



Master Degree course in Engineering and Management

Master Degree Thesis

ESG and Financial Performance: Cross-Sectional Patterns and Within-Firm Dynamics in a Pre-Mandatory Disclosure Setting

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ACADEMIC YEAR 2025-2026

Acknowledgements

To be completed.

Abstract

Does ESG create financial value, or is it merely an artefact of regulation? This question has become increasingly difficult to answer because the mandatory disclosure requirements have reshaped corporate behaviour since 2020. The present thesis addresses the issue directly by examining the relationship between ESG and financial performance in a predominantly voluntary setting, using a global sample of firms observed over a period of 2014-2018, before the major regulatory wave that transformed ESG from a strategic choice into a legal obligation.

The analysis is structured into two levels. First, a descriptive investigation of pillar-level ESG scores (Environmental, Social, and Governance) examines their distribution, temporal trends, and inter-correlations across sectors and markets. Second, a regression framework, that combines a baseline model, a sector moderation model and a market moderation model, tests whether ESG scores are associated with four financial outcomes: ROA, ROE, Tobin's Q, and WACC. The OLS and firm fixed effects specifications are estimated to make a distinction between cross-sectional structural patterns and genuine within-firm dynamics.

The present findings confirm that ESG performance generates financial value even absent regulatory pressure, with each pillar operating through distinct mechanisms and time horizons. The most consequential finding concerns governance: its coefficients are large and robust in cross-sectional specifications but collapse entirely in within-firm fixed effects models, suggesting that governance quality functions as a structural organisational characteristic that distinguishes persistently high-performing firms, rather than a dynamic lever that generates measurable returns when improved within a short time horizon. The Governance pillar thus emerges as a path-dependent variable rather than a dynamic one; the environmental dimension reveals a dual-channel mechanism, whereby operational costs are offset by a reduction in the cost of capital. The Social pillar shows positive dynamic effects consistent with instrumental stakeholder theory. Contextual moderation by sector and regulatory intensity further reveals that ESG value creation is institutionally contingent, following a substitution logic in highly regulated markets for Governance and Social, but a complementary logic for the Environmental dimension.

These results reframe the ESG debate: the question should not only focus on whether ESG creates or destroys value, but through which mechanism, over which time horizon and in which institutional context each dimension does so.

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Chapter 1

Introduction

1.1 Motivation and Research Problem

In recent years, Environmental, Social and Governance (ESG) factors have gained increasing importance and prominence in the decision-making process of investors, corporations and policy-makers. The integration of ESG considerations and criteria into financial analysis and investment strategies, initially perceived as a niche practice, has progressively evolved into a widely recognised standard, now considered a necessary practice and no longer viewed as optional. A growing number of institutional investors are methodically using these non-financial indicators to identify risks and opportunities as a result of growing concerns about social inequality, climate change and corporate ethics, as well as regulatory pressures to ensure transparency and sustainable development.

This ongoing transformation and prominence is evident from data: global assets under management applying ESG criteria have grown from approximately \$13 trillion in 2012 to over \$35 trillion by 2020 (Global Sustainable Investment Alliance, 2021). ESG is no longer seen merely as a matter of corporate image, but it has become a strategic imperative. ESG, indeed, now plays a pivotal role in a company's ability to maintain a competitive position, secure access to capital and preserve a strong reputation among stakeholders, including customers, employees, regulators and shareholders.

This shift is well reflected in the evolving regulatory landscape, particularly in the European Union, with some initiatives such as the Sustainable Finance Disclosure Regulation (SFDR), the Corporate Sustainability Reporting Directive (CSRD) and the EU Taxonomy that are designed to harmonise and standardise ESG disclosure and to promote consistency and accountability. At the same time, other initiatives at global level including the Sustainability Accounting Standards Board (SASB), the Global Reporting Initiative (GRI) and the Task Force on Climate-related Financial Disclosures (TCFD) have contributed to the development of reporting standards and materiality frameworks to support the incorporation of ESG considerations.

This regulatory wave has profoundly reshaped the ESG landscape. Yet it creates a

fundamental analytical challenge: when ESG adoption becomes a legal obligation rather than a strategic choice, it becomes difficult to determine whether any observed relationship between ESG and financial performance reflects genuine value creation or merely regulatory compliance. A firm that makes disclosures about ESG information because it is required to do so is different from a firm that chooses to do so voluntarily, and the financial implications may differ accordingly.

This observation motivates the present thesis. By analysing a global sample of firms over the period 2014-2018, the research examines the relationship between ESG and financial performance in a context that is predominantly voluntary. The period is significant for several reasons: first, it precedes the major mandatory disclosure regulations that took effect from 2020 onward. Second, it straddles the 2015 Paris Agreement and the adoption of the United Nations Sustainable Development Goals (SDGs), two key events that raised awareness of sustainability issues and increased their visibility without immediately imposing binding disclosure requirements. Third, it covers a period of rapid growth in ESG investing driven by market demand rather than regulatory mandates.

If the ESG-performance relationship is positive even in this pre-mandatory disclosure context, this finding would carry important implications. It would suggest that ESG creates value through intrinsic mechanisms, stakeholder trust, operational efficiency, risk reduction, innovation, rather than through the avoidance of regulatory penalties. Conversely, if the relationship is weak or absent in this period, it would suggest that the positive findings of more recent studies may be partly an artefact of the regulatory environment.

1.2 Main Contribution

In light of these considerations, the aim of this thesis is to investigate the relationship between pillar-level ESG performance and financial outcomes, complemented by an initial descriptive understanding of ESG patterns.

The methodology is structured at two levels: ESG pillar level stand-alone analysis and ESG-financial performance analysis.

Specifically, in the ESG stand-alone analysis the research seeks to examine the distribution and trends of ESG scores over time, by sector and market, analyse the correlations between the pillars (E vs S, E vs G, S vs G) to assess independence or overlap, and identify patterns in High vs Low Regulatory Intensity Markets and High-Impact vs Low-Impact sectors.

The second level tests whether pillar-level ESG performance is associated with four financial outcomes, ROA, ROE, Tobin's Q, and WACC, identifying which pillar drives the strongest effect, whether relationships differ by region and sector, and whether observed patterns reflect structural cross-sectional differences or genuine within-firm dynamics.

The research questions are accordingly:

- How are E, S, and G scores distributed across firms, sectors, and markets, and what trends emerge over 2014-2018?
- How correlated are the different ESG pillars?
- Do Environmental, Social, and Governance scores relate to corporate profitability and valuation, and which pillar shows the strongest association?
- Are ESG-financial relationships heterogeneous across regions and sectors?

1.3 Methodology Overview

As outlined above, the empirical analysis conducted in the present thesis is structured as a two-level investigation. The first consists of a stand-alone descriptive analysis of ESG scores at pillar level, environmental, social and governance, examining their distribution, temporal trends, and inter-correlations across a global sample of firms from a specific pre-mandatory disclosure period, 2014-2018. The second part of the analysis examines, instead, the relationship between ESG performance, still at pillar level, and four financial outcomes: return on assets (ROA), return on equity (ROE), Tobin's Q, and the weighted average cost of capital (WACC).

Data on ESG scores and financial variables are drawn directly from specific databases, one for ESG performance (FTSE Russell) and one for financial variables (S&P Capital IQ). The sample is composed of firms that operate across multiple sectors and geographical markets, classified according to their regulatory intensity (High vs Low Regulatory Intensity Markets) and the specific characteristics of the sectors, looking at the materiality of specific ESG dimension for each sector (High-Impact vs Low-Impact sectors).

The regression framework is composed of three interconnected models: a baseline model, a sector and a market moderation model. The baseline model tests the direct relationship between each ESG pillar and the financial performance metrics. To do so, firm size, leverage, GDP growth, cash holdings and year fixed effects are added as controls. The sector moderation model introduces an interaction term between ESG scores and the sector classification, with the aim of testing whether the relationship is amplified or attenuated in high impact sectors. The market moderation model applies the same logic to the regulatory dimension.

Both OLS and firm fixed effects specifications are estimated. While the OLS approach captures cross-sectional differences between firms, the introduction of firm fixed effects isolates within-firm variation over time. This distinction allows us to separate structural patterns from genuine within-firm dynamic changes. The robustness checks include the use of lagged ESG scores as well as the introduction of the R&D intensity control to rule out alternative explanations for the analysed relationship.

1.4 Thesis Structure

The thesis is organised as follows:

Chapter 2 provides the theoretical and empirical support and foundations of the study. The first part reviews the key theoretical frameworks, which include stakeholder theory, agency theory and the resource-based view, each generating clear predictions about the tested relationship. The second part, instead, presents the empirical literature, organised by research stream and not chronologically. In this section, specific gaps that motivate the thesis are also identified.

Chapter 3 describes in detail the research design. It presents the dataset, the data sources, the definitions of dependent, independent and control variables, and an explanation of the sector and market classification criteria. It also provides a clear specification of the regression models used in the analysis.

Chapter 4 reports the empirical results. It starts with the stand-alone analysis of the ESG scores and then moves to regression results for each of the three model specifications. The chapter includes the coefficient interpretation and robustness checks.

Chapter 5 opens a discussion over the findings in the context of the existing literature, develops their theoretical implications and provides practical implications for managers, investors and policymakers.

Chapter 6 concludes the thesis with a summary of the main findings, acknowledging the limitations of the present thesis and suggesting directions for future research.

Finally, the appendices report the full stepwise regression tables, the complete firm fixed effects specifications, and the additional robustness models, including the R&D intensity analysis, which are referenced throughout the empirical chapters.

Chapter 2

Background and Literature Review

This chapter provides the theoretical and empirical foundations for the analysis. The first section presents the key theoretical frameworks that generate predictions about the ESG-financial performance relationship. The second section reviews the empirical literature systematically, organised by research stream, and identifies the specific gaps that this study addresses.

2.1 Theoretical Background

2.1.1 Defining ESG: Origins, evolution, and measurement issues

Before proceeding to the theoretical and empirical literature, it is necessary to clarify what ESG is and what it means, a task that is less straightforward than it might appear.

From CSR to ESG

The intellectual roots of ESG lie in the Corporate Social Responsibility (CSR) tradition. Bowen (1953), in what is widely considered the founding text of modern CSR scholarship, argued that businessmen have an obligation to pursue policies and make decisions that are desirable in terms of the values of society. The American economist provided one of the earliest definitions in his book "Social Responsibilities of the Businessman", where he stated that the obligations of businessmen are to pursue policies, to make decisions, or to follow lines of action that are desirable in terms of the objectives and values of our society.

As time passed and the importance of CSR grew, various researchers, organizations, and institutions developed different definitions. Among the most cited definitions provided by international organisations are the following: the World Business Council for Sustainable Development (WBCSD) defines CSR as the commitment of business to contribute to sustainable economic development, working with employees, their families and local communities (WBCSD, 2001); the European Union's Green Paper describes CSR as a concept whereby companies, voluntarily, integrate social and environmental concerns in

their business operations and in their interactions with their stakeholders (COM, 2001); the International Organization for Standardization (ISO 26000:2010) provides the most comprehensive explanation of Corporate social responsibility. Corporate Social Responsibility can be understood as an organization's commitment to managing the effects that its decisions and activities have on society and the environment. This commitment should be carried out through ethical and transparent behaviour that promotes sustainable development and social well-being, while also considering stakeholders' expectations. Furthermore, it must comply with applicable laws and align with international standards of conduct, becoming an integral part of the organization's operations and relationships.

The transition from CSR to ESG represents a shift in audience and purpose. CSR is primarily normative, focusing on the firm's social obligations beyond profit maximization. ESG, by contrast, is instrumental: it assesses whether environmental, social, and governance factors are material to financial outcomes. The term ESG was coined in the 2004 UN report "Who Cares Wins", which argued for systematic integration of ESG factors into investment analysis.

A bridge between these perspectives is represented by the concept of "Creating Shared Value" (CSV) proposed by Porter and Kramer (2011). They argued that corporate strategies that at the same time create economic value for the firm and social value for the communities are the most effective. It is not a trade-off, but a synergy. The paper, for the first time, reframes ESG not as a cost or a constraint but as a source of competitive advantage. ESG should be used as a strategic lens to detect the best companies in terms of sustainability, resilience and ethical conduct or to identify firms aligned with investors' objectives.

The three pillars

ESG is conventionally disaggregated into three dimensions:

- Environmental (E): it refers to a company's impact on natural ecosystems, including carbon emissions, energy efficiency, resource use, waste management, environmental compliance, climate risk exposure.
- Social (S): it assesses how a company manages relationships with employees, customers, suppliers, and the broader community, focusing on labour and human rights, diversity and inclusion, consumer protection and community engagement.
- Governance (G): it evaluates the structure and quality of a firm's leadership, executive compensation, transparency, shareholder rights, audit quality, anti-corruption policies and overall accountability.

These three pillars are not equally weighted in practice and, moreover, the relative weighting depends on the rating agency. Governance has historically received more attention, as its effects on financial performance are generally considered more direct and easier to observe. Environmental factors have gained prominence more recently, driven

by climate change concerns and the Paris Agreement. Social ones appear to remain the least standardised and the most difficult to quantify.

Importantly, the three pillars can move in different directions. A firm may have excellent governance but poor environmental practices, or strong employee relations but weak board oversight. This heterogeneity within ESG has significant implications for empirical research, as studies that use aggregate ESG scores may obscure important differences across pillars. As Aydogmus, Gulay and Ergun (2022) found, the Social and Governance pillars were positively associated with firm value while the Environmental pillar was not, a finding that would be invisible in an analysis using only composite scores.

The measurement problem

Perhaps the most significant challenge facing ESG research, and certainly the most directly relevant to this thesis' topic since the 2014-2018 sample period, is the lack of a standardised measurement framework.

Berg, Kolben and Rigobon (2022) provide the most systematic and comprehensive analysis of this problem. They find, comparing ESG ratings from the six major providers (MSCI, Sustainalytics, Moody's S&P Global, Refinitiv, and KLD), pairwise correlations averaging approximately 0.54, a contrast with credit rating correlations above 0.99. The paper attributes the low correlation to three main causes: scope divergence (38%), due to each rater breaking down the concept of ESG performance into different indicators; measurement divergence (56%), due to differences in how these factors are assessed or quantified; and weighting divergence (6%), due to how much each factor contributes and influences the final score.

The divergence problem has direct and practical consequences for empirical research in general, as well as for this work. A study using MSCI ESG ratings and a study using Refinitiv ESG ratings may reach different conclusions about the same underlying relationship, but not because of a change in relationship, but because the independent variable is measured differently. Martiny et al. (2024), in their systematic review of ESG performance determinants, confirm that the choice of data provider is a significant source of cross-study inconsistency.

What is clear is that, for the period 2014-2018, this problem was more acute than it is today. ESG rating methodologies were less mature, there was less widespread coverage of smaller firms and emerging markets and especially a lack of mandatory disclosure. These measurement limitations should be kept in mind when interpreting the results of the present study.

To illustrate the differences in ESG assessment methodologies, Table 2.1 summarizes the major ESG data providers, commonly discussed in the literature, their coverage, scoring approaches, and specific notes. The present study uses FTSE Russell ESG scores for empirical analysis, providing broad coverage and allowing for consistent computation of ESG metrics across the sample.

Table 2.1. Comparative Overview of Major ESG Data Providers

Provider	Coverage	Methodology Overview	Notes
MSCI ESG Fundamentals	~17,000 issuers worldwide	Industry-relative scores (AAA–CCC), combines financial data with alternative sources; focuses on sector-specific risks and resilience	Widely used by institutional investors
Sustainalytics	~16,000 companies	Material ESG risk exposure, combining primary research, public data, and expert analysis; absolute risk categories from negligible to severe	Flags controversies; regular updates and governance assessments
Refinitiv (LSEG ESG Scores)	~14,000 companies	Public-data-based scores across 10 themes; industry-specific materiality weightings	Includes ESG controversies overlay; percentile rank scoring
S&P Global ESG Scores	>13,000 companies	Corporate Sustainability Assessment (CSA): industry-specific questionnaire + modeling for missing disclosures; delivers 0–100 score based on double materiality	Deep engagement; third-party audited CSA process
Bloomberg ESG Scores	~16,000 companies in more than 100 countries	Quantitative model based on disclosures, supplemented by estimates for missing data; 0–100 score	18+ years historical data; focus on disclosure quality
Moody’s ESG Solutions	>10,000 companies	ESG issuer profile and credit impact scores; integrates ESG into credit analysis; predictive scoring where data gaps exist. In July 2024, Moody’s announced a strategic partnership with MSCI, transitioning to MSCI’s ESG ratings; Moody’s ESG Solutions no longer operates as a fully independent provider.	Built on credit analysis framework.
FTSE Russell ESG Scores	~8,000 companies	ESG ratings based on more than 300 indicators across environmental, social, and governance pillars; industry-adjusted methodology combining publicly disclosed information and analyst assessment	Frequently used in academic research; integrated with LSEG data ecosystem

The evolving regulatory landscape

The measurement challenges discussed above have not gone unnoticed by regulators. Since the mid-2010s, a series of legislative initiatives, first in Europe but then started to be extended globally, has started to impose structure, higher comparability, and accountability on ESG reporting and rating practices.

