goods	59.62	57.18	53.49	52.38	48.81	52.14	395.98	-0.25	3.09	0.05	0.15
Utilities	52.16	54.58	54.50	54.37	46.13	62.37	721.40	-0.04	2.53	0.03	0.24
Automobiles & Auto Parts	54.43	62.33	53.05	51.63	30.02	59.45	3354.78	-0.06	3.22	0.05	0.13
Mineral Resources	56.68	43.04	61.86	63.25	48.90	65.59	508.47	-0.05	2.66	0.05	0.23
Technology Equipment	48.73	57.33	53.73	55.65	53.29	35.41	406.46	-0.08	2.88	0.05	0.15
Telecommunications Services	57.90	65.01	59.57	61.15	54.88	55.81	517.55	-0.17	2.73	0.04	0.34
Healthcare Services & Equipment	62.82	61.33	48.64	53.24	27.48	37.83	264.92	-0.12	3.00	0.08	0.14
Energy - Fossil Fuels	59.17	60.84	58.14	60.54	44.60	61.24	1278.05	-0.08	2.56	0.03	0.20
Pharmaceuticals & Medical Research	71.94	71.53	63.42	64.70	39.09	66.25	934.91	-0.11	3.02	0.07	0.19
Retailers	48.12	56.48	53.53	56.70	44.48	41.56	456.06	-0.17	2.77	0.08	0.13
Cyclical Consumer Services	61.28	76.83	53.34	52.73	48.24	53.24	484.65	-0.06	3.01	0.05	0.19
Personal & Household Products & Services	63.55	82.55	66.42	60.06	68.59	68.08	1143.90	-0.23	2.85	0.09	0.07
Software & IT Services	54.89	75.81	45.15	39.78	51.63	47.83	498.70	-0.09	3.01	0.05	0.11
Food & Beverages	57.35	62.98	49.37	46.43	48.89	56.56	418.00	-0.10	2.97	0.06	0.24
Chemicals	60.24	51.75	64.04	66.49	47.23	63.05	412.73	-0.20	2.83	0.05	0.23
Cyclical Consumer Products	48.87	53.74	37.77	35.21	20.52	49.30	1203.57	-0.22	3.20	0.06	0.09
Transportation	53.27	53.16	54.06	52.30	55.05	53.42	575.73	-0.11	3.05	0.04	0.24
Food & Drug Retailing	67.49	80.50	63.96	65.63	39.98	67.64	1279.43	-0.04	3.03	0.02	0.19
Renewable Energy	94.82	74.19	62.76	63.41	58.66	70.92	507.86	-0.04	2.80	0.01	0.12
Applied Resources	55.11	44.41	53.53	52.15	60.44	49.16	118.64	-0.07	2.87	0.05	0.24
Consumer Goods Conglomerates	64.91	55.02	65.72	70.60	56.75	60.71	245.35	-0.02	3.25	0.06	0.19
Real Estate	35.79	11.39	36.52	34.08	59.12	38.45	239.69	-0.13	2.93	0.03	0.27

Panel D: Industry sector distribution, Regression Variables 13-24

Industry sector	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR
Industrials	58.20	57.77	50.34	48.68	47.14	48.76	423.48	-0.19	3.06	0.04	0.21
Utilities	52.16	54.58	54.50	54.37	46.13	62.37	721.40	-0.04	2.53	0.03	0.24
Consumer Cyclical	53.47	63.02	48.90	48.52	36.53	50.28	1138.68	-0.13	3.04	0.06	0.14
Basic Materials	57.10	45.10	60.65	61.71	50.85	61.81	411.37	-0.08	2.73	0.05	0.23
Technology	54.48	65.04	54.67	54.84	53.69	47.91	479.90	-0.13	2.83	0.05	0.23
Healthcare	68.81	68.03	58.34	60.77	35.10	56.49	704.92	-0.11	3.01	0.07	0.17
Energy	59.97	61.15	58.24	60.60	44.92	61.46	1260.70	-0.08	2.57	0.03	0.20
Consumer Non-Cyclicals	61.50	68.96	56.48	55.33	48.54	61.10	712.88	-0.08	3.00	0.05	0.21
Real Estate	35.79	11.39	36.52	34.08	59.12	38.45	239.69	-0.13	2.93	0.03	0.27



**Table 26: Descriptive statistics for the  $AGE_{IN}$  variable**

This table reports the descriptive statistics for the proxy variable  $AGE_{IN}$ , used as age in the  $SA$  index regression.  $AGE_{IN}$  is the natural logarithm of years since firm inception. Panel A reports the descriptive statistics for the variable including the correlation with the  $SA$  index, mean, maximum value, minimum value, the standard deviation, the number of observations, the median value, the first quantile and the third quantile. Panel B reports the average values for each of the 25 unique European countries. Panel C reports the average value for each individual business sector. Panel D reports the average value for each individual industry sector.

Panel A: Descriptive Statistics $AGE_{IN}$		Panel C: Average values business sectors	
Correlation SA	-0.49	<b>Business sector</b>	
Mean	3.30	Industrial & Commercial Services	3.39
Max	5.21	Industrial Goods	3.55
Min	0.00	Utilities	3.18
Std	0.88	Automobiles & Auto Parts	3.05
N	1,838	Mineral Resources	2.85
Median	3.33	Technology Equipment	3.50
25th	2.71	Telecommunications Services	3.03
75th	4.01	Healthcare Services & Equipment	3.51
Panel B: Average values countries		Energy - Fossil Fuels	3.09
Austria	3.59	Pharmaceuticals & Medical Research	3.14
Belgium	2.82	Retailers	2.80
Cyprus	1.66	Cyclical Consumer Services	3.19
Czech Republic	2.77	Personal & Household Products & Services	3.78
Denmark	4.02	Software & IT Services	3.30
Finland	3.51	Food & Beverages	3.55
France	3.51	Chemicals	3.48
Germany	1.66	Cyclical Consumer Products	3.63
Greece	3.70	Transportation	3.59
Hungary	3.14	Food & Drug Retailing	4.09
Ireland	3.36	Renewable Energy	3.63
Isle of Man	1.95	Applied Resources	3.31
Italy	3.71	Consumer Goods Conglomerates	4.37
Jersey	2.57	Real Estate	3.30
Luxembourg	2.30	Panel D: Average values industry sectors	
Netherlands	3.52	<b>Industry sector</b>	
Norway	2.95	Industrials	3.48
Poland	2.57	Utilities	3.18
Portugal	3.64	Consumer Cyclicals	3.20
Russia	2.46	Basic Materials	3.07
Spain	3.52	Technology	3.23
Sweden	4.34	Healthcare	3.27
Switzerland	3.15	Energy	3.10
Ukraine	2.52	Consumer Non-Cyclicals	3.80
United Kingdom	3.23	Real Estate	3.30

## Appendix E: Correlation Matrices

**Table 27: Correlation matrix KZ index**

This table reports the correlation matrix for the financial constraints *KZ* index. *FC (KZ)* is the financial constraints index *KZ*. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Variables	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR
FC (KZ)	1.00																				
ESG	-0.09	1.00																			
ESGC	-0.09	0.87	1.00																		
ESGE	-0.04	0.85	0.74	1.00																	
ESG_RU	-0.11	0.76	0.67	0.85	1.00																
ESG_EM	-0.05	0.75	0.66	0.83	0.75	1.00															
ESG_EI	0.06	0.53	0.47	0.69	0.36	0.33	1.00														
ESGS	-0.10	0.88	0.77	0.69	0.68	0.65	0.38	1.00													
ESG_WF	-0.11	0.69	0.62	0.64	0.66	0.69	0.26	0.71	1.00												
ESG_HR	-0.08	0.71	0.61	0.54	0.53	0.49	0.32	0.83	0.46	1.00											
ESG_CO	-0.09	0.68	0.59	0.49	0.46	0.43	0.30	0.73	0.38	0.47	1.00										
ESG_PR	-0.09	0.59	0.51	0.46	0.44	0.43	0.28	0.70	0.47	0.40	0.39	1.00									
ESGG	-0.09	0.64	0.56	0.33	0.27	0.29	0.20	0.34	0.25	0.24	0.37	0.17	1.00								
ESM_MA	-0.09	0.58	0.50	0.28	0.21	0.25	0.17	0.28	0.20	0.20	0.32	0.14	0.96	1.00							
ESG_ES	0.01	-0.04	-0.03	-0.10	-0.10	-0.15	-0.04	-0.11	-0.15	-0.11	-0.02	-0.04	0.16	0.05	1.00						
ESG_CS	-0.07	0.63	0.52	0.50	0.49	0.52	0.23	0.52	0.45	0.40	0.46	0.25	0.51	0.39	-0.01	1.00					
CH	-0.01	0.38	0.19	0.36	0.33	0.33	0.25	0.34	0.30	0.29	0.20	0.23	0.19	0.17	-0.10	0.24	1.00				
AI	0.04	0.04	0.02	0.02	-0.03	-0.01	0.02	0.01	-0.01	-0.03	0.09	-0.01	0.08	0.07	0.01	0.06	0.01	1.00			
AGE	-0.09	0.26	0.24	0.21	0.21	0.20	0.17	0.34	0.18	0.36	0.21	0.23	0.02	0.02	-0.10	0.12	0.12	-0.07	1.00		
ROA	-0.38	-0.03	0.00	-0.05	0.03	-0.01	-0.12	0.00	0.03	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.04	-0.03	-0.03	-0.02	1.00	
LR	0.19	0.04	0.07	0.01	0.00	0.02	-0.05	0.02	-0.01	-0.03	0.06	0.01	0.08	0.08	0.08	0.02	-0.09	0.02	-0.05	-0.08	1.00

**Table 28: Correlation matrix SA index**

This table reports the correlation matrix for the financial constraints SA index. *FC (SA)* is the financial constraints index KZ. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Variables	FC (SA)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR
FC (SA)	1.00																				
ESG	-0.19	1.00																			
ESGC	-0.26	0.87	1.00																		
ESGE	-0.12	0.85	0.74	1.00																	
ESG_RU	-0.15	0.76	0.67	0.85	1.00																
ESG_EM	-0.14	0.75	0.66	0.83	0.75	1.00															
ESG_EI	-0.10	0.53	0.47	0.69	0.36	0.33	1.00														
ESGS	-0.28	0.88	0.77	0.69	0.68	0.65	0.38	1.00													
ESG_WF	-0.12	0.69	0.62	0.64	0.66	0.69	0.26	0.71	1.00												
ESG_HR	-0.32	0.71	0.61	0.54	0.53	0.49	0.32	0.83	0.46	1.00											
ESG_CO	-0.17	0.68	0.59	0.49	0.46	0.43	0.30	0.73	0.38	0.47	1.00										
ESG_PR	-0.18	0.59	0.51	0.46	0.44	0.43	0.28	0.70	0.47	0.40	0.39	1.00									
ESGG	0.00	0.64	0.56	0.33	0.27	0.29	0.20	0.34	0.25	0.24	0.37	0.17	1.00								
ESM_MA	0.00	0.58	0.50	0.28	0.21	0.25	0.17	0.28	0.20	0.20	0.32	0.14	0.96	1.00							
ESG_ES	0.11	-0.04	-0.03	-0.10	-0.10	-0.15	-0.04	-0.11	-0.15	-0.11	-0.02	-0.04	0.16	0.05	1.00						
ESG_CS	-0.06	0.63	0.52	0.50	0.49	0.52	0.23	0.52	0.45	0.40	0.46	0.25	0.51	0.39	-0.01	1.00					
CH	0.07	0.38	0.19	0.36	0.33	0.33	0.25	0.34	0.30	0.29	0.20	0.23	0.19	0.17	-0.10	0.24	1.00				
AI	0.09	0.04	0.02	0.02	-0.03	-0.01	0.02	0.01	-0.01	-0.03	0.09	-0.01	0.08	0.07	0.01	0.06	0.01	1.00			
AGE	-0.83	0.26	0.24	0.21	0.21	0.20	0.17	0.34	0.18	0.36	0.21	0.23	0.02	0.02	-0.10	0.12	0.12	-0.07	1.00		
ROA	0.00	-0.03	0.00	-0.05	0.03	-0.01	-0.12	0.00	0.03	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.04	-0.03	-0.03	-0.02	1.00	
LR	0.02	0.04	0.07	0.01	0.00	0.02	-0.05	0.02	-0.01	-0.03	0.06	0.01	0.08	0.08	0.08	0.02	-0.09	0.02	-0.05	-0.08	1.00



**Table 29: Correlation matrix WW index**

This table reports the correlation matrix for the financial constraints *WW* index. *FC (WW)* is the financial constraints index KZ. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy’s adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Variables	FC (WW)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR
FC (WW)	1.00																				
ESG	-0.59	1.00																			
ESGC	-0.42	0.87	1.00																		
ESGE	-0.58	0.85	0.74	1.00																	
ESG_RU	-0.53	0.76	0.67	0.85	1.00																
ESG_EM	-0.54	0.75	0.66	0.83	0.75	1.00															
ESG_EI	-0.35	0.53	0.47	0.69	0.36	0.33	1.00														
ESGS	-0.51	0.88	0.77	0.69	0.68	0.65	0.38	1.00													
ESG_WF	-0.44	0.69	0.62	0.64	0.66	0.69	0.26	0.71	1.00												
ESG_HR	-0.39	0.71	0.61	0.54	0.53	0.49	0.32	0.83	0.46	1.00											
ESG_CO	-0.37	0.68	0.59	0.49	0.46	0.43	0.30	0.73	0.38	0.47	1.00										
ESG_PR	-0.38	0.59	0.51	0.46	0.44	0.43	0.28	0.70	0.47	0.40	0.39	1.00									
ESGG	-0.31	0.64	0.56	0.33	0.27	0.29	0.20	0.34	0.25	0.24	0.37	0.17	1.00								
ESM_MA	-0.28	0.58	0.50	0.28	0.21	0.25	0.17	0.28	0.20	0.20	0.32	0.14	0.96	1.00							
ESG_ES	0.11	-0.04	-0.03	-0.10	-0.10	-0.15	-0.04	-0.11	-0.15	-0.11	-0.02	-0.04	0.16	0.05	1.00						
ESG_CS	-0.43	0.63	0.52	0.50	0.49	0.52	0.23	0.52	0.45	0.40	0.46	0.25	0.51	0.39	-0.01	1.00					
CH	-0.57	0.38	0.19	0.36	0.33	0.33	0.25	0.34	0.30	0.29	0.20	0.23	0.19	0.17	-0.10	0.24	1.00				
AI	0.01	0.04	0.02	0.02	-0.03	-0.01	0.02	0.01	-0.01	-0.03	0.09	-0.01	0.08	0.07	0.01	0.06	0.01	1.00			
AGE	-0.08	0.26	0.24	0.21	0.21	0.20	0.17	0.34	0.18	0.36	0.21	0.23	0.02	0.02	-0.10	0.12	0.12	-0.07	1.00		
ROA	-0.11	-0.03	0.00	-0.05	0.03	-0.01	-0.12	0.00	0.03	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.04	-0.03	-0.03	-0.02	1.00	
LR	0.04	0.04	0.07	0.01	0.00	0.02	-0.05	0.02	-0.01	-0.03	0.06	0.01	0.08	0.08	0.08	0.02	-0.09	0.02	-0.05	-0.08	1.00