Although the analysis is confined to the 2014-2018 window, understanding this regulatory timeline matters for interpreting the results. The sample period predates the major regulatory wave but it straddles an important piece of EU sustainability legislation, the Non-Financial Reporting Directive (NFRD).

The NFRD (Directive 2014/95/EU), adopted by the European Parliament and Council in October 2014, required large public-interest companies with more than 500 employees to disclose their information on environmental matters, social and employee-related issues, respect for human rights, anti-corruption policies, and board diversity. As an EU directive, it required transposition into national law with a deadline of 6 December 2016. From 2014, member states started working toward compliance.

To complement the ambitious regulatory programme of the European Union, there are three other interconnected pieces of the legislation.

The EU taxonomy Regulation, in force since 2020, has the aim to create a unified classification of sustainable economic activities, with the goal to identify which economic activities can be considered green and which are not. There are specifically six criteria to identify environmentally sustainable economic activities.

The Sustainable Disclosure Regulation (SFDR), effective since 2021 with progressive implementation phases, has the aim to increase the transparency of financial products regarding their risks and ESG impacts. This legislation requires financial market participants, such as financial advisors, asset managers, to disclose how they incorporate ESG risks and their impacts into the investment decisions, according to a classification based on the degree of sustainability defined in articles 6, 8 and 9.

The Corporate Sustainability Reporting Directive (CSRD), the most recent and in force since 2023, extended mandatory sustainability reporting to a far broader set of companies than its predecessor, the Non-Financial Reporting Directive (NFRD). It introduces harmonized European Sustainability Reporting Standards (ESRS), mandatory third-party assurance, and the principle of double materiality, which considers both the impacts of the company on the environment and society, and the effects of ESG factors on the company's own financial performance. It includes all the big companies (those with more than 250 employees or € 40 million of net turnover), all the listed companies, excluding the micro-enterprises, and will extend to listed SMEs starting from 2026.

There is a more recent addition: Regulation (EU) 2024/3005 on ESG rating activities, published in December 2024 and set to take effect in July 2026. This regulation directly addresses the rating divergence problem discussed, placing the European Securities and Markets Authority (ESMA) at the centre of a new supervisory framework for ESG rating providers.

Although most of these regulations became effective after the sample period, their

introduction reflects a broader shift toward standardisation, which was largely absent during 2014-2018.

The European Union has moved farther and faster, but is not acting alone. Globally, several initiatives contributed to the development of ESG reporting standards. The Global Reporting Initiative (GRI) remains one of the most widely adopted frameworks, offering comprehensive guidelines on environmental and social impacts. The Sustainability Accounting Standards Board (SASB) has taken a complementary approach, developing industry-specific standards focused on financial materiality, the dimension of ESG most directly relevant to investors. The Task Force on Climate-related Financial Disclosures (TCFD) has played a particularly influential role in promoting the disclosure of climate-related risks and opportunities, structured around four pillars: governance, strategy, risk management, and metrics and targets.

The most significant step toward global convergence came with the establishment of the International Sustainability Standards Board (ISSB) by the IFRS Foundation in 2021. The ISSB published its first two disclosure standards in 2023, IFRS S1 (general sustainability-related disclosures) and IFRS S2 (climate-related disclosures), with the explicit aim of creating a global baseline that national regulators can build upon. Several jurisdictions outside Europe, including the United Kingdom, Japan, Singapore, and Brazil, have already announced plans to adopt or align with ISSB standards, suggesting that the convergence process, though far from complete, is gaining momentum.

2.1.2 Theoretical frameworks

The relationship between ESG and financial performance has been theorized from multiple perspectives. These perspectives can generate different, and also in some cases opposing, predictions.

This section presents the six most relevant theoretical frameworks, discusses their core mechanisms, and identifies the implications for the present study.

Stakeholder Theory: ESG as a value creation

Stakeholder theory, as articulated by Freeman (1984), holds that firms create sustainable value by managing relationships with all stakeholders, like employees, customers, suppliers, communities, not only shareholders. Freeman provides a normative theory, Jones (1995) extended Freeman's framework into an "instrumental" version: firms that build relationships of trust with their stakeholders reduce transaction costs, attract better resources and, ultimately, achieve superior financial performance.

The empirical support for this prediction is substantial: a paper, studying Korean firms (Choi, Kwak and Choe, 2010) found that a stakeholder-weighted CSR index was positively correlated with financial performance, while an equal-weighted index was not. This suggests that strategic stakeholder management matters more than generic social

responsibility.

The stakeholder theory has important implications and generates a clear prediction for this thesis: even in the pre-mandatory disclosure phase 2014-2018, firms that proactively manage stakeholder relationships through ESG practices should exhibit superior financial performance, because the value-creation mechanism (trust, reduced transaction costs, better resources) operates independently of regulatory pressure.

Shareholder Theory: ESG as agency cost

An opposing perspective comes from Friedman (1970), who argued that the social responsibility of business is to increase its profits. Following this perspective, corporate resources devoted to ESG goals represent a diversion of shareholder wealth, a sort of agency cost in which managers pursue their own social or reputational goals at the expense of profit maximisation.

A further development is the formalisation of agency theory by Jensen and Meckling (1976): value destruction may arise when managers' interests are not perfectly aligned with those of shareholders. From this perspective, ESG investments may reflect managerial discretion rather than value-enhancing strategies.

This view predicts a negative ESG-financial performance relationship, or at least a neutral one. However, the latest papers show different results, making it difficult to maintain this view in light of recent evidence: Friede, Busch and Bassen (2015) in the meta-analysis shows a non-negative relationship for around 90% of studies.

A more nuanced version of agency-based perspective survives: rather than a simple linear relationship, the ESG-CFP link may depend on firm-specific and contextual factors. Cardillo and Basso (2025) highlight the crucial role of moderating variables, such as governance quality, cultural context, economic conditions, and industry characteristics, in shaping this relationship. In well-governed firms, ESG investments are more likely to be efficient and value-enhancing, whereas in poorly governed firms they may reflect over- or under-investment.

For this study, this theoretical framework leads to a clear empirical prediction: ESG performance should not lead to superior financial outcomes in the 2014-2018 period. Firms in that period, not having a regulatory incentive to adopt ESG, may have made investments across the three dimensions that reflect managerial discretion and therefore potentially agency-driven behaviour.

Resource-Based View: ESG as competitive advantage

Barney (1991) argued that firms achieve competitive advantage through resources that are valuable, rare, inimitable and non-substitutable (VRIN). Hart (1995) extended this framework also to natural resources proposing the "Natural-resources-based view": pollution prevention, product stewardship and sustainable development capabilities constitute

strategic resources.

Starting from these interesting perspectives, ESG practices can be interpreted as a source of intangible capabilities not easily replicable by competitors. These characteristics make ESG-related capabilities consistent with the VRIN criteria and therefore potentially value-enhancing.

Adamska, Dabrowski and Grygiel-Tomaszewska (2016), following this idea, tested the RBV against stakeholder theory in explaining the CSR-CFP link and found that their importance depends on market conditions. During an economic crisis, it seems that stakeholder behaviour becomes the dominant mechanism, during a recovery period, instead, firm-specific resources, such as reputation, consistent with the RBV, become more relevant in driving financial performance. This suggests that two theories are not mutually exclusive, but they operate through different channels under different conditions.

Following this perspective the prediction is clear: a positive relationship between ESG and financial performance is expected. Firms that invested in ESG capabilities before they were required to do so would be early-adopters and create first-mover advantages that should be difficult to replicate for later adopters.

Signalling Theory

A complementary lens is represented by Spence's (1973) signalling model. In markets where there is information asymmetry, high-quality firms have an incentive to send costly signals that distinguish them from low-quality firms. ESG can have this function: credible ESG reporting requires costs, represented by investments, and it is at the same time costly to fake them and therefore ESG should be informative to investors.

Huang (2022) develops this argument specifically looking at ESG, highlighting the three functions of ESG: they provide relevant information to valuation, they reduce information asymmetry between managers and investors and they situate the firm within a multi-stakeholder environment. All these elements predict that ESG adoption should be associated with a lower cost of capital and higher firm value.

The theory has, once again, specific implications for this thesis: in a predominantly voluntary disclosure regime, the signal value of ESG is higher than in a mandatory regime. When everyone is required to disclose, the signal becomes less informative.

Legitimacy Theory

Legitimacy theory (Suchman, 1995) states that firms and organisations seek to operate within the bounds of what society considers acceptable. If firm's actions are considered, in a way, illegitimate, like environmentally destructive, socially exploitative, poorly governed, it faces sanctions that can range from consumer boycotts, especially in case of environmental issue, to some regulatory intervention.

From this perspective, ESG is an important mechanism for maintaining or restoring legitimacy. The theory predicts that ESG adoption should be more prevalent in industries and firms that face greater legitimacy threats and that the financial benefits of ESG should be particularly visible in contexts where social expectations are rising. The period around the Paris Agreement (2015) and the SDGs (2015) represents precisely such a moment of rising social expectations, making the 2014-2018 window an ideal testing ground.

Porter Hypothesis

Porter and van der Linde (1995) challenged the conventional view that environmental regulation imposes net costs on firms. They argue, instead, that regulations, if well-designed, can stimulate innovation that can partially or fully offset compliance costs and even may generate regulatory competitive advantage. This "Porter Hypothesis" has been extended to the broader ESG context: firms that anticipate regulatory trends and invest early in sustainability may develop innovative capabilities that improve their competitive position.

There is empirical evidence that broadly supports this view: Dicuonzo et al. (2022) found a positive relationship between R&D intensity and ESG practices, supporting the idea that ESG commitments stimulate innovation.

For the present thesis, the Porter hypothesis operates in a distinctive way. In the 2014-2018 period, the major regulations had not yet been enacted, but their arrival was widely anticipated. Firms that invested in ESG capabilities during this period may have been positioning themselves for the regulatory wave to come, a form of "anticipatory compliance" that could yield both innovation benefits (Porter Hypothesis) and first-mover advantages (RBV).

From theory to hypothesis

The six frameworks presented above present the ESG-financial performance from fundamentally different angles. Table 2.2 synthesises the core mechanisms and predictions for each of the frameworks and also, crucially, their specific relevance to the voluntary pre-mandatory disclosure context of 2014-2018. This comparative assessment provides the theoretical foundation for the research hypotheses.

Table 2.2. Theoretical frameworks linking ESG to corporate financial performance (CFP)

Theoretical Framework	Core Mechanism	Prediction	Relevance in 2014–2018 context
Stakeholder Theory	ESG practices build trust with stakeholders → lower transaction costs, better resource access, superior performance	Positive, especially for S and G pillars	High: value-creation through stakeholder relations operates independently of regulatory pressure
Shareholder/Agency Theory	ESG investments divert shareholder wealth → agency costs, managerial discretion over profit maximisation	Negative or neutral; moderated by governance quality and firm-specific factors	Moderate: without regulatory incentives, voluntary ESG may reflect managerial discretion rather than value-enhancing strategy
Resource-Based View	ESG capabilities are VRIN resources → path-dependent, hard to imitate, source of competitive advantage	Positive; stronger for early adopters	High: firms investing in ESG before mandatory requirements build first-mover advantages difficult to replicate
Signalling Theory	Voluntary ESG disclosure is a costly, credible signal → reduces information asymmetry, lowers cost of capital	Positive, particularly on market-based measures (Tobin's Q, WACC)	Very high: in a voluntary regime the signal is more informative, as it is not yet diluted by mandatory disclosure requirements
Legitimacy Theory	Firms adopt ESG to remain within socially acceptable bounds → reduces reputational and regulatory risk	Positive, especially in high-scrutiny sectors and periods of rising social expectations	High: the 2014–2018 window straddles the Paris Agreement and SDGs, a moment of rapidly rising social expectations without binding obligations
Porter Hypothesis	Anticipatory ESG investment stimulates innovation and builds regulatory-readiness → competitive advantage when regulation arrives	Positive, particularly for E pillar and innovation-intensive firms	Moderate-High: firms engaging in anticipatory compliance during 2014–2018 may capture both innovation benefits and first-mover advantages

The frameworks generate partially conflicting predictions about the sign and magnitude of the ESG-financial performance relationship. However, the thesis does not treat the frameworks as mutually exclusive, but recognizes that different mechanisms may operate simultaneously and that their relative importance may vary depending on the institutional and sectoral context.

Three frameworks seem to be particularly central given the specific setting of the present thesis.

Stakeholder theory provides the primary value-creation logic: firms that manage relationships with employees, customers, communities, and investors with ESG practices should exhibit superior financial outcomes, as the underlying mechanisms of trust and reduced transaction costs operate independently of regulatory pressure.

Resource-based view complements the argument by framing ESG capabilities as path-dependent, difficult to imitate: firms that invested in sustainability before mandatory requirements were in place were building first-mover advantages that later adopters cannot easily replicate.

Signalling theory adds a new layer linked to the voluntary context, that is central in this thesis: when ESG disclosure is not legally required, it constitutes a more credible and informative signal to capital markets, reducing information asymmetry and lowering the cost of capital. This signal value is expected to be higher precisely in the pre-mandatory disclosure period analysed here, before mandatory disclosure dilutes its separating power.

Agency theory and the Porter hypothesis, although apparently less central in this thesis, introduce some important nuances and aspects, especially looking at the sample period. The agency perspective warns that, in the absence of regulatory pressure, voluntary ESG investments may in some cases reflect managerial discretion rather than genuine value creation, a concern that motivates the inclusion of governance quality as both an independent variable and a moderating factor. The Porter Hypothesis, through the concept of anticipatory compliance, suggests that firms positioning themselves ahead of the regulatory wave may capture innovation benefits and competitive advantages that begin to materialise within the sample period.

Taken together, these theoretical considerations give rise to the following testable hypotheses:

H1: ESG and financial performance: Environmental, Social, and Governance pillar scores are positively associated with firm financial performance (ROA, ROE, Tobin's Q) and negatively associated with the cost of capital (WACC) in the 2014-2018 pre-mandatory disclosure period.

H2: Pillar heterogeneity: The strength and direction of the ESG-financial performance relationship differs across the three pillars, with Governance expected to show the most robust association due to its more direct and measurable impact on firm value, and Environmental performance expected to show the weakest or most context-dependent effect.

H3: Contextual moderation: The ESG-financial performance relationship is moderated by sectoral exposure to ESG risks and by the regulatory intensity of the country in which a firm operates, with material ESG factors expected to generate stronger financial effects in sectors and markets where their relevance is highest.

2.1.3 Transmission channels

The six theoretical frameworks converge on several mechanisms through which ESG can influence financial performance. The following table summarises, making more explicit, from a channel perspective, what is outlined in the above paragraphs.

Table 2.3. Channels through which ESG affects firm performance

Channel	Theoretical Origin	Mechanism
Lower cost of capital	Signalling, Legitimacy	ESG disclosure reduces information asymmetry → investors require lower risk premium
Operational efficiency	RBV, Porter Hypothesis	Resource efficiency, waste reduction, innovation
Talent attraction and retention	Stakeholder Theory	Employee satisfaction → productivity, lower turnover
Risk reduction	Legitimacy, Stakeholder	Fewer controversies, sanctions, crises
Access to capital	Signalling, Stakeholder	Institutional investors prefer high-ESG firms
Market valuation premium	All	Higher Tobin's Q, market-to-book

The channels here are not mutually exclusive, but they are likely to operate together and reinforce one another.

Overall, the theoretical and empirical literature provides conflicting predictions regarding the ESG-financial performance relationship. These inconsistencies, combined with measurement challenges and the evolving regulatory context, make the 2014-2018 period particularly relevant for empirical investigation.

2.2 Literature Review

The literature review presented in this section is built on academic sources from Scopus, Web of Science, and Google Scholar. The papers included are peer-reviewed articles, meta-analyses, and systematic reviews published between 2003 and 2025. Earlier contributions are also included where they provide foundational theoretical insights.

The choice was to organize the review thematically rather than chronologically, to highlight some patterns of convergence and divergence across research streams and to provide a deeper examination of specific gaps.

2.2.1 The aggregate picture

The question of whether ESG practices are associated with superior financial performance has generated an extraordinarily large body of empirical research. Before examining individual studies, it is useful to consider meta-analyses, which aggregate findings across a large number of primary studies and allow for an assessment not only of the direction, but also of the magnitude of this relationship.

Looking specifically at this type of work, one of the most comprehensive and influential contributions is Orlitzky, Schmidt and Rynes (2003). This meta-analysis reported a positive correlation between corporate social performance (CSP) and financial performance (CFP). A key finding is the bidirectional characteristics of the relationship: not only is social performance linked to financial performance, but also financially successful firms tend to invest more in social initiatives. A finding that raises concerns about reverse causality and that would persist throughout the subsequent literature.