**Table 30: Complete correlation matrix including the WW, SA and KZ index**

This table reports the complete correlation matrix for the financial constraints *WW* index as the dependent variable. *FC (WW)* is the financial constraints index *WW*. *FC (SA)* is the financial constraints index *SA*. *FC (KZ)* is the financial constraints index *KZ*. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets.

Variables	FC (WW)	FC (SA)	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR	
FC (WW)	1.00																							
FC (SA)	-0.02	1.00																						
FC (KZ)	0.11	0.09	1.00																					
ESG	-0.59	-0.19	-0.09	1.00																				
ESGC	-0.42	-0.26	-0.09	0.87	1.00																			
ESGE	-0.58	-0.12	-0.04	0.85	0.74	1.00																		
ESG_RU	-0.53	-0.15	-0.11	0.76	0.67	0.85	1.00																	
ESG_EM	-0.54	-0.14	-0.05	0.75	0.66	0.83	0.75	1.00																
ESG_EI	-0.35	-0.10	0.06	0.53	0.47	0.69	0.36	0.33	1.00															
ESGS	-0.51	-0.28	-0.10	0.88	0.77	0.69	0.68	0.65	0.38	1.00														
ESG_WF	-0.44	-0.12	-0.11	0.69	0.62	0.64	0.66	0.69	0.26	0.71	1.00													
ESG_HR	-0.39	-0.32	-0.08	0.71	0.61	0.54	0.53	0.49	0.32	0.83	0.46	1.00												
ESG_CO	-0.37	-0.17	-0.09	0.68	0.59	0.49	0.46	0.43	0.30	0.73	0.38	0.47	1.00											
ESG_PR	-0.38	-0.18	-0.09	0.59	0.51	0.46	0.44	0.43	0.28	0.70	0.47	0.40	0.39	1.00										
ESGG	-0.31	0.00	-0.09	0.64	0.56	0.33	0.27	0.29	0.20	0.34	0.25	0.24	0.37	0.17	1.00									
ESM_MA	-0.28	0.00	-0.09	0.58	0.50	0.28	0.21	0.25	0.17	0.28	0.20	0.20	0.32	0.14	0.96	1.00								
ESG_ES	0.11	0.11	0.01	-0.04	-0.03	-0.10	-0.10	-0.15	-0.04	-0.11	-0.15	-0.11	-0.02	-0.04	0.16	0.05	1.00							
ESG_CS	-0.43	-0.06	-0.07	0.63	0.52	0.50	0.49	0.52	0.23	0.52	0.45	0.40	0.46	0.25	0.51	0.39	-0.01	1.00						
CH	-0.57	0.07	-0.01	0.38	0.19	0.36	0.33	0.33	0.25	0.34	0.30	0.29	0.20	0.23	0.19	0.17	-0.10	0.24	1.00					
AI	0.01	0.09	0.04	0.04	0.02	0.02	-0.03	-0.01	0.02	0.01	-0.01	-0.03	0.09	-0.01	0.08	0.07	0.01	0.06	0.01	1.00				
AGE	-0.08	-0.83	-0.09	0.26	0.24	0.21	0.21	0.20	0.17	0.34	0.18	0.36	0.21	0.23	0.02	0.02	-0.10	0.12	0.12	-0.07	1.00			
ROA	-0.11	0.00	-0.38	-0.03	0.00	-0.05	0.03	-0.01	-0.12	0.00	0.03	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.04	-0.03	-0.03	-0.02	1.00		
LR	0.04	0.02	0.19	0.04	0.07	0.01	0.00	0.02	-0.05	0.02	-0.01	-0.03	0.06	0.01	0.08	0.08	0.08	0.02	-0.09	0.02	-0.05	-0.08	1.00	

**Table 31: Complete correlation matrix for the WW, SA and KZ index with the excluded SIZE control variable**

This table reports the complete correlation matrix with the financial constraints *WW* index as the dependent variable. *FC (WW)* is the financial constraints index *WW*. *FC (SA)* is the financial constraints index *SA*. *FC (KZ)* is the financial constraints index *KZ*. *ESG* is the variable for overall ESG score. *ESGC* is the variable for combined overall ESG score with the controversy's adjustment. *ESGE* is the Environmental pillar score. *ESG\_RU* is the sub-category Resource Use score. *ESG\_EM* is the sub-category Emission score. *ESG\_EI* is the sub-category Environmental Innovation score. *ESGS* is the Social pillar score. *ESG\_WF* is the sub-category Workforce score. *ESG\_HR* is the sub-category Human Rights score. *ESG\_CO* is the sub-category Community score. *ESG\_PR* is the sub-category Product Responsibility score. *ESGG* is the Governance pillar score. *ESG\_MA* is the sub-category Management score. *ESG\_ES* is the sub-category Equal Shareholder Rights score. *ESG\_CS* is the sub-category CSR Strategy Score. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity. *AI* is the parameter measuring Asymmetric Information in terms of the bid-ask spread. *AGE* is the variable for Economic Age, measured by consecutive years listed from COMPUSTAT. *ROA* is the return-on-assets, measuring financial performance on the book value of assets. *LR* is the leverage-ratio, measured by long-term debt over total assets. *SIZE* is the natural logarithm of Total Assets to adjust for a large firm bias.