The most comprehensive synthesis remains Friede, Busch and Bassen (2015): a work that aggregated evidence from more than 2000 studies. The results were extremely striking: around 90% of studies report a non-negative ESG-CFP relationship, with the large majority reporting positive effects (around 60%). This evidence provides strong support for the view that ESG practices are, on average, not detrimental to firm value.

Focusing specifically on the environmental dimension, Albertini (2013) conducts a meta-analysis of 52 studies and confirms a positive relationship between environmental performance and financial performance. However, the study also highlights significant heterogeneity in the results. The magnitude and direction of the relationship varied, indeed, depending on environmental and financial measures employed, regional differences, industry sector and also on the time horizon of the study. Heterogeneity would emerge as another recurring theme in ESG research.

Linked to this, a more recent work by Cardillo and Basso, analysing 108 articles with a time-span from 2019 to 2023, focuses specifically on moderating variables, trying to understand which and under which condition the ESG-CFP relationship strengthens or weakens, identifying governance structures, cultural norms, technological readiness, market maturity, economic conditions, industry characteristics, and firm strategy as significant moderators. Their central argument is that the inconsistencies in the literature are not random noise, but reflect the systematic influence of contextual factors that many studies fail to control for.

Putting all these aspects together, the meta-analyses point clearly in one direction: the ESG-CFP relationship is predominantly positive, but with a magnitude of the effects that varies considerably, much of this variation can be attributed to differences in how ESG and financial performance are measured, the geographical and institutional context, and the time period under consideration. This aspect is particularly relevant for the present thesis given the limited coverage of the chosen timeframe in existing meta-analyses.

2.2.2 ESG and firm value: market-based evidence

While meta-analyses provide the aggregate picture, individual studies offer more granular insights into how ESG performance translates into market valuation. This section reviews studies that have as a main objective the market-based measures, primarily Tobin's Q and stock market valuations.

The start and key study in this stream is Eccles, Ioannou and Serafeim (2014), who focus on 180 US companies that had voluntarily adopted substantial environmental and social policies by the early 2000s and make the comparison with 200 comparable firms that had decided not to do so. During the 18-year period analyzed, the "high-sustainability" outperformed the counterparts in both stock market and accounting measures. This paper offers interesting insights, although a limitation should be highlighted: it is limited to US firms.

Then Yu, Guo and Luu (2018) extended these findings in a global setting. The paper examined about 2000 companies across 47 countries, using Bloomberg ESG scores. They find that higher ESG scores are associated with higher Tobin's Q, particularly among firms characterised by larger size, stronger liquidity, and higher R&D intensity. This study is particularly important for the present thesis as its sample period mirrors closely the analyzed one.

Aydogmus, Gulay and Ergun (2022) represent a key study, proving a more nuanced picture by disaggregating ESG scores into the three pillars. While the overall ESG scores were positively correlated with both firm value and profitability, some differences came up looking at the different dimensions: social and governance scores were positively related to firm value, while environmental score was not, although all the pillars were significantly associated with profitability measures. The key finding is that the market may not yet fully price environmental performance into valuation or that environmental investments have a longer payback period that Tobin's Q does not capture.

For the present study, the body of evidence establishes a strong priori expectation for the present thesis: ESG scores should be positively associated with firm value in the 2014-2018 period. But the key point is whether this relationship was already robust before the main regulatory wave, when ESG adoption was largely voluntary rather than forced by compliance requirements.

2.2.3 ESG disclosure

While seemingly distinct at first glance, a related question is whether ESG disclosure, the act of reporting ESG information independently of actual performance, generates firm value.

This issue is particularly important in the 2014-2018 period, when ESG disclosure was predominantly voluntary and reflected firms' strategic decisions about whether to disclose and the level of detail to provide.

Existing literature provides evidence that ESG disclosure can be value-relevant. For instance, Khan, Serafeim and Yoon (2016) show that firms disclosing material sustainability information exhibit superior performance and valuation. Similarly, Ioannou and Serafeim (2015) find that enhanced ESG disclosure improves the information environment and positively influences capital market participants' assessments.

Importantly, the valuation effects of ESG disclosure may depend not only on whether firms disclose sustainability information, but also on how such information is presented. The quality, clarity, and credibility of ESG disclosures can influence investors' assessments, suggesting that disclosure quality, rather than quantity alone, plays a crucial role in determining firm value.

2.2.4 Corporate governance as a moderator and driver of ESG performance

Worth highlighting is the dual role of corporate governance in the ESG literature: firstly as a component of the ESG in the "G" pillar and secondly as a mechanism that enables or constrains the other two dimensions.

This section reviews evidence on how governance structures influence ESG adoption and outcomes.

Starting from Pozzoli, Pagani and Paolone (2022) that focus on audit committees and make some important findings: characteristics such as independence and financial expertise are positively associated with ESG performance, while committee tenure is negatively related to it. This suggests that monitoring mechanisms traditionally linked to financial reporting quality also play a crucial role in shaping sustainability outcomes.

Daugaard and Ding (2022), reviewing the global drivers of ESG performance, argue that economic development, regulatory environment, and responsible investing are the three macro-level forces shaping ESG outcomes. Three dimensions that still remain insufficiently studied. Their call for research on the regulatory dimension is particularly relevant here, as the pre-mandatory disclosure sample allows for a test of ESG-performance links in the absence of mandatory requirements.

2.2.5 ESG and Innovation

A growing body of research is the one that focuses on whether ESG practices stimulate corporate innovation.

Dicuonzo et al. (2022) found a positive relationship between R&D intensity and ESG practices across firms in Southern and Eastern Europe and the United States, suggesting that innovative firms are more likely to adopt ESG practices, or, conversely, that ESG commitments stimulate innovation. The study does not resolve this directionality, but

the association seems to be robust.

Ding, Han and Wang (2024) identify two specific channels through which ESG influences total factor productivity: increased R&D investment and the relaxation of financing constraints. Firms with higher ESG performance face lower barriers to external financing, that leads to a greater investment in innovation. This finding connects the signalling and innovation literature: ESG disclosure reduces information asymmetry, which lowers the cost of capital, which enables more R&D.

2.2.6 Methodological challenges and limitations of the existing literature

Despite the predominantly positive correlations shown above, there are some challenges that should be taken into account before drawing conclusions.

The divergence of ESG ratings, already discussed above in the context of measurement, is central and highlights a big problem: a firm rated highly by one provider may be rated poorly by another, and that empirical results are sensitive to the choice of data source. An element that has equally direct consequences for all the empirical literature.

Endogeneity and reverse causality remain the most structurally difficult challenge. The majority of papers and studies are correlational: firms that perform well financially may have more resources to invest in ESG, creating a reverse causality problem. But few studies have addressed this in a convincing way.

Heterogeneity of measures, from accounting-based metrics (ROA, ROE, ROS), market-based metrics (Tobin's Q, stock returns) and risk-based metrics, is another aspect that makes cross-study comparison difficult and that may contribute to the appearance of inconsistency in an otherwise largely convergent literature.

To conclude, other two aspects deserve mention: the publication bias and the temporal and regulatory context. Firstly, the publication bias can come from a strong predominance of a particular finding, as the positive one (90%) highlighted by Friede, Busch and Bassen (2015). Then as most recent empirical studies analyse periods that include or follow the introduction of mandatory ESG disclosure regulations, making it difficult to disentangle the intrinsic value-creating effects of ESG from the compliance, driven effects of regulation. The pre-mandatory disclosure sample used here directly addresses this last limitation.

2.2.7 Literature gaps

Although some significant and robust findings emerge from the literature, significant gaps remain.

First, the vast majority of the papers and works examine periods that overlap with or

follow the introduction of mandatory ESG regulations, making it difficult to separate intrinsic ESG value from compliance effects, the primary gap this study addresses. Second, evidence from the specific window 2014-2018, that straddles the Paris Agreement and the adoption of the Sustainable Development Goals but precedes mandatory disclosure rules, remains limited as a distinctive analytical period. Third, the global dimension of the relationship in this pre-mandatory disclosure period is insufficiently studied: most studies focus on single countries or regions, and the few global studies do not explicitly frame their analysis in terms of the regulatory context.

The present study addresses these gaps directly, as detailed in Chapter 1.

Chapter 3

Methodology

3.1 Dataset and data sources

To address the research questions, the empirical analysis is conducted on a panel dataset of 2,473 unique firms, corresponding to 12,366 firm-year observations across 25 countries over the period 2014-2018. ESG scores at pillar level (Environmental, Social and Governance) are obtained from FTSE Russell and aggregated from monthly to annual values. Firm-level financial variables, including ROA, ROE, Tobin's Q and WACC, are retrieved from S&P Capital IQ. Firms are classified into ten macro-industry groups according to FTSE Russell.

The two datasets were merged using the International Securities Identification Number (ISIN) as the common identifier, ensuring unambiguous firm-level matching across the two sources.

3.2 Variables

To empirically investigate the relationship between ESG performance and firm financial outcomes, the paper considers three main types of variables: dependent variables, independent variables, and control variables.

This structured approach allows for a transparent and replicable analysis while accounting for firm- and country-level heterogeneity.

3.2.1 Dependent variables

To understand at which stage and under which conditions ESG was already informative in a pre-mandatory disclosure phase, the dependent variables used combine accounting- and market-based measures, as well as both forward and backward-looking indicators, a choice that directly reflects the dual perspective on financial performance introduced in Section 1.2 and that allows us to test the H1 hypothesis across multiple dimensions. The variables used are ROA, ROE, Tobin's Q, and WACC.

ROA Return on Assets (ROA) is used as a backward-looking accounting-based measure of firm profitability. It captures how efficiently a firm generates earnings from its total asset base and it is commonly used in the literature as an indicator of operating performance.

ROA(%) is obtained directly from Capital IQ Pro with the following extraction formula: `=@SPG(company_id; "IQ_ROA"; "FY0"; end_of_year_date)`, where the final parameter corresponds to the fiscal year-end date used to align all the observations across the analysed firms.

ROE Return on Equity (ROE) is employed as backward-looking accounting-based measure of firm profitability from the shareholders' perspective. It captures the ability to generate returns from the invested capital by the equity holders.

The variable, as for ROA, is directly retrieved from Capital IQ Pro using the standardised metric for the ROE (%) with the following formula:

`=@SPG(company_id; "IQ_ROE"; "FY0"; end_of_year_date)`.

Tobin's Q Tobin's Q is used as a market based measure of firm valuation. Unlike the previous indicators, Tobin's Q reflects investors' expectations about future growth opportunities and the intangible assets of the firm. As such, it offers a forward-looking perspective on firm performance.

Tobin's Q is theoretically defined as the ratio of the market value of the firm to the replacement cost of the asset. But since the estimation of these variables is quite difficult in practice, in the empirical literature it is common to use some simplified proxies. In this study, Tobin's Q is approximated as the ratio of market capitalisation to total assets, a proxy widely adopted in empirical research. The simplification is supported by Chung and Pruitt (1994), who show that simplified approximations of Tobin's Q correlate at 96.6% with the theoretically complete measure, supporting the use of such proxies in empirical research. This variable is particularly important for testing the signalling and legitimacy mechanisms identified in 2.1.1, where ESG disclosure in a voluntary regime is expected to be informative to capital markets and therefore reflected in market valuations.

WACC The weighted average cost of capital (WACC) is used as a market-based measure of the cost of financing. It represents the average rate of return required by both the equity and debt holders. WACC provides an indication of how the financial markets price firm's activities. Including WACC as a dependent variable allows direct testing of the cost of capital channel identified in 2.1.3: if ESG disclosure reduces information asymmetry, as signalling theory predicts, high-ESG firms should face a lower required return from investors.

In this study, the WACC (%) was calculated exactly following the standard practice in literature. WACC is calculated using standard CAPM for equity cost, combined with firm debt and tax rate. Country-specific risk-free rates are used, in particular from the long-term government bond yields (10-year) dataset provided by the Organisation for Economic Co-operation and Development (OECD). Country-specific risk is therefore

partially captured through the use of these country-specific risk-free rates. The equity risk premium (ERP) is instead kept uniform across countries within each year, consistent with the assumption of integrated global capital markets commonly adopted in cross-country empirical finance. The ERP varies over time, ranging from 5.08% to 6.12% over the sample period, while remaining constant across firms within each year.

This approach allows us to capture time-varying market risk conditions while preserving cross-sectional comparability. Specific betas are downloaded directly from Capital IQ with the formula

`=@SPG(company_id; "IQ_CUSTOM_BETA"; start_of_year_date; end_of_year_date).`

The cost of debt (R_d) is calculated as the ratio between interest expenses and total debt. Finally, the corporate tax rate corresponds to the firm-specific effective tax rate.

3.2.2 Independent variables

The independent variables capture firms' performance across the three dimensions using ESG scores at pillar level provided by FTSE Russell.

ESG scores reflect the specific methodology developed by the provider. The FTSE Russell model evaluates companies' exposure using a hierarchical framework composed of 3 pillars, 14 underlying themes and more than 300 individual indicators.

Scores range from a minimum of 0 to a maximum of 5 and are designed to evaluate the companies' exposure to and management of the ESG-related risks and opportunities. Higher ESG pillar scores indicate stronger management of ESG-related risks and opportunities.

Environmental Score (E) The environmental score evaluates the impact of firm's operations and its ability to manage the environmental risks. According specifically to FTSE Russell methodology, the pillar and the valuation takes into account themes such as climate change, biodiversity, pollution and resource management, water security, and environmental aspects of supply chains.

Social Score (S) The Social score evaluates how firms manage relationships with employees, customers, suppliers and communities. Within the FTSE Russell framework, the Social pillar includes the following elements: labour standards, human rights and community relations, health and safety, customer responsibility and supply chain management.

Governance score(G) The Governance score reflects the quality of corporate governance structures and practices within the firm. The pillar includes themes such as corporate governance practices, risk management, anti-corruption policies and tax transparency.

3.2.3 Control variables

The empirical analysis includes a set of control variables to account for firm- and country-level heterogeneity that might influence financial outcomes independently of ESG performance. The selection of controls has been guided by the mechanisms identified in

Chapter 2: variables that could simultaneously drive ESG scores and financial outcomes are included to isolate the net ESG effect.

At the firm level, controls include: firm size, leverage (%), capex intensity (%), and cash holdings (%).

Firm size, measured as the natural logarithm of total assets, was included because larger firms tend to have greater resources to invest in ESG practices and are subject to greater stakeholder scrutiny. Not including size as a control would risk attributing to ESG what is in fact a scale effect.

Leverage(%), measured as total debt over total assets was included to avoid confounding the ESG-cost-of-capital relationship with capital structure effects.

Capex intensity (%) was introduced because capital-intensive firms tend to have higher environmental footprints and face greater material ESG exposure, particularly on the Environmental pillar. Including capex intensity controls for the possibility that investment-heavy sectors drive both higher ESG scores and lower short-term profitability.

Cash holding (%) was included as it is particularly relevant for isolating ESG effects from those driven by financial flexibility.

At the macroeconomic level, instead, GDP (%) variable, sourced from OECD, was introduced. Country-level economic conditions influence both corporate profitability and the propensity to invest in ESG; including GDP growth controls for the possibility that firms in faster-growing economies appear to perform better regardless of their ESG profile.

R&D intensity, defined as R&D expenditures divided by total assets, is incorporated as an additional control variable, but only in robustness models, due to the sample reduction associated with its inclusion. The inclusion of the variable is due to the evidence that R&D-intensive firms are more likely to adopt ESG practices and tend to exhibit superior financial performance, creating a potential omitted variable bias if not controlled for.

3.3 Sector and Market Classification

3.3.1 Sector Classification

In addition to firm-level characteristics, the empirical analysis incorporates a sectoral dimension to account for heterogeneity in material relevance of ESG issues across industries. A sectoral materiality approach was adopted, rather than relying exclusively on conventional industry classifications, which are more commonly used in literature.

This classification does not reflect a priori expectations of higher ESG performance. Instead, it aims to capture differences in exposure and material relevance of E, S and G issues across sectors. Three non-mutually exclusive sector-level dummy variables were defined; each one captures whether a given sector is characterised by high material exposure to the respective ESG dimension.

As previously mentioned, firms are grouped into ten macro-industry categories. For each ESG pillar, sectors are classified as High (1) if they exhibit substantial exposure to

the relevant dimension and Low (0) otherwise.

Sectors are classified as High exposure according to the following criteria:

- **HighImpactEnv**: sectors with high exposure to emissions, resources use and climate-related risk.
- **HighImpactSocial**: sectors with high exposure to workforce risk, safety, health and labor practises.
- **HighImpactGov**: sectors characterised by high relevance of complex governance structures, transparency requirements, regulatory oversight, and risk management.

The resulting classification is presented in Table 3.1.

Table 3.1. Industry classification by ESG exposure

Industry	HighImpactEnv	HighImpactSocial	HighImpactGov
Oil and Gas / Fossil Fuel Industry	High	Low	High
Materials	High	Low	Low
Industrials	High	High	Low
Consumer Goods	Low	High	Low
Health Care / Pharma	Low	High	High
Consumer Services / Discretionary	Low	High	Low
Telecommunications	Low	High	High
Utilities	High	Low	High
Financials	Low	Low	High
Technology	Low	High	High

The non-mutually exclusive structure allows a sector to be simultaneously exposed to multiple ESG dimensions, reflecting the multidimensional nature of sustainability risks. The sectoral classification adopted in this study is grounded in the concept of financial materiality, according to which the economic relevance of ESG issues varies across industries depending on firms' exposure to sustainability-related risks.

Empirical evidence suggests that ESG issues that are financially material for a given sector are more strongly associated with firm performance outcomes (Khan, Serafeim and Yoon, 2016). Prior research further shows that the economic relevance of ESG factors differs across industries due to variations in sustainability risks, stakeholder expectations, and regulatory pressures (Dyck et al., 2019).

This perspective is also consistent with the stakeholder-based view of the firm, which highlights how organizations operating in different industries face heterogeneous stakeholder pressures and institutional environments (Freeman, 1984).

An earlier version of sectoral classification was initially adopted, based on a single-dimension assignment. However, after initial adoption, it became clear that this approach primarily captures environmental exposure and therefore risked conflating overall ESG relevance with environmental materiality alone, implicitly underrepresenting the social and governance dimensions.

3.3.2 Market Classification

Beyond sector-level exposure, the empirical analysis also considers cross-country differences in ESG regulatory markets. Countries in the sample are classified as High Regulatory Intensity or Low Regulatory Intensity markets.

Rather than relying on traditional legal or economic classifications, the categorization is based on differences in ESG-related regulatory and institutional frameworks across countries during the sample period.

Prior research shows that sustainability disclosure and corporate ESG practices are significantly influenced by national regulatory environments and institutional settings (Ioannou and Serafeim, 2017; Christensen, Hail and Leuz, 2021).

In particular, the classification was defined based on 4 criteria:

- **Mandatory law pre-2018:** a country is classified high as having a mandatory ESG law if, before 2018, it adopted a legally binding national or supranational framework requiring firms to disclose non-financial or ESG-related information. This includes both stand-alone national legislation and national transpositions of the EU Non-Financial Reporting Directive (2014/95/EU). Regulatory frameworks based solely on voluntary principles or non-binding guidelines are not considered mandatory. Prior literature highlights that mandatory sustainability reporting requirements can significantly influence corporate disclosure practices (Ioannou and Serafeim, 2017).
- **Voluntary guidance pre-law:** it takes into account the existence of well-established voluntary ESG disclosure practices prior to the introduction of mandatory requirements. A country is assigned a value of one if, before the adoption of binding regulation, ESG reporting was promoted through voluntary guidelines, industry standards, stock-exchange recommendations, or strong investor-driven disclosure norms.
- **Effective enforcement pre-2018:** enforcement is defined as the existence of a formal mechanism making ESG disclosure obligations non-optional and verifiable, irrespective of the actual intensity of supervision. A country is assigned a value of one if ESG disclosure requirements were subject to legal, regulatory, or stock-exchange-based enforcement mechanisms, including the possibility of sanctions for non-compliance. The inclusion of stock-exchange-based mechanisms is particularly relevant for markets such as Singapore, where the SGX Listing Rules established a formal comply-or-explain ESG reporting framework for listed companies from 2016, representing a binding disclosure architecture even in the absence of standalone statutory legislation. Prior studies emphasize that the effectiveness of sustainability reporting regulation depends not only on the presence of formal requirements but also on the strength of enforcement mechanisms (Christensen, Hail and Leuz, 2021).
- **High institutional support:** this variable reflects the presence of a supportive institutional environment facilitating ESG disclosure, including strong corporate governance systems, active institutional investors, credible regulatory authorities, and

widespread adoption of international reporting standards. Countries with a long-standing sustainability culture and coordinated public-private ESG initiatives are classified as having high institutional support, even in the absence of early mandatory regulation. Institutional investors and governance structures are known to play an important role in shaping corporate sustainability disclosure across countries (Krueger, Sautner and Starks, 2020).

Countries are classified as High Regulatory Intensity markets if at least three of the four criteria are satisfied. All other countries are classified as Low Regulatory Intensity markets. The resulting classification is presented below.

Table 3.2. Country classification by regulatory intensity (2014-2018)

Country	Mandatory law pre-2018	Voluntary guidance pre-law	Effective enforcement	High institutional support	Heavy /Light
Australia	0	1	0	1	Light
Belgium	1	1	1	1	Heavy
Canada	0	1	0	1	Light
Denmark	1	1	1	1	Heavy
Finland	1	1	1	1	Heavy
France	1	1	1	1	Heavy
Germany	1	1	1	1	Heavy
Greece	1	0	0	0	Light
Hong Kong	1	1	0	1	Heavy
Ireland	1	1	1	1	Heavy
Israel	0	1	0	1	Light
Italy	1	0	0	0	Light
Japan	0	1	0	0	Light
Korea	0	1	0	0	Light
Netherlands	1	1	1	1	Heavy
Norway	0	1	0	1	Light
New Zealand	0	1	0	1	Light
Austria	1	1	1	1	Heavy
Portugal	1	1	0	0	Light
Singapore	1	1	0	1	Heavy
Spain	1	1	0	0	Light
Sweden	1	1	1	1	Heavy
Switzerland	0	1	0	1	Light
UK	1	1	1	1	Heavy
USA	0	1	0	1	Light

Note: The classification captures regulatory intensity, defined as the formal architecture of ESG disclosure obligations and institutional enforcement, rather than sustainability performance or ESG culture broadly conceived. Countries with advanced voluntary ESG practices but limited binding disclosure requirements during 2014-2018 may be classified as Low Regulatory Intensity. Regulatory intensity and sustainability leadership are conceptually distinct constructs.

Among the countries in the sample, Italy requires explicit discussion. Italy transposed the NFRD through Legislative Decree 254/2016 and is therefore assigned a value of one on the mandatory law criterion. However, in the remaining three dimensions, Italy scores zero, resulting in a Light classification.

The distinction between formal transposition and substantive regulatory intensity becomes clear when Italy is placed in direct comparison with the Heavy-classified countries. France had established non-financial reporting requirements already in 2001 through the Nouvelles Regulations Economiques, subsequently expanded by the Grenelle II law in

2010. But more importantly, France, Germany and the United Kingdom had by 2014 already developed structured voluntary frameworks, strong enforcement architectures and mature institutional investor communities that engaged systematically with ESG criteria, the three dimensions on which Italy scores zero. Germany’s Deutscher Nachhaltigkeitskodex (2010) and the UK’s Companies Act reporting requirements and mandatory greenhouse gas disclosure (2013) are examples of how these countries had built the broader regulatory ecosystem across all four criteria long before any binding EU obligation. In Italy, by contrast, the legislative decree transposed the directive into a legal system that lacked this preparatory infrastructure across all three remaining dimensions.

Indeed, Italy, before 2018, lacked a structured voluntary ESG disclosure framework: no major national guidelines, stock-exchange recommendations, or coordinated investor-driven norms were in place comparable to other countries, such as to those active in France, Germany, or the United Kingdom. For the enforcement dimension, the Decree assigned supervisory powers to Consob (Italian securities market regulator), but with a narrowly scoped mandate and a proportionate sanctions regime. And additionally applied to a very small population of firms (around 200 large public-interest entities). On institutional support, the Italian institutional investor community had not yet developed a systematic ESG engagement culture during 2014-2018, and voluntary adoption of international reporting standards such as GRI remained limited relative to core European markets. So overall, Italy satisfies in a convincing way only one of the four criteria and therefore is classified as Low Regulatory Intensity. An outcome that well reflects the distinction between the formal transposition of the EU directive and the broader regulatory ecosystem, that require some material changes in corporate ESG behaviour.

This classification approach is intended to approximate the relative strength of national ESG regulatory environments prior to the widespread adoption of global sustainability reporting standards. Together, these variables allow the empirical analysis to investigate whether ESG performance was already reflected in firms’ financial outcomes during the pre-mandatory disclosure period.

The binary classification inevitably simplifies institutional heterogeneity and should therefore be interpreted as a broad proxy for regulatory exposure rather than a complete representation of national ESG environments, which was beyond the scope of this thesis.

Again, an initial alternative approach based on median country-level ESG scores was considered, but discarded because it would create circularity: the same ESG scores would define the groups and be used in regressions, potentially biasing results. The criteria-based framework adopted in this study overcomes these limitations, providing a conceptually sound and empirically robust measure of regulatory intensity.

3.4 Robustness check: Missing data and outliers

Prior to the empirical analysis, the dataset was screened for missing observations. Observations were excluded only when essential variables for a given regression were missing,

preserving as much of the original sample as possible.

This approach allows different regression specifications to maximise coverage while ensuring completeness for all included observations.

To mitigate the influence of extreme values, financial variables were trimmed at the 1st and 99th percentiles. Trimming was preferred over winsorisation in order to avoid artificially compressing extreme values toward the threshold levels. By excluding only the most extreme observations, this approach reduces the potential distortion of parameter estimates while maintaining the integrity of the underlying data distribution.

Table 3.3 summarises the descriptive statistics of the dataset post-trimming, providing for all the relevant variables the number of total observations, mean, median, standard deviations, and other key statistics.

Table 3.3. Summary statistics of variables

Variable	N	Mean	Median	Std Dev	Min	Max	P1	P25	P50	P75	P90	P99
E_score	10482	2.307	2.300	1.404	0.000	5.000	0.000	1.000	2.300	3.346	4.200	5.000
S_score	10482	2.136	2.000	1.263	0.000	5.000	0.000	1.000	2.000	3.050	3.900	5.000
G_score	10482	3.053	3.050	0.996	0.000	5.000	0.900	2.400	3.050	3.750	4.300	5.000
ROA	10731	4.770	3.946	4.033	-5.298	21.806	-2.433	2.022	3.946	6.641	10.040	18.199
ROE	10730	11.682	10.356	14.646	-67.523	100.955	-36.082	5.694	10.356	16.539	25.961	60.881
Tobin's Q	10074	1.203	0.778	1.336	0.024	9.598	0.031	0.393	0.778	1.511	2.692	6.919
WACC	7489	5.500	5.100	3.000	0.000	16.600	0.300	3.400	5.100	7.200	9.500	14.500
Size	10974	16.287	16.099	1.590	0.839	21.767	12.858	15.238	16.099	17.221	18.355	20.663
Leverage	10864	0.243	0.229	0.171	0.000	0.799	0.000	0.106	0.229	0.353	0.479	0.693
Capex_intensity	10237	3.864	1.778	6.006	0.004	52.562	0.007	0.432	1.778	4.888	9.358	32.184
Cash_holdings	10691	9.130	4.052	15.269	0.077	128.748	0.158	1.448	4.052	9.999	21.252	87.744
GDP	12270	2.104	2.400	1.082	-0.600	25.200	0.400	1.400	2.400	2.900	2.900	3.900

Units: ESG scores range from 0 to 5. Financial ratios (ROA, ROE, WACC, Capex intensity, Cash holdings) are expressed as percentages (%). Tobin's Q is a ratio. Firm size is measured as the natural logarithm of total assets. GDP is expressed as a percentage (%).

The WACC deserves more attention, given the higher number of missing observations compared to other variables in the dataset, with approximately 300 additional firm-level missing values.

This pattern is primarily driven by the construction of the WACC, which requires the simultaneous availability of multiple inputs, that include cost of equity, cost of debt, effective tax rate, and leverage. And consequently the absence of any of these components results in a missing WACC observation.

More specifically, missing values are not randomly distributed across the sample. At the firm level and looking at size, smaller firms exhibit a relatively high proportion of missing observations (approximately 21%). However, large firms also display substantial missing rates (around 29%), suggesting that firm size alone does not fully explain the observed pattern. Significant heterogeneity emerges at country level. Some countries show very high missing rates, reaching up to around 60% for countries such as Greece, Sweden, and Italy, while others have considerably lower levels (e.g., Finland and New Zealand, around 10-11%).

These numbers suggest that missing data are not only driven by firm-level characteristics but also by country-specific differences. As a consequence, the presence of

non-random missingness may introduce a potential source of sample selection bias.

While this limitation cannot be fully resolved, its impact is partially mitigated by the use of all available observations for each specification, maximizing sample size while ensuring data consistency across variables. Results for WACC should be read nonetheless with all these aspects in mind.

3.5 Regression

The empirical analysis is built upon three types of regression models: a baseline model, a sector moderation model, and a market moderation model. These specifications allow for a progressively richer framework to examine the relationship between ESG scores and firm performance, as well as how this relationship varies across different sectoral and market conditions.

For each model, results are presented in four separate tables, one for each dependent variables: ROA, ROE, Tobin's Q, and WACC. To follow a consistent structure across all models, each table contains exactly four columns that progressively introduce controls and fixed effects.

All the variables are mean-centered before the regression estimation. This transformation does not affect the slope coefficients but makes the intercept more interpretable as the predicted value for a firm with average ESG scores and average control variable values. Centering is particularly important in the moderation models, where the interaction terms are built as products of continuous variables and binary ones. To ensure comparability across all specifications and facilitate the interpretation of all the coefficients, centering is applied consistently also to baseline model.

Additionally, country-specific annual GDP growth rates are included as a macroeconomic control variable, as noted above, in specifications without year fixed effects. Since GDP growth rates vary over time and across countries, their variation is substantially absorbed once year fixed effects are introduced, which capture all time-specific shocks common to firms in a given year. So including GDP in year fixed effects would therefore introduce collinearity, near the perfect one, between the GDP variable and the year dummies, rendering the coefficient unstable and uninterpretable. For this reason, GDP is included as a control but excluded when year fixed effects are incorporated.

Regarding standard errors: in the within-firm specifications, cluster-robust standard errors at the firm level are used to account for serial correlation within firms over time; in the cross-sectional specifications, HC3 standard errors are used instead, which are more robust in finite samples than standard HC1 or HC2 variants and less likely to underestimate variability in the presence of influential observations.

3.5.1 Baseline model

The baseline regression examines the raw and direct relationship between pillar-level ESG scores and firm financial performance.

Each of the four outcome-specific tables follows the same four-column structure. Column (1) includes only the three ESG pillar scores as regressors, without controls or fixed effects, providing a raw unconditional estimate of the ESG-performance association. Column (2) adds firm- and country-level control variables, specifically firm size, leverage, capital expenditure intensity, cash holdings, and GDP growth rate, to account for observable heterogeneity that may independently drive both ESG scores and financial outcomes. Column (3) further includes year fixed effects, absorbing time-specific shocks common to all firms in a given year, such as macroeconomic fluctuations or global market conditions. Column (4) introduces firm fixed effects alongside the controls and year fixed effects, yielding a two-way fixed effects estimator that restricts identification to within-firm variation over time.

This four-column structure is not just a matter of presentational choice. It reflects a fundamental methodological distinction between two identification strategies. Columns (1) through (3) exploit cross-sectional variation across firms, capturing structural differences between firms with different ESG profiles. Column (4), with the inclusion of firm fixed effect, restricts identification to within-firm variation over time, capturing whether changes in a firm's own ESG scores are associated with subsequent changes in its financial performance. Presenting both strategies within the same table allows the reader to observe directly how coefficients evolve as identification becomes progressively more demanding, and in particular how much of the observed ESG-performance association reflects persistent structural differences between firms versus genuine dynamic effects operating within firms over time.

3.5.2 Sector moderation model

The model examines whether the effect of ESG scores varies across sectors with degrees of material exposure to sustainability risks. Each ESG pillar is interacted with its corresponding sector-level dummy variable, `HighImpactEnv`, `HighImpactSocial`, and `HighImpactGov`, as defined in Section 3.3.1.

The same four-column structure is applied, with one important difference in column (4). Because the `HighImpact` dummies are defined at the industry level and are time-invariant by construction, the inclusion of firm fixed effects in column (4) would create an identification problem. Firm fixed effects absorb all cross-sectional variation across firms, which is precisely the variation needed to identify the moderation effect, leaving the interaction terms identified solely through within-firm time variation in ESG scores, which is insufficient to recover meaningful estimates of sectoral heterogeneity. Exactly for this reason, column (4) in the sector moderation tables uses industry FE rather than firm FE. This specification controls for time-invariant average differences across industries while preserving the cross-sectional variation between firms within the same industry, which

is the identifying variation needed to estimate how the ESG-performance relationship differs between high and low impact sectors.

Specifications with firm fixed effects are nonetheless estimated and reported in the Appendix, not to resolve the identification problem, but to make it transparent: it is possible to observe directly how the interaction terms behave when within-firm variation alone is used for identification, and to assess the extent to which the moderation effects are driven by cross-sectional rather than dynamic within-firm variation.

3.5.3 Market moderation model

The market moderation model investigates whether the relationship depends on the country in which a firm operates, and in particular on the regulatory environment. Each pillar is interacted with `HighRegulatoryMarket`.