Variables	FC (WW)	FC (SA)	FC (KZ)	ESG	ESGC	ESGE	ESG_RU	ESG_EM	ESG_EI	ESGS	ESG_WF	ESG_HR	ESG_CO	ESG_PR	ESGG	ESM_MA	ESG_ES	ESG_CS	CH	AI	AGE	ROA	LR	SIZE	
FC (WW)	1.00																								
FC (SA)	-0.02	1.00																							
FC (KZ)	0.11	0.09	1.00																						
ESG	-0.59	-0.19	-0.09	1.00																					
ESGC	-0.42	-0.26	-0.09	0.87	1.00																				
ESGE	-0.58	-0.12	-0.04	0.85	0.74	1.00																			
ESG_RU	-0.53	-0.15	-0.11	0.76	0.67	0.85	1.00																		
ESG_EM	-0.54	-0.14	-0.05	0.75	0.66	0.83	0.75	1.00																	
ESG_EI	-0.35	-0.10	0.06	0.53	0.47	0.69	0.36	0.33	1.00																
ESGS	-0.51	-0.28	-0.10	0.88	0.77	0.69	0.68	0.65	0.38	1.00															
ESG_WF	-0.44	-0.12	-0.11	0.69	0.62	0.64	0.66	0.69	0.26	0.71	1.00														
ESG_HR	-0.39	-0.32	-0.08	0.71	0.61	0.54	0.53	0.49	0.32	0.83	0.46	1.00													
ESG_CO	-0.37	-0.17	-0.09	0.68	0.59	0.49	0.46	0.43	0.30	0.73	0.38	0.47	1.00												
ESG_PR	-0.38	-0.18	-0.09	0.59	0.51	0.46	0.44	0.43	0.28	0.70	0.47	0.40	0.39	1.00											
ESGG	-0.31	0.00	-0.09	0.64	0.56	0.33	0.27	0.29	0.20	0.34	0.25	0.24	0.37	0.17	1.00										
ESM_MA	-0.28	0.00	-0.09	0.58	0.50	0.28	0.21	0.25	0.17	0.28	0.20	0.20	0.32	0.14	0.96	1.00									
ESG_ES	0.11	0.11	0.01	-0.04	-0.03	-0.10	-0.10	-0.15	-0.04	-0.11	-0.15	-0.11	-0.02	-0.04	0.16	0.05	1.00								
ESG_CS	-0.43	-0.06	-0.07	0.63	0.52	0.50	0.49	0.52	0.23	0.52	0.45	0.40	0.46	0.25	0.51	0.39	-0.01	1.00							
CH	-0.57	0.07	-0.01	0.38	0.19	0.36	0.33	0.33	0.25	0.34	0.30	0.29	0.20	0.23	0.19	0.17	-0.10	0.24	1.00						
AI	0.01	0.09	0.04	0.04	0.02	0.02	-0.03	-0.01	0.02	0.01	-0.01	-0.03	0.09	-0.01	0.08	0.07	0.01	0.06	0.01	1.00					
AGE	-0.08	-0.83	-0.09	0.26	0.24	0.21	0.21	0.20	0.17	0.34	0.18	0.36	0.21	0.23	0.02	0.02	-0.10	0.12	0.12	-0.07	1.00				
ROA	-0.11	0.00	-0.38	-0.03	0.00	-0.05	0.03	-0.01	-0.12	0.00	0.03	0.00	-0.01	0.00	-0.02	-0.01	-0.01	-0.04	-0.03	-0.03	-0.02	1.00			
LR	0.04	0.02	0.19	0.04	0.07	0.01	0.00	0.02	-0.05	0.02	-0.01	-0.03	0.06	0.01	0.08	0.08	0.08	0.02	-0.09	0.02	-0.05	-0.08	1.00		
SIZE	-0.94	0.06	0.02	0.63	0.43	0.61	0.56	0.57	0.36	0.54	0.47	0.41	0.39	0.38	0.34	0.31	-0.11	0.46	0.62	0.01	0.06	-0.05	0.01	1.00	



## Appendix F: Company Sample List

**Table 32: List of sample companies**

This table reports the 387 unique European companies included in the data sample. The company name collected is reported in the column *Company*. The country of origin is reported in the column *Country*. The average total ESG score for all observed values is reported in the column *Avg. ESG* for each individual company.

<b>Company</b>	<b>Country</b>	<b>Avg. ESG</b>
STRABAG SE	Austria	45.77
ANDRITZ AG	Austria	60.42
EVN AG	Austria	62.62
SEMPERIT AG HOLDING	Austria	48.89
VOESTALPINE AG	Austria	48.46
AT & S AUSTRIA TECHNOLOGIE & SYSTEMTECHNIK AG	Austria	40.16
S&T AG	Austria	37.87
AMS AG	Austria	34.44
KAPSCH TRAFFICOM AG	Austria	63.91
ORANGE BELGIUM SA	Belgium	49.53
ION BEAM APPLICATIONS SA	Belgium	58.91
EURONAV NV	Belgium	40.47
ELIA GROUP SA	Belgium	30.48
TELENET GROUP HOLDING NV	Belgium	68.80
FAGRON NV	Belgium	41.84
AANNEMINGSMAATSCHAPPIJ CFE NV	Belgium	47.97
D'IETEREN NV	Belgium	37.70
KINEPOLIS GROUP NV	Belgium	31.00
ONTEX GROUP NV	Belgium	45.48
NYRSTAR NV	Belgium	57.01
ECONOCOM GROUP SE	Belgium	31.18
BARCO NV	Belgium	48.37
POLYMETAL INTERNATIONAL PLC	Cyprus	68.59
O2 CZECH REPUBLIC AS	Czech Republic	43.58
BANG & OLUFSEN A/S	Denmark	36.77
ROCKWOOL INTERNATIONAL A/S	Denmark	56.12
AP MOELLER - MAERSK A/S	Denmark	57.73
SOLAR A/S	Denmark	27.88
H LUNDBECK A/S	Denmark	50.06
NKT A/S	Denmark	48.34
ALK-ABELLO A/S	Denmark	33.65
NOVO NORDISK A/S	Denmark	74.55
DEMANT A/S	Denmark	33.74
TIETOEVRY CORP	Finland	66.55
HUHTAMAKI OYJ	Finland	54.04
NOKIA OYJ	Finland	84.86
OUTOKUMPU OYJ	Finland	62.93
WARTSILA OYJ ABP	Finland	68.13



KEMIRA OYJ	Finland	55.43
NOKIAN TYRES PLC	Finland	42.12
KONECRANES ABP	Finland	56.50
UPM-KYMMENE OYJ	Finland	83.70
FORTUM OYJ	Finland	71.08
SANOMA OYJ	Finland	53.73
ELISA OYJ	Finland	47.77
NESTE OYJ	Finland	70.64
CARGOTEC CORP	Finland	57.16
TIKKURILA OYJ	Finland	48.32
NELES OYJ	Finland	77.67
AIR FRANCE KLM SA	France	65.09
VIRBAC SA	France	49.57
SYNERGIE SE	France	23.91
GROUPE CRIT SA	France	13.12
MANITOU BF SA	France	35.81
SECHE ENVIRONNEMENT SA	France	37.74
BOLLORE SE	France	36.81
NEXANS SA	France	75.88
SOPRA STERIA GROUP SA	France	55.27
ETABLISSEMENTS MAUREL ET PROM SA	France	24.98
ATOS SE	France	60.96
TELEPERFORMANCE SE	France	53.42
HERMES INTERNATIONAL SCA	France	57.23
VILMORIN & CIE SA	France	66.41
OENEO SA	France	5.75
COMPAGNIE DES ALPES SA	France	46.34
DERICHEBOURG SA	France	34.62
UBISOFT ENTERTAINMENT SA	France	42.63
TELEVISION FRANCAISE 1 SA	France	56.25
ALBIOMA SA	France	46.33
RALLYE SA	France	78.36
BOIRON SA	France	44.97
COVIVIO SA	France	64.86
GL EVENTS SA	France	34.85
HAULOTTE GROUP SA	France	30.59
SAFRAN SA	France	42.90
IPSOS SA	France	63.16
JCDECAUX SA	France	72.01
L'AIR LIQUIDE SOCIETE ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES GEORGES CLAUDE SA	France	64.72
CARREFOUR SA	France	75.69
TOTAL SE	France	83.92
L'OREAL SA	France	81.97
ACCOR SA	France	71.32
QUADIENT SA	France	49.75
SANOFI SA	France	83.27
LVMH MOET HENNESSY LOUIS VUITTON SE	France	59.48
FAURECIA SE	France	62.15
SODEXO SA	France	82.84
THALES SA	France	54.12