The same four-column structure applies, and for the same identification reasons discussed in Section 3.5.2, column (4) uses industry fixed effects rather than firm fixed effects. Specifications with firm fixed effects are nonetheless estimated and reported in the Appendix to make the identification constraint transparent.

Chapter 4

Empirical Analysis

4.1 Stand-alone Analysis

4.1.1 General ESG Analysis

Descriptive statistics indicate distinct distributional characteristics for each ESG pillar. Governance scores show the highest average level and the lowest dispersion, suggesting a relatively homogeneous distribution across firms. Environmental scores display intermediate values, but the greatest variability, while Social scores have lower average, with a moderately concentrated distribution. The close alignment of mean and median values

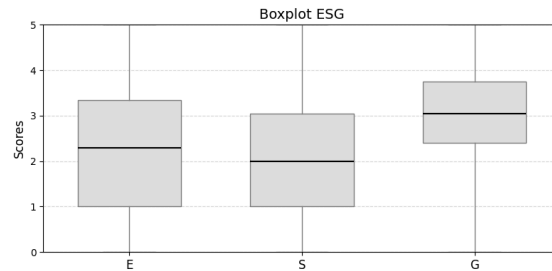


Figure 4.1. Boxplot at pillar level

across the pillars indicates limited skewness, suggesting the absence of extreme outliers. Boxplots further illustrate these patterns: Environmental scores have wider interquartile ranges and longer whiskers, Governance scores are tightly clustered, and Social scores remain concentrated at lower levels.

Kernel density (Figure 4.2) plots complement the descriptive part, providing a further visualization of these differences.

These findings, overall, show that ESG should not be treated as a single, homogeneous construct: each pillar exhibits distinct distributional characteristics, consistent with the pillar-level heterogeneity documented in 2.1.1, where the three pillars were shown to be also conceptually distinct.

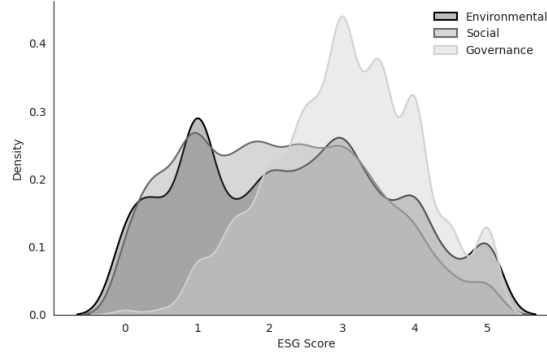


Figure 4.2. Kernel density

4.1.2 Sector Analysis

According to the definition of the three non-mutually exclusive sector-level dummies, Table 4.1 reports ESG scores by pillar and sectoral exposure.

Pillar	Impact	N	Mean	Std	Median	Min	Max	CV
E	High	3684	2.262	1.179	2.4	0	5	0.521
	Low	6798	2.331	1.511	2.3	0	5	0.648
S	High	6494	2.166	1.251	2.2	0	5	0.577
	Low	3988	2.086	1.281	2.0	0	5	0.614
G	High	4821	3.096	0.930	3.1	0	5	0.300
	Low	5661	3.016	1.047	3.0	0	5	0.347

Table 4.1. Descriptive statistics of ESG pillars

Comparing High-Impact and Low-Impact sectors reveals modest differences in ESG scores, with Environmental scores exhibiting greater within-group variability and Governance scores remaining stable across sectors. Social scores are slightly higher in High-Impact sectors, reflecting increased stakeholder scrutiny and sector-specific relevance. These patterns justify examining pillar-specific interactions in subsequent regressions.

4.1.3 Market Analysis

ESG scores vary also systematically across countries. Table 4.2 reports pillar-level for High and Low Regulatory Intensity countries.

Pillar	High Regulatory Intensity	Low Regulatory Intensity
E_Score	2.739 $\pm$ 1.431	2.161 $\pm$ 1.364
S_Score	2.717 $\pm$ 1.265	1.940 $\pm$ 1.200
G_Score	3.349 $\pm$ 0.874	2.953 $\pm$ 1.014

Table 4.2. ESG scores by regulatory intensity

Overall, firms in countries with high regulatory intensity exhibit higher ESG scores,

reflecting a more consistent and institutionally supported adoption of sustainability practices. Governance scores remain relatively high across both groups, indicating a baseline level of standardization. Environmental and Social scores are not only higher in high-intensity countries but also display greater dispersion, suggesting that these pillars are more sensitive to local market conditions, stakeholder pressures, and regulatory enforcement. These patterns support the expectation that institutional environments can shape the adoption and maturity of ESG practices, particularly in the Environmental and Social dimensions.

4.1.4 Temporal Trends

Table 4.3 presents the evolution of ESG scores at pillar level in the sample period: Governance scores remain high and relatively stable, while Environmental and, especially, Social scores gradually show an upward and gradual trend, reflecting incremental adoption driven by voluntary initiatives, sectoral exposure, and country-level regulatory intensity. These trends are consistent with the pre-mandatory disclosure window: ESG adoption in the sample period was rising but voluntarily driven, providing a baseline to assess subsequent regulatory impacts.

Year	E	S	G
2014	2.202	1.956	2.927
2015	2.209	1.964	2.938
2016	2.238	2.034	2.980
2017	2.379	2.220	3.158
2018	2.502	2.502	3.258

Table 4.3. Temporal evolution of ESG scores by pillar

Reading the temporal pattern through the regulatory lens

The gradual upward trend documented in table 4.3 invites a closer reading when mapped against the EU regulatory calendar. To do that, the sample is disaggregated into EU members, given the NFRD is an EU-specific legislation. The EU group also includes firms headquartered in the United Kingdom, since Brexit became legally effective only in January 2020.

Figure 4.3 documents annual mean ESG scores at pillar level for each group. The most striking insight is not the acceleration itself, but where it originates. EU firms begin the sample period at substantially higher score levels across all three pillars, Environmental (3.18 vs. 1.93 in 2014), Social (3.10 vs. 1.64), Governance (3.50 vs. 2.77), and their trajectory remains comparatively flat throughout the period, with a slight exception for the governance pillar. Non-EU companies drive the aggregate upward trend, with a visible acceleration from 2017 on: Environmental +0.165 points, Social +0.210 points, Governance +0.187 points in the 2016-2017 window alone. Two-sample t-tests confirm that this acceleration is statistically significant in aggregate across all firms (Environmental: $t = 4.48$, $p < 0.001$; Social: $t = 6.11$, $p < 0.001$; Governance: $t = 8.73$, $p < 0.001$) and

that Non-EU firms accelerate significantly more than EU firms on Environmental ($t = -2.39$, $p = 0.017$) and Social ($t = -4.87$, $p < 0.001$), while no significant difference is found on Governance ($t = 0.91$, $p = 0.364$).

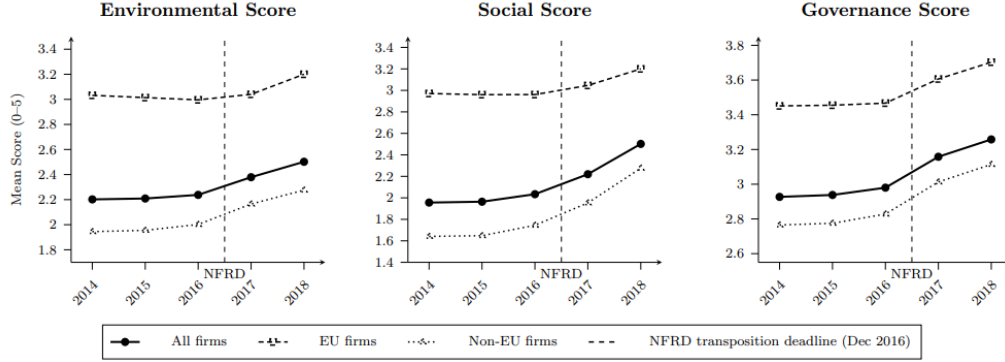


Figure 4.3. ESG pillar score trends, disaggregated by EU membership status during the sample period

The elevated baseline scores of EU firms in 2014 are themselves informative. These data reflect years of voluntary ESG adoption preceding any binding disclosure obligation, consistent with the broader pattern of European capital markets having developed ESG expectations ahead of formal regulation through soft-law instruments, national corporate governance codes and stewardship codes. The NFRD legislation, in this reading, codified and standardised practices that market forces had already begun to diffuse, formalising an existing trajectory rather than initiating a new one. This elevated EU baseline should not, however, be read as evidence of homogeneous European ESG culture. Within the EU, there is meaningful variation across countries, reflecting different histories of voluntary disclosure, investor engagement, and institutional development. What unifies EU firms relative to the Non-EU ones is not uniformity, but a shared institutional environment that had already begun producing ESG expectations before the NFRD made them binding and that left comparatively little room for further score improvement within the 2014-2018 window. Among EU firms, the absence of a visible acceleration post-2016 is itself informative: member states had until December 2016 to transpose the NFRD, yet scores remained flat, suggesting the directive had already been anticipated by capital markets rather than triggering new behaviour. It is worth highlighting again that the directive referred to and applied nonetheless exclusively to EU-domiciled public-interest entities with more than 500 employees, a narrow subset of the global sample.

The acceleration among Non-EU firms tells a qualitatively different story. Headquartered in the United States, Japan, South Korea, Australia, and elsewhere, these firms faced no NFRD obligation. The observed convergence toward higher ESG scores from 2017 onwards is instead consistent with what DiMaggio and Powell (1983) term mimetic

isomorphism: firms that are outside the regulated perimeter of legislation tend to adopt practices modelled by their regulated peers to maintain legitimacy with institutional investors who, regardless of portfolio geography, were increasingly attentive to ESG criteria. Bradford (2020) describes this dynamic as the Brussels Effect, EU regulatory standards exerting de facto influence through market channels well beyond their formal jurisdictional scope.

Taken together, these patterns should be interpreted as consistent with a multi-mechanism process of institutional convergence, combining anticipatory adjustment within the EU and mimetic diffusion in external markets, rather than as evidence of a single uniform regulatory treatment effect.

This reading matters for the thesis’s identification strategy. The regulatory wave that genuinely transformed ESG from a strategic choice into a legal obligation, such as the CSRD, the SFDR, the EU Taxonomy Regulation, became effective between 2020 and 2023, entirely outside the sample window.

The NFRD transposition deadline visible in Figure 4.3 is therefore best understood as a contextual marker of growing institutional attention to ESG, not as a structural break separating a clean from a contaminated period (especially considering the narrow scope of the interested firms). What the data show is that the score growth observed across 2014-2018 is driven predominantly by voluntary strategic adoption responding to investor demand, precisely the mechanism that the pre-mandatory disclosure framing of this thesis is designed to isolate.

4.1.5 Correlation Analysis

ESG pillars are positively correlated but sufficiently distinct. Governance shows the lowest correlation with other pillars, while Environmental and Social display moderate correlation. The heatmap confirms that ESG pillars are related but not redundant.

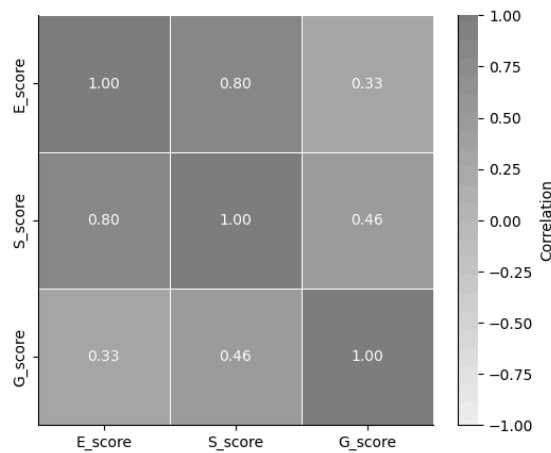


Figure 4.4. Heatmap

Variance Inflation Factor (VIF) analysis further supports the distinctiveness of the pillars (Table 4.4).

Variable	VIF
E_Score	3.108
S_Score	3.211
G_Score	1.320

Table 4.4. VIF for ESG pillars

All VIF values remain well below critical thresholds, suggesting limited multicollinearity and supporting the treatment of each pillar as a separate explanatory variable.

4.2 Regression Results

This section presents the main regression results across the three model specifications. For each model, results are organised in four tables, one per dependent variable, following the four-column structure described in Section 3.5. The focus here is on identifying the key patterns across pillars, specifications, and models. A detailed economic interpretation of the coefficients is provided in Section 4.3.

4.2.1 Baseline Model: Main regression results

The baseline model examines the direct association between ESG pillar scores and firm financial outcomes, testing directly the H1 hypothesis. The four tables below present results for each outcome variable, with column (1) through (3) exploiting cross-sectional variation and column (4) introducing firm fixed effects to isolate within-firm dynamics.

Table 4.5. ROA Regression Results - Pooled OLS and Fixed Effects Models

	(1) Baseline	(2) + Controls	(3) + Year FE	(4) + Firm FE
E_score_c	-0.739*** (0.050)	-0.128** (0.049)	-0.151*** (0.049)	-0.133* (0.072)
S_score_c	0.583*** (0.058)	0.499*** (0.055)	0.504*** (0.056)	0.146** (0.061)
G_score_c	0.301*** (0.047)	0.465*** (0.047)	0.510*** (0.046)	0.024 (0.082)
Size_c	-	-1.251***	-1.243***	-0.687**
Leverage_c	-	-1.607***	-1.509***	-6.458***
Capex intensity_c	-	0.003	0.007	0.135***
Cash holdings_c	-	0.012***	0.015***	0.009
GDP_c	-	0.196***	-	-
Observations	9411	8547	8586	6052
Number of Firms	2146	1994	2003	1673
R-squared	0.030	0.219	0.218	-
R-squared (Within)	-	-	-	0.102
Controls	No	Yes	Yes	Yes
Firm FE	No	No	No	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Column (4) adds firm fixed effects, yielding a two-way fixed effects estimator (firm and year).

The within R^2 is reported for fixed effects models.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Across the cross-sectional specifications (column 1 to column 3), Governance shows a positive and significant relationship with ROA, with coefficients increasing from 0.301*** in column (1) to 0.510*** in column (3) as controls and year fixed effects are added. The Social pillar is also positive and significant throughout, while the Environmental dimension is negative and significant across all cross-sectional columns.

The introduction of firm fixed effects, in column (4), substantially reduces all coefficients, with only Environmental and Social retaining marginal significance.

Table 4.6. ROE Regression Results - Pooled OLS and Fixed Effects Models

	(1) Baseline	(2) + Controls	(3) + Year FE	(4) + Firm FE
E_score_c	-0.720*** (0.167)	0.132 (0.187)	0.092 (0.188)	-0.228 (0.471)
S_score_c	0.679*** (0.199)	0.467* (0.212)	0.336 (0.216)	-0.063 (0.374)
G_score_c	1.132*** (0.179)	1.341*** (0.197)	1.501*** (0.191)	-0.226 (0.456)
Size_c	-	-1.531***	-1.476***	-2.094
Leverage_c	-	1.097	1.550	-2.093
Capex intensity_c	-	-0.045	-0.017	0.199
Cash holdings_c	-	0.054***	0.067***	0.017
GDP_c	-	0.888***	-	-
Observations	9378	8526	8565	6052
Number of Firms	2151	1996	2005	1673
R-squared	0.009	0.040	0.038	-
R-squared (Within)	-	-	-	0.002
Controls	No	Yes	Yes	Yes
Firm FE	No	No	No	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Column (4) adds firm fixed effects, yielding a two-way fixed effects estimator (firm and year).

The within R^2 is reported for fixed effects models.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The cross-sectional results for ROE confirm the dominance of Governance, with a coefficient rising to 1.501*** in column (3). Instead, Environmental score loses significance once the controls are added. Same pattern for Social where the coefficients remain largely insignificant.

In column (4), all ESG coefficients become statistically insignificant, and the within R-squared drops to 0.002, indicating that ESG pillar variation explains virtually almost no within-firm variation in ROE.

Table 4.7. Tobin's Q Regression Results - Pooled OLS and Fixed Effects Models

	(1) Baseline	(2) + Controls	(3) + Year FE	(4) + Firm FE
E_score_c	-0.197*** (0.017)	-0.005 (0.017)	-0.019 (0.017)	-0.036 (0.026)
S_score_c	0.091*** (0.019)	0.083*** (0.018)	0.083*** (0.018)	0.025 (0.018)
G_score_c	0.119*** (0.016)	0.166*** (0.016)	0.186*** (0.015)	0.007 (0.023)
Size_c	-	-0.408***	-0.399***	-0.886***
Leverage_c	-	-0.893***	-0.855***	-0.679**
Capex intensity_c	-	-0.009***	-0.005*	0.003
Cash holdings_c	-	0.009***	0.011***	0.003*
GDP_c	-	0.110***	-	-
Observations	9126	8332	8364	6052
Number of Firms	2095	1950	1959	1673
R-squared	0.026	0.237	0.235	-
R-squared (Within)	-	-	-	0.138
Controls	No	Yes	Yes	Yes
Firm FE	No	No	No	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Column (4) adds firm fixed effects, yielding a two-way fixed effects estimator (firm and year).

The within R^2 is reported for fixed effects models.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Governance and Social show consistent positive and significant associations with Tobin's Q across column (1) through (3), with Governance rising to 0.186*** in column (3). Instead, Environmental score, with a trend already highlighted in the other financial variables, is negative and significant in column (1), but loses its significance once controls are added. In column (4), all three pillar coefficients become statistically insignificant.

It is worth noting that the proxy for Tobin's Q, market capitalisation divided by total assets, may introduce an upward bias in the ESG coefficients for firms with significant unrecorded intangibles such as reputation and human capital, which inflate the numerator without affecting the book-value denominator. However, this concern does not appear to dominate the results across any of the three pillars. The Governance coefficients on Tobin's Q comparing to the ones on ROA and ROE are consistently smaller, the environmental coefficient is negative or insignificant once controls are added, and Social coefficient is positive but modest in magnitude. An overall pattern that is inconsistent with a dominant upward bias and that suggests that approximation does not materially distort the comparative picture across outcome variables.

Table 4.8. WACC Regression Results - Pooled OLS and Fixed Effects Models

	(1) Baseline	(2) + Controls	(3) + Year FE	(4) + Firm FE
E_score_c	-0.088* (0.046)	-0.196*** (0.047)	-0.257*** (0.046)	-0.218* (0.121)
S_score_c	0.056 (0.052)	0.199*** (0.051)	0.201*** (0.052)	0.210* (0.095)
G_score_c	0.224*** (0.041)	0.275*** (0.044)	0.364*** (0.040)	-0.006 (0.129)
Size_c	-	-0.015	0.009	-0.126
Leverage_c	-	-5.799***	-5.599***	-7.899***
Capex intensity_c	-	0.007	0.019**	-0.016
Cash holdings_c	-	0.003	0.009**	0.005
GDP_c	-	0.450***	-	-
Observations	6855	6348	6348	6052
Number of Firms	1816	1707	1707	1676
R-squared	0.006	0.120	0.102	-
R-squared (Within)	-	-	-	0.023
Controls	No	Yes	Yes	Yes
Firm FE	No	No	No	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Column (4) adds firm fixed effects, yielding a two-way fixed effects estimator (firm and year).

The within R^2 is reported for fixed effects models.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

With WACC the Environmental dimension shows a negative and significant association across all the cross-sectional specifications, that rise from -0.088* in column (1) to -0.257*** in column (3). Governance and Social are both positive and significant in the cross-sectional approach. Again, in column (4) the coefficients lose significance with the exception of environmental and social scores, which retain nonetheless marginal significance.

Overall, the baseline results reveal a clear, interesting and consistent pattern: cross-sectional relationships are strong and robust, particularly for Governance, while within-firm dynamics are substantially weaker across all financial outcomes. This distinction between structural cross-firm and dynamic within-firm effects is the central empirical finding of the baseline analysis and, for this reason, it is discussed in detail in Section 4.3.1.

These patterns provide partial support for H1. Governance and Social align with the predicted positive direction across accounting- and market-based measures. The environmental pillar shows, instead, a systematically negative association with ROA and ROE across cross-sectional specifications, a deviation from the prediction of H1 hypothesis.

4.2.2 Sector moderation Model: Main regression results

The sector moderation model introduces interaction terms between ESG pillar and its corresponding high-impact dummy, as highlighted in Section 3.3.1, testing the H3 hypothesis. Column (4) uses industry fixed effects rather than firm fixed effects, for the identification reasons previously discussed.

Table 4.9. ROA Regression Results - ESG Sectoral Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.682*** (0.053)	-0.024 (0.052)	-0.042 (0.052)	-0.063 (0.052)
S_score_c	0.588*** (0.069)	0.537*** (0.065)	0.541*** (0.065)	0.390*** (0.065)
G_score_c	0.507*** (0.059)	0.679*** (0.057)	0.726*** (0.056)	0.775*** (0.056)
E_score_c : HighImpactEnv	-0.141* (0.064)	-0.325*** (0.060)	-0.337*** (0.060)	-0.306*** (0.060)
S_score_c : HighImpactSocial	0.000 (0.067)	-0.032 (0.062)	-0.030 (0.061)	-0.049 (0.061)
G_score_c : HighImpactGov	-0.536*** (0.089)	-0.574*** (0.081)	-0.583*** (0.081)	-0.602*** (0.081)
Size_c	-	-1.261***	-1.255***	-0.981***
Leverage_c	-	-1.665***	-1.576***	-1.352***
Capex intensity_c	-	0.003	0.008	0.014
Cash holdings_c	-	0.011***	0.014***	0.013***
GDP_c	-	0.182***	-	-
Observations	9411	8547	8586	8586
Number of Firms	2146	1994	2003	2003
R-squared	0.035	0.225	0.225	0.275
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction ExHighImpactEnv is negative and significant across all specification, with a rising pattern in absolute magnitude reaching -0.337*** in column (3) and also remaining stable at -0.306*** with industry fixed effects in column (4). The interaction GxHighImpactGov is consistently negative and significant, while SxHighImpactSocial shows a different pattern, it is largely insignificant.

The Governance main effect, representing the effect in low-impact sector, increases progressively across columns, reaching 0.775*** in column (4).

Table 4.10. ROE Regression Results - ESG Sectoral Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.505** (0.176)	0.410* (0.199)	0.397* (0.201)	0.353* (0.203)
S_score_c	0.450* (0.225)	0.182 (0.249)	0.023 (0.252)	0.121 (0.257)
G_score_c	2.012*** (0.228)	2.218*** (0.236)	2.384*** (0.231)	2.249*** (0.235)
E_score_c : HighImpactEnv	-0.505* (0.245)	-0.731*** (0.244)	-0.812*** (0.243)	-0.842*** (0.243)
S_score_c : HighImpactSocial	0.399* (0.222)	0.481* (0.231)	0.528* (0.230)	0.385 (0.233)
G_score_c : HighImpactGov	-2.224*** (0.321)	-2.296*** (0.328)	-2.325*** (0.327)	-2.154*** (0.331)
Size_c	-	-1.551***	-1.502***	-1.293***
Leverage_c	-	0.758	1.177	2.096
Capex intensity_c	-	-0.043	-0.017	0.097*
Cash holdings_c	-	0.052***	0.063***	0.040***
GDP_c	-	0.844***	-	-
Observations	9378	8526	8565	8565
Number of Firms	2151	1996	2005	2005
R-squared	0.016	0.048	0.047	0.078
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction $G \times HighImpactGov$ is strongly negative and significant across all specifications, reaching -2.325*** in column (3). By contrast, the $ExHighImpactSocial$ shows a negative and significant pattern. $S \times HighImpactSocial$ shows a positive and marginal coefficient in columns (2) and (3), but loses significance one industry fixed effects consideration are added.

Table 4.11. Tobin's Q Regression Results - ESG Sectoral Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.185*** (0.018)	0.019 (0.018)	0.008 (0.018)	-0.030 (0.017)
S_score_c	0.103*** (0.022)	0.107*** (0.021)	0.108*** (0.021)	0.096*** (0.021)
G_score_c	0.173*** (0.018)	0.215*** (0.017)	0.237*** (0.017)	0.244*** (0.017)
E_score_c : HighImpactEnv	-0.017 (0.020)	-0.071*** (0.018)	-0.082*** (0.018)	-0.052*** (0.018)
S_score_c : HighImpactSocial	-0.020 (0.022)	-0.031 (0.020)	-0.032 (0.020)	-0.052** (0.020)
G_score_c : HighImpactGov	-0.148*** (0.032)	-0.136*** (0.029)	-0.144*** (0.029)	-0.108*** (0.030)
Size_c	-	-0.410***	-0.401***	-0.341***
Leverage_c	-	-0.906***	-0.870***	-0.677***
Capex intensity_c	-	-0.008**	-0.005	0.002
Cash holdings_c	-	0.009***	0.011***	0.009***
GDP_c	-	0.107***	-	-
Observations	9126	8332	8364	8364
Number of Firms	2095	1950	1959	1959
R-squared	0.029	0.240	0.239	0.307
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction ExHighImpactEnv is negative and significant from column (2) onward, reaching -0.052*** in column (4). The interaction GxHighImpactGov is negative and significant across all specifications. SxHighImpactSocial becomes negative and significant only in column (4) with industry fixed effects. This trend suggests that this effect emerges only after controlling for industry-level heterogeneity.

Table 4.12. WACC Regression Results - ESG Sectoral Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.050 (0.049)	-0.156*** (0.049)	-0.204*** (0.049)	-0.215*** (0.050)
S_score_c	0.024 (0.066)	0.173** (0.067)	0.171** (0.068)	0.176** (0.069)
G_score_c	0.169*** (0.050)	0.234*** (0.052)	0.327*** (0.049)	0.368*** (0.050)
E_score_c : HighImpactEnv	-0.191*** (0.058)	-0.174*** (0.059)	-0.219*** (0.058)	-0.193*** (0.058)
S_score_c : HighImpactSocial	0.063 (0.062)	0.049 (0.064)	0.059 (0.065)	0.047 (0.066)
G_score_c : HighImpactGov	0.191** (0.076)	0.173** (0.073)	0.160* (0.074)	0.179** (0.075)
Size_c	-	-0.021	0.001	-0.022
Leverage_c	-	-5.772***	-5.577***	-5.314***
Capex intensity_c	-	0.005	0.017**	0.010
Cash holdings_c	-	0.004	0.009***	0.011***
GDP_c	-	0.442***	-	-
Observations	6855	6348	6348	6348
Number of Firms	1816	1707	1707	1707
R-squared	0.009	0.122	0.105	0.125
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction ExHighImpactEnv is, once again, negative and significant across all specifications, reaching -0.219*** in column (3). The interaction GxHighImpactGov shows an asymmetric pattern relative to the other outcomes: it is positive and significant across all specifications, in contrast to the negative interactions observed for ROA, ROE and Tobin's Q. SxHighImpactSocial remains insignificant throughout.

The sector moderation tables reveal heterogeneous ESG effects across sectors. The Environmental and Governance interactions show the most consistent patterns, while Social pillar shows a limited sectoral heterogeneity. The asymmetric behaviour of GxHighImpactGov across outcome variables is a notable finding that is worth highlighting and for this reason, it is discussed in Section 4.3.2 more in details.

Lastly looking at the results of the within approach, when the firm fixed effects are added, most interactions lose their significance, with the only exception of GxHighImpactGov with ROA and SxHighImpactSocial with WACC.

4.2.3 Market moderation Model: Main regression results

The market moderation model introduces interaction terms between each ESG pillar and the HighRegulatoryIntensity dummy, completing the test of H3. As in the other moderation model, in column (4) there is the addition of industry fixed effects.

Table 4.13. ROA Regression Results - ESG Market Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.798*** (0.057)	-0.223*** (0.056)	-0.248*** (0.057)	-0.269*** (0.056)
S_score_c	0.714*** (0.067)	0.646*** (0.065)	0.666*** (0.067)	0.524*** (0.066)
G_score_c	0.348*** (0.052)	0.546*** (0.052)	0.596*** (0.051)	0.612*** (0.051)
E_score_c × HighReg	0.332*** (0.118)	0.514*** (0.103)	0.523*** (0.102)	0.534*** (0.099)
S_score_c × HighReg	-0.522*** (0.138)	-0.591*** (0.122)	-0.621*** (0.121)	-0.684*** (0.118)
G_score_c × HighReg	-0.281** (0.122)	-0.486*** (0.109)	-0.527*** (0.107)	-0.383*** (0.105)
Size_c	-	-1.260***	-1.255***	-0.983***
Leverage_c	-	-1.666***	-1.583***	-1.285***
Capex intensity_c	-	0.004	0.007	0.017*
Cash holdings_c	-	0.010***	0.013***	0.011***
GDP_c	-	0.172***	-	-
Observations	9411	8547	8586	8586
Number of Firms	2146	1994	2003	2003
R-squared	0.034	0.224	0.224	0.275
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction ExHighReg is positive and significant across all the specifications, reaching 0.523*** in column (3) and remaining stable at 0.534*** in column (4). The interactions SxHighReg and GxHighReg are both negative and significant across all specifications.

Table 4.14. ROE Regression Results - ESG Market Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.854*** (0.189)	-0.128 (0.206)	-0.154 (0.209)	-0.237 (0.210)
S_score_c	1.088*** (0.230)	0.870*** (0.245)	0.763*** (0.253)	0.858*** (0.254)
G_score_c	1.190*** (0.202)	1.367*** (0.225)	1.561*** (0.218)	1.454*** (0.220)
E_score_c × HighReg	0.763* (0.413)	1.303*** (0.433)	1.247*** (0.429)	1.407*** (0.424)
S_score_c × HighReg	-1.626*** (0.486)	-1.737*** (0.504)	-1.731*** (0.501)	-1.997*** (0.497)
G_score_c × HighReg	-0.318 (0.426)	-0.206 (0.451)	-0.429 (0.443)	-0.286 (0.442)
Size_c	-	-1.538***	-1.490***	-1.294***
Leverage_c	-	1.019	1.436	2.645**
Capex intensity_c	-	-0.041	-0.016	0.113***
Cash holdings_c	-	0.052***	0.063***	0.036***
GDP_c	-	0.850***	-	-
Observations	9378	8526	8565	8565
Number of Firms	2151	1996	2005	2005
R-squared	0.011	0.042	0.040	0.073
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The interaction ExHighReg is positive and significant across all specifications, reaching 1.247*** in column (3). SxHighReg is, instead, strongly negative and significant throughout, reaching -1.731*** in column (3). GxHighReg remains insignificant across all specifications for ROE. It represents a notable difference from the other financial variables.

Table 4.15. Tobin's Q Regression Results - ESG Market Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.230*** (0.019)	-0.039* (0.019)	-0.054*** (0.019)	-0.078*** (0.018)
S_score_c	0.126*** (0.022)	0.113*** (0.021)	0.120*** (0.022)	0.092*** (0.021)
G_score_c	0.120*** (0.017)	0.187*** (0.017)	0.211*** (0.017)	0.222*** (0.017)
E_score_c × HighReg	0.164*** (0.037)	0.182*** (0.034)	0.188*** (0.034)	0.158*** (0.032)
S_score_c × HighReg	-0.166*** (0.044)	-0.133*** (0.040)	-0.151*** (0.039)	-0.137*** (0.037)
G_score_c × HighReg	-0.016 (0.045)	-0.138*** (0.037)	-0.160*** (0.036)	-0.109*** (0.035)
Size_c	-	-0.410***	-0.402***	-0.342***
Leverage_c	-	-0.903***	-0.868***	-0.673***
Capex intensity_c	-	-0.008***	-0.005*	0.002
Cash holdings_c	-	0.009***	0.011***	0.009***
GDP_c	-	0.106***	-	-
Observations	9126	8332	8364	8364
Number of Firms	2095	1950	1959	1959
R-squared	0.028	0.240	0.239	0.308
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

All three interactions are statistically significant from columns (2) to (4). ExHighReg is positive at 0.188*** in column (3), while SxHighReg and GxHighReg are both negative, at -0.151*** and -0.160*** respectively. The patterns are stable with the introduction of industry fixed effects in column (4).

Table 4.16. WACC Regression Results - ESG Market Moderation (Interaction Model)

	(1) No Controls	(2) + Controls	(3) + Year FE	(4) + Industry FE
E_score_c	-0.110* (0.053)	-0.249*** (0.054)	-0.308*** (0.054)	-0.308*** (0.054)
S_score_c	0.057 (0.061)	0.223*** (0.060)	0.242*** (0.061)	0.231*** (0.062)
G_score_c	0.308*** (0.046)	0.319*** (0.049)	0.420*** (0.044)	0.478*** (0.045)
E_score_c × HighReg	0.146 (0.103)	0.267** (0.106)	0.275** (0.104)	0.259** (0.103)
S_score_c × HighReg	0.013 (0.120)	-0.108 (0.121)	-0.160 (0.120)	-0.143 (0.120)
G_score_c × HighReg	-0.474*** (0.101)	-0.282** (0.110)	-0.346*** (0.103)	-0.367*** (0.103)
Size_c	-	-0.021	0.000	-0.024
Leverage_c	-	-5.810***	-5.617***	-5.382***
Capex intensity_c	-	0.007	0.019**	0.010
Cash holdings_c	-	0.003	0.008**	0.010***
GDP_c	-	0.446***	-	-
Observations	6855	6348	6348	6348
Number of Firms	1816	1707	1707	1707
R-squared	0.009	0.122	0.105	0.125
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Robust standard errors (HC3) in columns (1)–(3); cluster-robust (firm level) in column (4).

Column (2) adds firm-level controls to column (1). Column (3) adds year fixed effects.

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

ExHighReg is positive and significant in columns (2) through (4). GxHighReg is negative and significant across all specifications. SxHighReg remains insignificant throughout, distinguishing WACC from the other outcome variables where Social showed significant negative interactions.