KERING SA	France	73.03
PEUGEOT SA	France	85.10
ESSILORLUXOTTICA SA	France	52.64
SEB SA	France	65.76
DASSAULT AVIATION SA	France	42.20
COMPAGNIE PLASTIC OMNIUM SE	France	52.49
COMPAGNIE DE SAINT GOBAIN SA	France	83.21
CAPGEMINI SE	France	60.32
INGENICO GROUP SA	France	38.34
CASINO GUICHARD PERRACHON SA	France	72.16
VIVENDI SA	France	83.21
REMY COINTREAU SA	France	41.39
CHRISTIAN DIOR SE	France	59.07
EIFFAGE SA	France	71.71
PUBLICIS GROUPE SA	France	76.14
DASSAULT SYSTEMES SE	France	48.97
ERAMET SA	France	61.82
RENAULT SA	France	82.61
ORANGE SA	France	70.90
ORPEA SA	France	48.43
ILIAD SA	France	38.44
VALNEVA SE	France	52.33
TRIGANO SA	France	12.71
BUREAU VERITAS SA	France	50.05
NEXITY SA	France	65.81
ALSTOM SA	France	87.31
EUTELSAT COMMUNICATIONS SA	France	44.89
ELECTRICITE DE FRANCE SA	France	73.75
IPSEN SA	France	52.21
ARKEMA SA	France	63.28
AEROPORTS DE PARIS SA	France	68.07
KORIAN SA	France	64.11
REXEL SA	France	54.96
SUEZ SA	France	65.86
GROUPE GUILLIN SA	France	7.11
VALEO SA	France	73.99
CGG SA	France	54.52
RUBIS SCA	France	49.40
BIOMERIEUX SA	France	53.78
TECHNICOLOR SA	France	68.72
VALLOUREC SA	France	73.25
FRESENIUS SE & CO KGAA	Germany	61.22
TAKKT AG	Germany	16.27
BRENNTAG AG	Germany	59.89
GEK TERNA HOLDINGS REAL ESTATE CONSTRUCTION SA	Greece	43.96
GR SARANTIS SA	Greece	40.08
LAMDA DEVELOPMENT SA	Greece	29.44
HELLENIC TELECOMMUNICATIONS ORGANIZATION SA	Greece	76.92
HELLENIC PETROLEUM SA	Greece	67.81
MARFIN INVESTMENT GROUP HOLDINGS SA	Greece	30.46
MYTILINEOS SA	Greece	69.91



PUBLIC POWER CORPORATION SA	Greece	51.09
TERNA ENERGY SA	Greece	49.82
MAGYAR TELEKOM TAVKOZLESI NYRT	Hungary	77.77
MOL MAGYAR OLAJES GAZIPARI NYRT	Hungary	63.50
EXPERIAN PLC	Ireland	50.97
GLANBIA PLC	Ireland	29.63
CRH PLC	Ireland	80.83
DCC PLC	Ireland	53.65
GREENCORE GROUP PLC	Ireland	44.86
KERRY GROUP PLC	Ireland	46.50
SMURFIT KAPPA GROUP PLC	Ireland	79.27
ORIGIN ENTERPRISES PLC	Ireland	45.89
KENMARE RESOURCES PLC	Ireland	42.92
PLAYTECH PLC	Isle of Man	43.60
BUZZI UNICEM SPA	Italy	47.61
PIAGGIO & C SPA	Italy	61.21
SAIPEM SPA	Italy	87.32
PETROFAC LTD	Jersey	61.65
EUROFINS SCIENTIFIC SE	Luxembourg	36.49
SES SA	Luxembourg	39.60
TENARIS SA	Luxembourg	56.19
ARCELORMITTAL SA	Luxembourg	81.01
ROYAL DUTCH SHELL PLC	Netherlands	86.96
KONINKLIJKE KPN NV	Netherlands	64.83
KONINKLIJKE DSM NV	Netherlands	76.14
AIRBUS SE	Netherlands	77.77
KONINKLIJKE BAM GROEP NV	Netherlands	69.96
SBM OFFSHORE NV	Netherlands	65.66
UNILEVER NV	Netherlands	93.07
WOLTERS KLUWER NV	Netherlands	64.13
AMG ADVANCED METALLURGICAL GROUP NV	Netherlands	56.93
KONINKLIJKE VOPAK NV	Netherlands	68.43
POSTNL NV	Netherlands	60.12
CORBION NV	Netherlands	61.44
ALTICE EUROPE NV	Netherlands	12.26
KONINKLIJKE AHOLD DELHAIZE NV	Netherlands	75.37
EXOR NV	Netherlands	22.01
QIAGEN NV	Netherlands	73.78
MOWI ASA	Norway	66.44
ORKLA ASA	Norway	74.00
EQUINOR ASA	Norway	80.06
REC SILICON ASA	Norway	33.40
CYFROWY POLSAT SA	Poland	28.93
CIECH SA	Poland	21.44
ENERGA SA	Poland	45.97
JASTRZEBSKA SPOLKA WEGLOWA SA	Poland	24.53
KGHM POLSKA MIEDZ SA	Poland	51.45
GRUPA LOTOS SA	Poland	50.55
POLIMEX MOSTOSTAL SA	Poland	22.27
PGE POLSKA GRUPA ENERGETYCZNA SA	Poland	35.36
POLSKIE GORNICTWO NAFTOWE I GAZOWNICTWO SA	Poland	39.30



TAURON POLSKA ENERGIA SA	Poland	30.04
ORANGE POLSKA SA	Poland	65.25
NEUCA SA	Poland	27.83
GRUPA AZOTY SA	Poland	29.63
ALTRI SGPS SA	Portugal	43.83
CORTICEIRA AMORIM SGPS SA	Portugal	45.46
EDP ENERGIAS DE PORTUGAL SA	Portugal	78.63
GALP ENERGIA SGPS SA	Portugal	58.55
NAVIGATOR COMPANY SA	Portugal	59.15
SONAE INDUSTRIA SGPS SA	Portugal	41.13
SEMAPA SOCIEDADE DE INVESTIMENTO E GESTAO SGPS SA	Portugal	50.51
SONAE SGPS SA	Portugal	76.42
EXILLON ENERGY PLC	Russia	23.49
AK ALROSA PAO	Russia	44.19
GMK NORIL'SKIY NIKEL' PAO	Russia	56.86
URALKALIY PAO	Russia	30.15
ROSTELEKOM PAO	Russia	36.38
TATNEFT' PAO	Russia	42.72
NOVOLIPETSK STEEL PAO	Russia	50.73
SEVERSTAL' PAO	Russia	54.69
GAZPROM NEFT' PAO	Russia	48.49
MAGNITOGORSKIY METALLURGICHESKIY KOMBINAT PAO	Russia	41.67
RASPADSKAYA PAO	Russia	11.24
NOVATEK PAO	Russia	54.82
NK ROSNEFT' PAO	Russia	65.82
POLYUS PAO	Russia	40.47
FEDERAL HYDRO-GENERATING COMPANY RUSHYDRO PAO	Russia	40.76
INTER RAO YEES PAO	Russia	44.40
ROSSIYSKIYE SETI PAO	Russia	30.18
PHOSAGRO PAO	Russia	34.92
MEGAFON PAO	Russia	34.16
NATURGY ENERGY GROUP SA	Spain	72.89
INDRA SISTEMAS SA	Spain	74.28
ACCIONA SA	Spain	81.73
DISTRIBUIDORA INTERNACIONAL DE ALIMENTACION SA	Spain	49.10
EDP RENOVAVEIS SA	Spain	65.36
ENDESA SA	Spain	81.10
ENAGAS SA	Spain	74.81
TUBACEX SA	Spain	33.81
SIEMENS GAMESA RENEWABLE ENERGY SA	Spain	76.68
IBERDROLA SA	Spain	86.21
INDUSTRIA DE DISENO TEXTIL SA	Spain	84.00
MIQUEL Y COSTAS & MIQUEL SA	Spain	16.64
ACS ACTIVIDADES DE CONSTRUCCION Y SERVICIOS SA	Spain	62.73
GRIFOLS SA	Spain	37.28
REPSOL SA	Spain	76.62
SACYR SA	Spain	56.77
CEMEX LATAM HOLDINGS SA	Spain	48.80
TELEFONAKTIEBOLAGET LM ERICSSON	Sweden	83.76
SKANSKA AB	Sweden	56.55
TRELLEBORG AB	Sweden	57.47