The market moderation results show a consistent asymmetric relationship across pillars: Environmental performance benefits from stricter regulatory environments, while Social and Governance show diminishing returns in high regulatory intensity markets.

When firm fixed effects are introduced, ExHighReg and SxHighReg lose significance, while GxHighReg retains significance on ROA.

4.3 Interpretations of coefficients

The following interpretations are primarily descriptive and aim to provide an economic intuition of the estimated coefficients across the three models. The focus is on the magnitude and stability of the effects, the movement of coefficients across specifications, if any, and the contrast between cross-sectional and within-firm dynamics.

Instead, in Chapter 5 there is a more specific discussion of the results from a theoretical standpoint and with literature implications.

4.3.1 Baseline Model

Cross-sectional results

The cross-sectional specifications, columns (1) through (3), reveal a heterogeneous picture across pillars. Moving from the raw and unconditional estimates in column (1) to the fully controlled specification with controls and year fixed effects in column (3), several patterns emerge.

The pillar that shows the strongest and most consistent cross-sectional association is the Governance one. Its coefficient on ROA shows an increasing pattern, starting from 0.301*** in column (1) to 0.510*** in column (3). This suggests that the relationship is not driven by omitted firm characteristics but rather reflects a genuine structural association between governance quality and profitability. A similar pattern emerges for ROE, where the Governance score rises from 1.132*** to 1.501***, for Tobin's Q from 0.119*** to 0.186***, and for WACC from 0.224*** to 0.364***. The progressive strengthening of the Governance coefficient as controls are added is interesting: it indicates that firms with stronger governance are not only and simply larger or less leveraged, but that the governance dimension is able to capture something distinct about the quality of the firms that common controls do not absorb.

The social dimension, instead, shows a moderate but consistent positive correlation with ROA, stable around 0.500*** across columns (1) through (3), and with Tobin's Q at 0.083***. The effect on ROE and WACC is less consistent, with WACC showing a positive and significant coefficient of 0.201*** in column (3).

The environmental pillar shows a negative and significant association with ROA, strengthening from -0.739*** in column (1) to -0.151*** in column (3) after controlling for firm characteristics. What is clear from the reduction of magnitude is that part of the raw negative association detected in column (1) was driven by omitted variables, in particular firm size and leverage. However, it is worth highlighting that the negative association with WACC increases considerably, becoming more negative (from -0.088* to -0.257***), suggesting that environmental practices have a more robust and persistent association with the cost of capital than with accounting-based profitability measures.

Governance disappearance in the within-firm specification

The introduction of firm fixed effects produces the most important and interesting insight of the entire analysis. The Governance dimension, which was the dominant and most robust regressor in the cross-sectional specifications, becomes, instead, statistically insignificant across all four financial variables. The coefficient of the governance dimension on ROA drops from 0.510*** to 0.024, on ROE from 1.501*** to -0.226, on Tobin's Q from 0.186*** to 0.007, and on WACC from 0.364*** to -0.006. These within-firm coefficients are statistically not distinguishable from zero.

This trend is not a marginal attenuation but a complete collapse. The economic interpretation is precise and straightforward: firms with stronger governance systematically outperform their peers, but changes in governance within a given firm over time are not associated with measurable improvements in financial performance in the short and in the medium term. Governance quality is better understood as an organisational characteristic, which offers a way to distinguish firms from one another, rather than as a dynamic lever that can be used to produce firm return, when improved, in a near future.

This finding has direct implications for how the ESG-performance association should be read: the cross-sectional association between the Governance dimension and financial performance is real and robust, but it reflects structural differences between firms rather than a genuine dynamic effect of governance improvements. The robustness check with lagged ESG scores, in the Appendix, confirms this trend and consequently the following interpretation: Governance coefficients remain stable and highly significant in the cross-sectional specifications with lagged scores, while remaining insignificant in the within-firm specifications, ruling out that the cross-sectional results are driven by reverse causality.

ROE anomaly

ROE tables, among all the four specifications, deserve particular attention in general and especially in the within-firm specification. The within R-squared for ROE is particularly low (0.002), also compared with the others (0.102 for ROA, 0.138 for Tobin's Q, and 0.023 for WACC). The decrease of R in the within approach is quite normal and consequently expected, but it is worth highlighting this notably low value, because it is not a random anomaly but it reflects a structural feature of ROE as a financial metric.

As is well known, ROE is defined as net income over book equity, and its denominator is quite sensitive to capital structure changes that operated obviously independently of ESG performance, such as leverage changes, share buybacks and one-off write-downs. These dynamics can dominate the variation in ROE, within a given time frame, in a way that the ESG-related variation becomes undetectable. There is some empirical evidence of this aspect: the most direct one is the change in sign between the cross-sectional approach and the within-firm specification of the leverage dimension. Leverage is positive at +1.550 in column (3) and negative at -2.093 in column (4). A change in sign indicating

that the within-firm variation in ROE is driven primarily by capital structure changes rather than by the firm characteristics that leverage proxies for in the cross-section.

In this context, the R-squared for ROE is not a failure of the model but a reflection of the fact that year-to-year variation in ROE within a firm is dominated by financial aspects rather than by operational or sustainability factors. For these aspects, the within-firm results should be interpreted with this limitation in mind.

WACC-Governance anomaly

The Governance dimension produces a result on WACC that requires direct discussion.

In the cross-sectional specification, the coefficient is positive and significant, rising from +0.224*** in column (1) to +0.275*** in column (2) and +0.364*** in column (3) as controls and year fixed effects are added. It is documented that firms with higher Governance scores are associated with a higher cost of capital. A result that is completely in the opposite direction of the H1 prediction and of what the signalling mechanism identified in section 2.1 would anticipate.

Two characteristics of the results sharpen the interpretation before any theoretical reading is attempted. First, the coefficient, as noted above, strengthens as controls are added, ruling out that the anomaly is driven by the omission of controls, such as firm size or leverage. Second, the robustness check with one-period lagged scores confirms the positive patterns: the cross-sectional coefficient on WACC remains positive and highly significant at +0.296***, ruling out that the result is a contemporaneous artefact or driven by reverse causality. The anomaly is not incidental, it is structural.

The key to understand this mechanism lies in what a high Governance score actually signals in a voluntary disclosure regime. As discussed in Section 2.1.2, signalling theory predicts that ESG disclosure reduces information asymmetry and lowers the required return by transmitting a credible quality signal (Spence, 1973; Huang, 2022). But governance disclosure seems not to operate as a simple quality signal, but it carries two layers of information at the same time. In 2014-2018, a firm that voluntarily disclosed information regarding the governance dimension, such as board structure, executive compensation arrangements, fiduciary obligations, it is not only communicating quality: it is making its full institutional complexity visible to investors. As Jensen and Meckling (1976) establish, greater transparency around governance structures surfaces the agency relationships embedded in the firm. In a voluntary disclosure regime, investors cannot fully separate whether a high governance score reflects genuine value creation or the visibility of greater fiduciary and managerial constraints. ESG disclosure at the same time reduces information asymmetry and situates the firm within a multi-stakeholder environment. Two functions that, in a voluntary regime, investors cannot fully decompose. The result is clear: a higher required return, not despite the transparency, but partly because of what that transparency fully reveals.

An interpretation that becomes stronger and more than speculative thanks to the within-firm result (WACC collapses to -0.006 and becomes statistically indistinguishable from zero). If the positive WACC association were a genuine dynamic effect, it would

survive also in the within-firm specification. And it does not. The cross-sectional premium therefore belongs to the type of firm that high governance scores identify in the cross-section, not to governance improvement as a managerial action. This is precisely the organisational identity mechanism developed in Section 5.2.1: governance quality distinguishes structurally different firms, and it is that structural difference that investors are pricing on WACC.

It should be noted, however, that this remains a plausible interpretation rather than a causally identified claim: the data are consistent with the proposed mechanism but do not allow a direct test of the investor pricing channel.

With this reading and the proposed interpretation, the anomaly does not invalidate the signalling theory, the signal conveys more information than the theory's baseline version models, and investors price that additional information accordingly. A result that is itself a finding.

Environmental and Social within-firm effects

The other two pillars, the Environmental and Social pillars, show intermediate behaviour in the within-firm approach. The Environmental maintains marginal significance on ROA and WACC, suggesting changes in environmental practices may have some measurable within-firm impact, even if modest. Social, following the same trend, retains significance on ROA and on WACC, indicating that improvements in social practices within a firm are associated with modest but detectable improvements in these outcomes. Both pillars lose significance on ROE and Tobin's Q in the within specification.

4.3.2 Sector Moderation

The sector moderation results reveal significant heterogeneity in the relationship across sectors. The environmental and governance pillars show the most economically meaningful patterns.

Environmental pillar in high-impact sectors

The interaction `ExHighImpactEnv` is negative and significant across all the financial variables, with a coefficient of -0.337^{***} on ROA, -0.812^{***} on ROE, -0.082^{***} on Tobin's Q, and -0.219^{***} on WACC in column (3). These coefficients represent the additional and negative effect of environmental performance in high-impact sectors compared to low-impact sectors. The Wald tests confirm that the total marginal effect of Environmental performance in high-impact sectors is negative and significant for ROA, ROE and Tobin's Q. This suggests that firms in environmentally exposed sector show worse profitability and valuation outcomes as environmental scores increase, rather than benefiting from stronger environmental practices.

WACC represents the only exception to this pattern. Although the interaction is negative on WACC (meaning a lower cost of capital), the Wald test combining the low-impact effect and the interaction yields a total marginal effect of -0.423^{***} , which is negative

and highly significant. This indicates that in high-impact environmental sectors, stronger environmental performance is associated with an even lower cost of capital than in low-impact sectors. It means that investors seem to reward environmental practices in these sectors with a lower risk premium, even when the same practices are associated with worse accounting and market-based performance outcomes. This divergence is interesting and suggests that environmental investments in high-impact sectors may be perceived as a risk-reducing channel, even if their short- and medium-term impact on operating performance is negative.

An interesting aspect is that the pattern is stable with industry fixed effects in column (4), an aspect that strengthens the interpretation considerably. Industry fixed effects absorb all time-invariant average differences across sectors, meaning that the moderation effect is identified not from the comparison between different industries but from variation between firms operating within the same industry. Firms in the same high-impact sector but with different environmental scores show the same pattern as the cross-industry comparison, confirming that the result reflects genuine heterogeneity in how individual firms manage environmental risks within their sector, rather than compositional differences between sectors.

Governance pillar: an asymmetric pattern

The governance dimension shows an asymmetric pattern across outcomes that is economically interesting. The interaction $G \times \text{HighImpactGov}$ is negative and significant for ROA at -0.583^{***} , for ROE at -2.325^{***} , and for Tobin's Q at -0.144^{***} . This indicates that the positive effect of Governance is weaker in high-impact sectors such as Financials, Utilities, and Healthcare. For the WACC the interaction is positive and significant. This means that in high-impact governance sectors, stronger governance is associated with a higher cost of capital rather than a lower one, contrary to the pattern observed for profitability and valuation measures. This asymmetry persists across all specifications including column (4) with industry fixed effects. A possible interpretation of this asymmetric pattern on WACC is developed in Section 5.2.3, in the context of the broader substitution hypothesis.

Social pillar: limited sectoral heterogeneity

Looking at the Social pillar, it shows limited evidence of sectoral moderation. The interaction $S \times \text{HighImpactSocial}$ is largely insignificant across outcome variables and specifications, with the partial exception of ROE where a positive coefficient of 0.528^* emerges in column (3) but loses significance with industry fixed effects in column (4). The Wald tests confirm that the total marginal effect of Social performance in high-impact social sectors is not statistically distinguishable from the low-impact effect in most specifications.

4.3.3 Market Moderation

The market moderation tables reveal a consistent asymmetry between the Environmental pillar and the Governance and Social ones. It is clear how the regulatory environment plays opposite moderating roles depending on the pillar that is considered.

Environmental pillar: regulatory complementarity

The interaction $ExHighReg$ is positive and significant across all the variables, with a coefficient of 0.523*** on ROA, 1.247*** on ROE, 0.188*** on Tobin's Q, and 0.275** on WACC in column (3). The calculated Wald tests confirm that the total marginal effect of Environmental performance in high regulatory intensity markets is positive and significant for ROA and ROE. This indicates that the negative effect in low regulatory countries of Environmental performance is not only mitigated but reversed in highly regulated environments. Firms with stronger environmental practices in markets with stricter regulatory frameworks are associated with better financial outcomes than their counterparts in low regulatory intensity markets.

Social and Governance pillars: regulatory substitution

The Social and Governance pillars show the opposite pattern. The interaction $SxHighReg$ is negative and significant for ROA at -0.621***, for ROE at -1.731***, and for Tobin's Q at -0.151***, while remaining insignificant for WACC. The Wald tests confirm that the total marginal effect of Social performance in high regulatory intensity markets is not statistically significant for ROA and Tobin's Q, indicating that the positive baseline effect of Social performance is fully offset in highly regulated environments. The interaction $GxHighReg$ is similarly negative and significant for ROA at -0.527***, for Tobin's Q at -0.160***, and for WACC at -0.346***, while remaining insignificant for ROE. The Wald tests confirm that the total marginal effect of Governance in high regulatory intensity markets is not statistically significant for ROA and Tobin's Q, suggesting that the financial premium associated with strong governance is substantially reduced in markets where regulatory oversight already enforces minimum governance standards.

Stability across specifications

All three interaction patterns are stable once the industry fixed effects are added in column (4), and the robustness check with lagged ESG scores, reported in the Appendix and explained more in detail in the next section, confirms that the main findings are not driven by reverse causality.

4.4 Robustness Check

To assess the robustness and the sensitivity of the main results to reverse causality, the full specification, meaning with controls and year fixed effects for the cross-section approach (corresponding to column (3) of the main tables) and with the addition of firm fixed effects for the within-firm approach (corresponding to column (4)), are re-estimated with

lagged ESG scores. This means that contemporaneous ESG scores were replaced with one-period lagged values, ensuring that financial outcomes in year t are associated not with ESG score measured at period t , but at $t-1$. This reduces the risk that firms that are financially successful invest more in ESG practices. An element that could bias the observed associations shown in the main tables.

However, the approach addresses some concerns, but it does not fully address endogeneity, and the results should be interpreted as associative rather than causal.

The lagged specifications for each financial variable are reported in full in the Appendix.

The following paragraphs focus on the key patterns that emerge and the differences relative to the main results.

Baseline model

The key element to be highlighted is that in the cross-sectional lagged specification, the results are remarkably stable compared to column (3) of the main results.

The Governance pillar remains positive and also highly significant across all the financial variables, with coefficients of 0.500*** on ROA, 1.506*** on ROE, 0.163*** on Tobin's Q, and 0.296*** on WACC. The slight reduction in magnitude is minimal and does not alter the interpretation of the main results. The Social pillar maintains its significance on ROA at 0.454*** and on Tobin's Q at 0.093***. The Environmental dimension, instead, loses significance on ROA, moving from -0.151*** in the main tables to -0.068, while retaining significance on WACC at -0.169***. This attenuation on ROA suggests that the non-lagged negative association partly reflects a same-year relationship rather than a predictive one. Instead the cost of capital effect is more robust to the temporal shift.

Looking at the within-firm lagged specification, all ESG coefficients lose their statistical significance in all the financial variables, aligned and consistent with all the main within-firm results. This undoubtedly reinforces the interpretation that the ESG-performance association is primarily structural and cross-sectional rather than dynamic and causal.

Sector moderation model

In the cross-sectional lagged specification, the key patterns are confirmed: the interaction *ExHighImpactEnv* remains negative and significant across all the financial variables, *GxHighImpactGov* remains negative and significant for ROA, ROE and Tobin's Q. The asymmetric positive pattern on WACC is confirmed, once again, with the lag, confirming the interpretation that this result reflects a genuine structural feature rather than a contemporaneous artefact. Different is the interaction for the Social pillar that is largely insignificant across outcomes, with the partial exception of the Wald test on ROA which shows a positive marginal effect of 0.449*** in high-impact social sectors, a result that was not significant in the main specification.

In the within-firm lagged approach, all ESG coefficients and interactions lose significance. Results that are consistent with the main within-firm results and the identification constraints.

Market moderation model

Once again, in the robustness results, the main patterns from column (3) are confirmed. The interaction `ExHighReg` remains positive and significant across all outcome variables. The interaction `SxHighReg` remains negative and significant for ROA and ROE. The interaction `GxHighReg` remains negative and significant for ROA and Tobin's Q, while losing significance on WACC relative to the main results. A notable difference emerges for ROE, where the Wald test yields a positive and significant marginal effect of Governance in high regulatory markets at 1.278**, a pattern that was not visible in the main specification and that suggests that the governance premium in highly regulated markets may operate with a delay on equity returns.

In the within-firm lagged specification, the coefficient and the interactions lose significance.