SECURITAS AB	Sweden	42.05
SSAB AB	Sweden	62.25
SWEDISH MATCH AB	Sweden	71.44
TELIA COMPANY AB	Sweden	76.49
ATLAS COPCO AB	Sweden	77.58
BOLIDEN AB	Sweden	72.92
OC OERLIKON CORPORATION AG PFAEFFIKON	Switzerland	47.28
BELIMO HOLDING AG	Switzerland	38.43
VALORA HOLDING AG	Switzerland	38.38
SGS SA	Switzerland	76.30
RIETER HOLDING AG	Switzerland	36.26
GIVAUDAN SA	Switzerland	70.47
NOVARTIS AG	Switzerland	84.03
ROCHE HOLDING AG	Switzerland	84.04
TECAN GROUP AG	Switzerland	35.20
CLARIANT AG	Switzerland	72.90
LAFARGEHOLCIM LTD	Switzerland	67.37
ABB LTD	Switzerland	91.05
SWATCH GROUP AG	Switzerland	26.57
STRAUMANN HOLDING AG	Switzerland	57.59
SONOVA HOLDING AG	Switzerland	64.92
LONZA GROUP AG	Switzerland	72.48
YPSOMED HOLDING AG	Switzerland	30.01
KUEHNE UND NAGEL INTERNATIONAL AG	Switzerland	42.19
HUBER+SUHNER AG	Switzerland	42.29
DAETWYLER HOLDING AG	Switzerland	47.47
SULZER AG	Switzerland	74.42
NESTLE SA	Switzerland	88.85
MEYER BURGER TECHNOLOGY AG	Switzerland	20.79
COCA COLA HBC AG	Switzerland	91.85
COMPAGNIE FINANCIERE RICHEMONT SA	Switzerland	56.03
BOSSARD HOLDING AG	Switzerland	30.70
FLUGHAFEN ZUERICH AG	Switzerland	30.84
FERREXPO PLC	Switzerland	49.31
GLENCORE PLC	Switzerland	80.48
STMICROELECTRONICS NV	Switzerland	90.95
KERNEL HOLDING S.A.	Ukraine	37.82
PETRA DIAMONDS LTD	United Kingdom	70.00
INTERNATIONAL CONSOLIDATED AIRLINES GROUP SA	United Kingdom	72.45
SPEEDY HIRE PLC	United Kingdom	50.43
BALFOUR BEATTY PLC	United Kingdom	68.82
TULLOW OIL PLC	United Kingdom	59.21
VISTRY GROUP PLC	United Kingdom	39.78
GENUS PLC	United Kingdom	26.56
DIAGEO PLC	United Kingdom	85.82
ELEMENTIS PLC	United Kingdom	53.91
BAE SYSTEMS PLC	United Kingdom	68.91
DEVRO PLC	United Kingdom	38.17
ELECTROCOMPONENTS PLC	United Kingdom	45.27
SPECTRIS PLC	United Kingdom	60.37
GO-AHEAD GROUP PLC	United Kingdom	50.48



HEADLAM GROUP PLC	United Kingdom	22.01
HILL & SMITH HOLDINGS PLC	United Kingdom	51.07
HUNTING PLC	United Kingdom	40.10
IMPERIAL BRANDS PLC	United Kingdom	80.18
JKX OIL AND GAS PLC	United Kingdom	41.13
KELLER GROUP PLC	United Kingdom	29.42
KIER GROUP PLC	United Kingdom	52.49
HOWDEN JOINERY GROUP PLC	United Kingdom	25.15
MEGGITT PLC	United Kingdom	45.46
MORGAN ADVANCED MATERIALS PLC	United Kingdom	62.90
NATIONAL EXPRESS GROUP PLC	United Kingdom	52.02
ASSOCIATED BRITISH FOODS PLC	United Kingdom	71.19
PEARSON PLC	United Kingdom	72.97
GB GROUP PLC	United Kingdom	16.18
EUROMONEY INSTITUTIONAL INVESTOR PLC	United Kingdom	14.50
RIO TINTO PLC	United Kingdom	77.31
RENISHAW PLC	United Kingdom	65.59
RPS GROUP PLC	United Kingdom	58.91
SSE PLC	United Kingdom	62.33
SENIOR PLC	United Kingdom	46.73
SERCO GROUP PLC	United Kingdom	80.03
BP PLC	United Kingdom	86.16
RENEWI PLC	United Kingdom	55.61
SIG PLC	United Kingdom	56.07
DS SMITH PLC	United Kingdom	52.18
PHOTO-ME INTERNATIONAL PLC	United Kingdom	23.94
TATE & LYLE PLC	United Kingdom	57.69
TESCO PLC	United Kingdom	73.67
SMITH & NEPHEW PLC	United Kingdom	67.09
GLAXOSMITHKLINE PLC	United Kingdom	84.46
WEIR GROUP PLC	United Kingdom	59.97
DECHRA PHARMACEUTICALS PLC	United Kingdom	34.57
BABCOCK INTERNATIONAL GROUP PLC	United Kingdom	40.04
ASTRAZENECA PLC	United Kingdom	88.81
WINCANTON PLC	United Kingdom	45.43
BT GROUP PLC	United Kingdom	72.95
PETROPAVLOVSK PLC	United Kingdom	31.87
BURBERRY GROUP PLC	United Kingdom	71.05
NEXT PLC	United Kingdom	64.37
KINGFISHER PLC	United Kingdom	80.40
ITV PLC	United Kingdom	71.87
MARSHALLS PLC	United Kingdom	59.53
HALFORDS GROUP PLC	United Kingdom	52.25
NCC GROUP PLC	United Kingdom	37.84
CENTRICA PLC	United Kingdom	77.55
ESSENTRA PLC	United Kingdom	52.56
BUNZL PLC	United Kingdom	46.62
RENTOKIL INITIAL PLC	United Kingdom	65.71
KAZ MINERALS PLC	United Kingdom	50.03
HIKMA PHARMACEUTICALS PLC	United Kingdom	57.12
BRITVIC PLC	United Kingdom	70.05



QINETIQ GROUP PLC	United Kingdom	48.01
SAVILLS PLC	United Kingdom	46.06
PZ CUSSONS PLC	United Kingdom	51.42
DUNELM GROUP PLC	United Kingdom	38.76
HOCHSCHILD MINING PLC	United Kingdom	35.39
RANK GROUP PLC	United Kingdom	40.35
FRASERS GROUP PLC	United Kingdom	32.12
HILTON FOOD GROUP PLC	United Kingdom	26.43
SMITHS GROUP PLC	United Kingdom	48.69
CAPITA PLC	United Kingdom	62.02
BODYCOTE PLC	United Kingdom	34.85
OCADO GROUP PLC	United Kingdom	48.99
REDDE NORTHGATE PLC	United Kingdom	34.95
PREMIER OIL PLC	United Kingdom	55.41
DIXONS CARPHONE PLC	United Kingdom	56.68
TALKTALK TELECOM GROUP PLC	United Kingdom	31.81
JOHN WOOD GROUP PLC	United Kingdom	50.12
RESTORE PLC	United Kingdom	35.64
SUPERDRY PLC	United Kingdom	26.09
INCHCAPE PLC	United Kingdom	40.69
ROLLS-ROYCE HOLDINGS PLC	United Kingdom	70.99
CENTRAL ASIA METALS PLC	United Kingdom	43.52
STAGECOACH GROUP PLC	United Kingdom	49.96
PHOENIX GLOBAL RESOURCES PLC	United Kingdom	11.52
VESUVIUS PLC	United Kingdom	44.26
SAGE GROUP PLC	United Kingdom	53.77
COMPASS GROUP PLC	United Kingdom	73.70
NATIONAL GRID PLC	United Kingdom	63.15
CLS HOLDINGS PLC	United Kingdom	47.05
SSP GROUP PLC	United Kingdom	51.11
VODAFONE GROUP PLC	United Kingdom	83.27
INTERCONTINENTAL HOTELS GROUP PLC	United Kingdom	74.40
DAILY MAIL AND GENERAL TRUST P L C	United Kingdom	38.27
AO WORLD PLC	United Kingdom	34.30
AGGREKO PLC	United Kingdom	43.27
SIGNATURE AVIATION PLC	United Kingdom	40.23
COMPUTACENTER PLC	United Kingdom	49.27
ROTORK PLC	United Kingdom	46.00
SPIRAX-SARCO ENGINEERING PLC	United Kingdom	42.20
DOMINO'S PIZZA GROUP PLC	United Kingdom	38.28
JD SPORTS FASHION PLC	United Kingdom	29.07
HARWORTH GROUP PLC	United Kingdom	37.17
WPP PLC	United Kingdom	62.25
FIAT CHRYSLER AUTOMOBILES NV	United Kingdom	90.33



## Appendix G: Regression Results

**Table 33: Results from ESGG, ESGS and ESGG regressions**

This table reports the results from combined regressions using the main model for the period 2010-2019 on the *WW*, *KZ* and *SA* financial constraints indices. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. Model (1)' is estimated using the *WW* index as the dependent variable. Model (2)'' is estimated using the *KZ* index as the dependent variable. Model (3)''' is estimated using the *SA* index as the dependent variable. *ESGE* is the Environmental pillar score. *ESGS* is the Social pillar score. *ESGG* is the Governance pillar score. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *AGE<sub>IN</sub>* is the firm age control proxy variable, given as the total number of years since inception of each specific entity. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)' WW Index	Model (2)'' KZ Index	Model (3)''' SA Index
<i>ESGE</i>	-0.0012*** (0.00001)	-0.0075** (0.0036)	0.0006* (0.0004)
<i>ESGS</i>	-0.0007*** (0.00001)	-0.0028 (0.0039)	-0.0023*** (0.0004)
<i>ESGG</i>	-0.0004*** (0.00001)	-0.0067** (0.0029)	0.00042 (0.0003)
<i>AGE</i>	-0.0124*** (0.0027)	-0.1176 (0.1248)	
<i>AGE<sub>IN</sub></i>			-0.1349*** (0.0072)
<i>ROA</i>	-0.1334*** (0.0213)	-14.374*** (0.9768)	-0.2365** (0.0954)
<i>LR</i>	0.0359 (0.0103)	3.3212*** (0.4724)	-0.0905* (0.0465)
YEAR FE	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838
ADJUSTED R2	0.5215	0.2883	0.4721

**Table 34: Results from extended sub-category regressions with KZ index**

This table reports the results from the sub-category cross-sectional regressions for the period 2010-2019 on the KZ financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. *ESG\_RU* is the sub-category Resource Use score in model (7). *ESG\_EM* is the sub-category Emission score in model (8). *ESG\_EI* is the sub-category Environmental Innovation score in model (9). *ESG\_WF* is the sub-category Workforce score in model (10). *ESG\_HR* is the sub-category Human Rights score in model (11). *ESG\_CO* is the sub-category Community score in model (12). *ESG\_PR* is the sub-category Product Responsibility score in model (13). *ESG\_MA* is the sub-category Management score in model (14). *ESG\_ES* is the sub-category Equal Shareholder Rights score in model (15). *ESG\_CS* is the sub-category CSR Strategy Score in model (16). *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)
<i>ESG_RU</i>	-0.0144*** (0.0023)									
<i>ESG_EM</i>		-0.0128*** (0.0024)								
<i>ESG_EI</i>			0.0018 (0.0019)							
<i>ESG_WF</i>				-0.0166*** (0.0031)						
<i>ESG_HR</i>					-0.0045** (0.0019)					
<i>ESG_CO</i>						-0.0065*** (0.0021)				
<i>ESG_PR</i>							-0.0040** (0.0020)			
<i>ESG_MA</i>								-0.0078*** (0.0021)		
<i>ESG_ES</i>									0.0003 (0.0025)	
<i>ESG_CS</i>										-0.0087*** (0.0021)
<i>AGE</i>	-0.0938 (0.1226)	-0.0891 (0.1237)	-0.2234* (0.1228)	-0.1399 (0.1222)	-0.1523 (0.1251)	-0.1580 (0.1235)	-0.1771 (0.1237)	-0.1864 (0.1222)	-0.2133* (0.1228)	-0.1355 (0.1233)
<i>ROA</i>	13.91*** (0.9715)	-14.032*** (0.9739)	-14.111*** (0.9839)	13.904*** (0.9746)	14.132*** (0.9799)	14.309*** (0.9795)	-14.164*** (0.9801)	-14.324*** (0.9782)	-14.183*** (0.9812)	14.45*** (0.9786)
<i>LR</i>	3.3175*** (0.4700)	3.3085*** (0.4715)	3.265*** (0.4763)	3.2384*** (0.4711)	3.2248*** (0.4743)	3.2838*** (0.4741)	3.2444*** (0.4745)	3.3178*** (0.4737)	3.2292*** (0.4749)	3.2398*** (0.4727)
<i>YEAR FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>INDUSTRY FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>COUNTRY FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>OBSERVATIONS</i>	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838
<i>ADJUSTED R2</i>	0.2943	0.2899	0.2791	0.2904	0.2809	0.2825	0.2803	0.2842	0.2787	0.2856

**Table 35: Results from extended sub-category regressions with SA index**

This table reports the results from the sub-category cross-sectional regressions for the period 2010-2019 on the SA financial constraints index. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. *ESG\_RU* is the sub-category Resource Use score in model (7). *ESG\_EM* is the sub-category Emission score in model (8). *ESG\_EI* is the sub-category Environmental Innovation score in model (9). *ESG\_WF* is the sub-category Workforce score in model (10). *ESG\_HR* is the sub-category Human Rights score in model (11). *ESG\_CO* is the sub-category Community score in model (12). *ESG\_PR* is the sub-category Product Responsibility score in model (13). *ESG\_MA* is the sub-category Management score in model (14). *ESG\_ES* is the sub-category Equal Shareholder Rights score in model (15). *ESG\_CS* is the sub-category CSR Strategy Score in model (16). *AGE\_IN* is the firm age control proxy variable, given as the total number of years since inception of each specific entity. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R2* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)	Model (13)	Model (14)	Model (15)	Model (16)
<i>ESG_RU</i>	-0.0009*** (0.0002)									
<i>ESG_EM</i>		-0.0009*** (0.0002)								
<i>ESG_EI</i>			0.0002 (0.0002)							
<i>ESG_WF</i>				-0.0006* (0.0003)						
<i>ESG_HR</i>					-0.0012*** (0.0002)					
<i>ESG_CO</i>						-0.0007*** (0.0002)				
<i>ESG_PR</i>							-0.0006*** (0.0002)			
<i>ESG_MA</i>								-0.0002 (0.0002)		
<i>ESG_ES</i>									-0.0007*** (0.0002)	
<i>ESG_CS</i>										-0.0005** (0.0002)
<i>AGE_IN</i>	-0.1376*** (0.0072)	-0.1356*** (0.0072)	-0.1392*** (0.0072)	-0.1383*** (0.0072)	-0.1342*** (0.0072)	-0.1360*** (0.0073)	-0.1377*** (0.0072)	-0.1383*** (0.0072)	-0.1367*** (0.0072)	-0.1377*** (0.0072)
<i>ROA</i>	-0.2386** (0.0959)	-0.2434** (0.0958)	-0.2517*** (0.0964)	-0.2479** (0.0962)	-0.2378** (0.0951)	-0.2703*** (0.0959)	-0.2527*** (0.0958)	-0.2619*** (0.0961)	-0.2576*** (0.0959)	-0.2717*** (0.0962)
<i>LR</i>	-0.0958** (0.0467)	-0.0942** (0.0467)	-0.0977** (0.0469)	-0.1010** (0.0468)	-0.0958** (0.0463)	-0.0942** (0.0468)	-0.0987** (0.0467)	-0.0993** (0.0469)	-0.1021** (0.0467)	-0.1005** (0.0468)
YEAR FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
INDUSTRY FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OBSERVATIONS	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838
ADJUSTED R2	0.4658	0.4662	0.4615	0.4623	0.4731	0.4647	0.4646	0.4614	0.4640	0.4628

**Table 36: Results from WW, KZ and SA pooled regressions**

This table reports the results from pooled regressions using the main models (1)-(3) for the period 2010-2019 on the *WW*, *KZ* and *SA* financial constraints indices. The dependent variable (*FC*) is calculated for every unique entity at the end of each observed year. The standard errors are represented in the parentheses. Model (1)-(3)' is estimated using the *WW* index as the dependent variable. Model (1)-(3)'' is estimated using the *KZ* index as the dependent variable. Model (1)-(3)''' is estimated using the *SA* index as the dependent variable. *INTERCEPT* is the intercept for the relative model. *ESG* is the combined score from the E, S and G pillars from the Thomson Reuters Refinitiv ESG measure. *AI* is the parameter measuring asymmetric information in terms of the annual bid-ask spread at closing. *CH* is the parameter measuring agency costs in terms of Cash Holding Liquidity given by cash and liquid assets. *AGE* is the economic age control proxy variable, given as the number of consecutive years each unique entity has been listed on an official exchange, estimated from COMPUSTAT. *AGE<sub>IN</sub>* is the firm age control proxy variable, given as the total number of years since inception of each specific entity. *ROA* is the return on assets given by the book value. *LR* is the leverage ratio given by the long-term debt over total assets. *YEAR FE* is a dummy variable controlling for time specific variation for the included time period 2010-2019. *INDUSTRY FE* is a dummy variable controlling for industry specific variations originating from the ten different industry sectors in the TRBC. *COUNTRY FE* is a dummy variable controlling for country specific variations originating from our 25 included European countries. *OBSERVATIONS* reports the number of included regression observations. *ADJUSTED R<sup>2</sup>* reports the adjusted r-squared for the given regression model. The statistical significance of the included variables is illustrated as the following: \*\*\*1% significance level, \*\*5% significance level and \*10% significance level.

Variable	Model (1)' WW Index	Model (2)' WW Index	Model (3)' WW Index	Model (1)'' KZ Index	Model (2)'' KZ Index	Model (3)'' KZ Index	Model (1)''' SA Index	Model (2)''' SA Index	Model (3)''' SA Index
<i>INTERCEPT</i>	-0.2646*** (0.0079)	-0.2645*** (0.0079)	-0.2805*** (0.0069)	1.1054*** (0.3393)	1.1075*** (0.3393)	1.1686*** (0.3407)	-3.1697*** (0.0327)	3.166*** (0.0327)	-3.1612*** (0.0324)
<i>FC</i>	-0.0025*** (0.00008)	-0.0025*** (0.00008)	-0.0018*** (0.00007)	-0.0141*** (0.0033)	-0.0143*** (0.0033)	-0.1659*** (0.0036)	-0.0019*** (0.0004)	-0.0020*** (0.0004)	-0.0029*** (0.0004)
<i>AI</i>		0.0061** (0.0027)			0.1322 (0.1195)			0.0421*** (0.0129)	
<i>CH</i>			-0.00002*** (0.000001)			0.00009* (0.00005)			0.00003*** (0.000005)
<i>ΔCF</i>	0.0109*** (0.0024)	0.0113*** (0.0222)	0.0116*** (0.0021)	-0.3101*** (0.1048)	-0.3007*** (0.1051)	-0.3128*** (0.1047)			
<i>AGE<sub>IN</sub></i>							-0.1736*** (0.0074)	-0.1722*** (0.0074)	-0.1698*** (0.0074)
<i>ROA</i>	-0.1467*** (0.0223)	-0.1454*** (0.0223)	-0.1601*** (0.0196)	-17.014*** (0.9563)	-16.986*** (0.9565)	-16.961*** (0.9559)	-0.0949 (0.1039)	-0.0860 (0.1037)	-0.0743 (0.1029)
<i>LR</i>	0.0367*** (0.0108)	0.0364*** (0.0108)	0.0099** (0.0096)	3.555*** (0.4653)	3.5476*** (0.4653)	3.6612*** (0.4683)	-0.0454 (0.0508)	-0.0475 (0.0506)	-0.0046 (0.0506)
<i>YEAR FE</i>	No	No	No	No	No	No	No	No	No
<i>INDUSTRY FE</i>	No	No	No	No	No	No	No	No	No
<i>COUNTRY FE</i>	No	No	No	No	No	No	No	No	No
<i>OBSERVATIONS</i>	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838
<i>ADJUSTED R<sup>2</sup></i>	0.3781	0.3790	0.5192	0.1880	0.1881	0.1892	0.2567	0.2605	0.2717