Overall view

Taking all the results together, the lagged specifications provide strong support to the main cross-sectional results in terms of robustness. Indeed, the key findings seem to survive the temporal shift introduced by the lagged scores.

Instead, the within-firm results do not survive the lag in any model, confirming that the ESG-performance association is predominantly structural and cross-sectional in nature.

The robustness check therefore supports interpreting the main results as genuine and persistent associations between ESG pillar performance and financial outcomes, while reinforcing the caution against causal interpretation discussed throughout the analysis.

4.4.1 R&D intensity control

As a further robustness check, R&D intensity, defined as R&D expenditures divided by total assets, is added as an additional control. The control is introduced to the cross-sectional specification with controls and year fixed effects, corresponding to column (3) in the main results. This additional robustness check aims to assess whether the observed ESG-financial performance associations are partly driven by omitted characteristics linked to innovation.

The composition of the sample is the first relevant preliminary consideration that should be taken into account. The inclusion of this variable reduces, indeed, the sample from approximately 8500 to around 4500 observations. This is because a large share of firms do not report R&D expenditures. This selection introduces a bias toward more transparent, and innovation-active firms. Consequently, the results of this specification

should be interpreted with this element in mind.

The R&D intensity coefficient is positive and significant on ROA (0.131***), Tobin's Q (0.122***), and WACC (0.035***), and not consistent on ROE. Some sensitivity in significance levels is also observed, in particular for the Social pillar on Tobin's Q and the Environmental pillar on ROA, while the Governance pillar retains strong significance across all financial variables and specifications.

Looking at the ESG scores, the signs are preserved across all the three models and across all the financial variables, with, however, two attenuations that are worth highlighting. Starting from the Governance pillar, the coefficient on ROA declines from 0.510*** in the main results to 0.258***, while the Social pillar on Tobin's Q loses its significance completely.

Overall, the ESG-financial performance associations present and documented in the main results are not fully explained by innovation-related characteristics, although the moderate attenuation of the Governance and Social pillars suggests that part of these premia may operate through innovation-related channels.

The inclusion of R&D intensity also affects the explanatory power of the models. In particular, the R-square decreases for accounting-based measures and WACC compared to the baseline specification, while it increases for Tobin's Q. This pattern is consistent with differences in sample composition. The R&D subsample is more selective and may exhibit greater heterogeneity not fully captured by control variables, reducing the overall explanatory power in accounting-based regressions. At the same time, R&D represents a key determinant of market valuation, as innovation is directly priced by investors, which explains the improved model fit in Tobin's Q specifications. So the variation in R-square cannot be interpreted as a deterioration of the models, but rather a reflection of the different information inside the R&D variable across financial measures.

However, the considerable reduction of the sample limits the ability to come to stronger conclusions on this point.

4.4.2 Alternative outlier treatment: winsorisation

Finally, as an additional robustness check, the baseline specifications were re-estimated using winsorisation at the 1st and 99th percentile thresholds as an alternative to trimming. Coefficients maintain their sign and qualitative interpretation across all outcome variables and both cross-sectional and within-firm specifications. In particular, the Governance collapse in firm fixed effects models is fully confirmed, with the Governance pillar remaining statistically insignificant across all four financial outcomes, reinforcing the structural interpretation discussed in Section 4.3.1.

Chapter 5

Discussion of the Results

This chapter interprets the empirical findings presented in the preceding chapters in light of the existing literature and theoretical frameworks, presented in Chapter 2.

The focus on the pre-mandatory disclosure environment (2014-2018) allows us to isolate the intrinsic value-creation mechanisms of ESG, separating them from regulatory compliance effects that, instead, characterised more recent periods.

The three hypotheses tested in this thesis are not evaluated as binary outcomes. The empirical evidence neither simply confirms nor rejects them: it confirms each at one level of analysis and qualifies it at another. The table presented above helps to map each hypothesis to its core finding and the qualification the data impose on the original formulation. The theoretical interpretation of these patterns is developed more specifically and in more depth in Sections 5.2.1 through 5.2.4.

Hypothesis	Original prediction	What the data show	Critical qualification
H1 - ESG pillars positively associated with ROA, ROE, Tobin's Q; negatively with WACC	Broad confirmation in cross-sectional specifications, particularly for Governance and Social. Environmental deviates on accounting metrics but aligns on WACC (-0.257^{***}). One exception: Governance shows a positive association with WACC ($+0.364^{***}$), contrary to H1's prediction	Within-firm (FE) effects substantially weaker across all pillars and outcomes, suggesting value-creation mechanisms operate over horizons that annual within-firm variation cannot fully detect	Confirmed with qualification
H2 - Pillar heterogeneity, with Governance most robust and Environmental weakest or most context-dependent	Governance dominant in cross-section (ROA coefficient rising from 0.301^{***} to 0.510^{***} as controls are added); Environmental not weak but structurally different	Governance collapses entirely under firm fixed effects (ROA: $0.510^{***} \rightarrow 0.024$, n.s.), while Environmental retains marginal within-firm significance on WACC. The pillar predicted most robust is dynamically inert; the one predicted weakest reveals the most complex pattern	Confirmed and substantially extended
H3 - ESG-performance relationship stronger in high-exposure sectors and high-regulatory markets	Confirmed: sector and regulatory intensity both moderate the relationship significantly across specifications and outcomes	Asymmetric in a way the original formulation did not anticipate. Governance and Social follow a substitution logic ($G \times \text{HighReg} = -0.527^{***}$ on ROA); Environmental follows a complementary logic ($E \times \text{HighReg} = +0.523^{***}$ on ROA), amplified rather than substituted by regulatory intensity	Confirmed with unanticipated asymmetry

Table 5.1. Hypothesis outcome summary

5.1 Comparison with Existing Literature

The empirical findings provide a set of results that not only confirm the existing literature, but also offer new evidence on how the ESG-financial performance relationship operates when ESG adoption is largely voluntary. There are mainly three dimensions of comparison that deserve attention: the direction and the magnitude of the associations, the pillar heterogeneity, the distinctive implications of the voluntary setting.

5.1.1 Direction and magnitude of effects

The meta-analyses have established a predominantly positive ESG-CFP relationship across thousands of studies (Friede, Busch and Bassen, 2015; Orlitzky, Schmidt and Rynes, 2003). A persistent open question, however, is whether this relationship reflects genuine value creation or is at least partly an artefact of the regulatory environments in which most of these studies were conducted. The present findings speak directly to this question.

The observed positive cross-sectional associations cannot be attributed to regulatory compliance mechanisms, since mandatory disclosure requirements were not yet in place during the sample period. This suggests that ESG practices were already generating some economic value through intrinsic mechanisms. In other words, the results support the view that ESG performance is not detrimental, even in a pre-mandatory disclosure phase, to firm value and that it is mainly positively associated with financial performance. This is not a trivial finding: it implies that the positive associations documented in post-2018 studies are not purely a regulatory artefact, but are rooted in genuine value-creation mechanisms. This suggests a reframing of how the existing meta-analytic consensus should be interpreted.

Looking more specifically at the results, the magnitude of the effects seems to be moderate rather than large. An element consistent with previous studies suggesting that ESG benefits tend to materialize gradually and may not be fully captured by short-term financial indicators. The moderation in magnitude, however, should not lead to the conclusion and evidence of weak effects: it is exactly what one would expect if ESG value creation operates through channels, such as governance quality, stakeholder trust, risk reduction, that are by definition slow-moving rather than short-term operational improvements.

What the table reveals, taken as a whole, is that the three hypotheses operate at different levels of analysis. H1 is a claim about direction, broadly right, but requiring the cross-section/within-firm distinction to be read correctly. H2 is a claim about hierarchy, partially validated, but the data reframe what "robust" and "weak" mean for each pillar. H3 is a claim about moderation, confirmed, but with an internal asymmetry between Environmental and the other two pillars that the original formulation treated as symmetric. Each qualification points toward a finding that is more theoretically precise than the hypothesis it qualifies, and that is, in itself, a result.

5.1.2 Pillar heterogeneity and the critique of composite scores

The critique of aggregate ESG scores is well established in the literature and the present thesis provides direct and empirical support to the idea that if ESG is treated as a single construct, it may obscure important and meaningful differences across its three dimensions.

In the present thesis, the heterogeneity is not marginal: the environmental pillar

shows a negative association with accounting-based metrics as well as a persistent negative association with WACC, leading to a more negative cost; the Governance dimension dominates the cross-sectional results but collapses in within firms; Social pillar shows an intermediate and more dynamic effects. These are not only variations in magnitude of the coefficients, but genuinely different patterns that an aggregate score would entirely hide.

Starting from the Governance dimension, it emerges as the most consistent pillar, element that is corroborated by a consistent corporate governance literature, while the other two dimensions seem to exhibit more variable and context-dependent effects.

The strongest and consistent role of governance in leading the relationship can be interpreted as the combined effect of multiple mechanisms. On one hand, the governance dimension directly influences decision-making quality, risk management, but on the other hand, in a voluntary environment, this dimension acts as a credible signal to investors, reducing information asymmetry and enhancing firm valuation.

The environmental pillar and its results suggest a more complex value-creation mechanism. Investments on this dimension are often characterised by longer time horizons, higher costs that are upfront. All elements that make credible the assumption that the benefit may not be immediately reflected in accounting or market-based metrics.

The Social pillar has an intermediate position, but with effects that are overall positive. A result that is aligned with all the studies, such as Choi, Kwak and Choe (2010), that attribute the performance of this dimension to trust mechanisms that operates through employee relations and stakeholder engagement.

All these findings lead to a direct and consequential implication: composite ESG scores are structurally misleading. The unified scores aggregate dimensions that operate through different mechanisms, at different speeds, and with different signs across financial outcomes.

5.1.3 Pre-mandatory disclosure window

From the beginning, it was clear that the most distinctive contribution of this thesis is its temporal positioning. The reason is that the majority of the works and papers focus on periods that overlap with or follow the introduction of mandatory ESG disclosure requirements, making it difficult to separate intrinsic value creation from compliance-driven effects. The present thesis, focusing only on 2014-2018, offers a cleaner test of whether ESG performance generates financial benefits that are independent from the regulatory pressure.

The present analysis captures a phase in which ESG adoption was largely voluntary, even though with an important and increasing level of awareness of sustainability issues

following events such as the Paris Agreement and the introduction of Sustainable Development Goals.

The positive ESG-financial performance finding in a pre-mandatory disclosure context, in particular for Governance and Social pillar, provides support for the intrinsic value-creation hypothesis. If the tested relationship were purely a regulatory artefact, one would expect a clear result: a weak or absent association in this period. Instead, the evidence points to an opposite direction. The robustness to the addition of controls, fixed effects and lagged scores make an even stronger suggestion: ESG-performance association observed in more recent studies is not simply a product of regulatory mandates, but reflects a genuine structural relationship between sustainability practices and firm quality.

This finding has a direct implication for the broader ESG literature: it suggests that at least part of the positive association already documented in post-2018 studies would have existed regardless of the regulatory pressure. Regulation may have amplified or standardised these effects, but it did not create them. This strengthens the credibility of the literature, documenting positive ESG effects in post-regulatory environments. It suggests that at least part of those effects reflects real value creation rather than mere compliance-based signalling. At the same time, the within-approach results suggest that the causal channels through which ESG creates value may operate more slowly or indirectly. A limitation that just a within-firm estimates can detect and that the existing literature has only partially highlighted.

5.2 Theoretical Implications

The aim of this section is not simply to give a confirmation or a disconfirmation of the theoretical frameworks presented in Chapter 2, but to try to illuminate the conditions under which each framework is operative, reveal mechanisms through which ESG affects financial performance and produce insights that go beyond the single theory.

5.2.1 Governance as organisational identity

The central role of Governance pillar emerging from the empirical analysis suggests that governance should not be interpreted merely as one component of ESG, but a fundamental and foundational element that shapes the firm's organisational identity.

Indeed, the most theoretically interesting and consequential finding of this study is represented by this pillar, and in particular its strong cross-sectional explanatory power and the complete disappearance of its coefficients in the within firm specification.

However, the finding does not lead to the "easy interpretation" that simply the governance dimension does not matter for financial performance. The results from the cross-sectional approach are too large and too robust for a conclusion of this type. It is, instead,

necessary to develop a deeper understanding of the whole mechanism.

A possible and theoretically richer interpretation is that governance quality functions as an organisational identity, meaning a structural characteristic that distinguishes high-performing firms from low-performing ones in a persistent, path-dependent manner. It is not a dynamic lever that management can adjust to produce near-term financial improvements.

Three theoretical frameworks converge on this interpretation, each adding an interesting and distinct layer.

Starting from the stakeholder theory, this result and finding suggests that elements like trust and relational capital generated by good governance are accumulated over time through constant and repeated interactions with employees, investors, suppliers, and cannot be simply created or destroyed within a single annual reporting cycle.

From the resource-based view, the governance dimension, with board quality and transparency, can be categorized and interpreted as among the most strategically valuable resources identified by Barney (1991), given its characteristics of tacitness, path dependence, and social complexity. All elements that make the Governance pillar difficult to imitate and impossible to build quickly.

A further layer comes from the signalling theory. As shown by Spence (1973), signals that are costly offer a possible way to separate the firms from low-quality ones. If governance quality is a deep structural characteristic accumulated over years, then a firm's governance score is not merely a signal of current practices, but it is a cumulative signal of organisational identity. And the pre-mandatory disclosure context amplifies this signal value: when all is voluntary as it was in the 2014-2018 interval, only firms that have genuinely high governance quality are keen to bear the cost of high scores. This makes the signal more separating than in a mandatory disclosure regime.

Putting all these aspects together, these three frameworks point to the same conclusion, but from different angles: the cross-sectional premium and the within-firm collapse are not contradictory findings, they are two sides of the same mechanism. The implication is one that the existing papers only partially reveal: the Governance pillar should not be interpreted as a time-varying performance lever, but as a structural predictor of firm quality.

Many papers test the within-firm specification not as a part of the main contribution, but as a robustness check and interpret the attenuation of coefficients as a sign of endogeneity bias. The different approach of this thesis leads to a different conclusion: the decrease of magnitude and significance of the coefficients in the within-firm specification is not a statistical artefact, but it reveals a real mechanism through which governance creates value. Both the cross-sectional and the within-firm associations are real and true simultaneously, showing that the mechanism is structural and not dynamic.

Governance should be seen as a means through which to predict which firms will outperform and, interestingly, not when they will do so.

5.2.2 Environmental performance: dual channel mechanisms

The environmental pillar produces the most empirically complex and theoretically demanding pattern of the present thesis. The results, instead of a clean positive or negative association, reveal a systematic divergence across outcomes that resists a single-channel explanation and points toward two partially offsetting mechanisms, that operate at different speeds.

The starting point of this section is the anomaly itself. As highlighted previously, in the cross-sectional specifications, there is a negative association with accounting-based profitability metrics, ROA and ROE. The association loses significance on ROA when one-period lag is introduced. But, at the same time, the pillar shows and maintains a negative and significant association with WACC across all the cross-sectional specifications and even after the inclusion of lagged ESG scores. The divergence between a fragile accounting channel and a more persistent cost-of-capital is the empirical fact that, undoubtedly, requires attention and interpretation.

Starting from a natural reading of the observed pattern, the pillar seems to operate through two distinct and partially offsetting mechanisms. The first one is the operational cost channel. In the 2014-2018 period, achieving a high score in the environmental pillar required to internalise real costs, such as emissions reduction programmes, resource efficiency upgrades, supply chain sustainability assessments. All costs that have an impact on near-term accounting returns. Indeed, the negative association with ROA seems to be consistent with this interpretation. But, the attenuation to non-significance when the one-year lag is introduced suggests a more short-lived effect that does not compound over time. It reflects a contemporaneous drag rather than a persistent depression of profitability. An aspect that is particularly important and that offers an important qualification: the data are consistent with the view of transition cost, rather than a structural destruction of value and consequently they do not allow a stronger causal claim.

Risk-reduction is the second mechanism, as suggested by the negative association between the environmental scores and the WACC that is robust across all specification, surviving both the one-year lag environmental scores and to the within-firm approach.

A pattern that seems to be consistent with both signalling theory and legitimacy theory: the environmental investment and disclosure reduces the information asymmetry and signals an alignment of the firms with the rising expectations of the society. This leads investors to apply a lower risk premium to those firms.

This interpretation should be read, however, cautiously and it is necessary to be explicit about what this dual-channel interpretation is and what it is not. It is an interpretation that is a coherent reading of the empirical asymmetry, but it is not a fully demonstrated causal story. The data do not allow us to trace the mechanism directly. What is clear from the results is that the accounting and the market channels respond and react to environmental investment with different timescales and through different

audiences. Firm-level cost structures in the short run, and investor risk pricing in a more persistent, structural way.

Taken together, the two channels offer a coherent reading of the empirical pattern. The key theoretical implication is a support and a reframing of the Porter hypothesis (1995), that argued that environmental investment, if strategically managed, can generate innovation benefits that offset compliance costs. This offset may operate not through accounting channel in the short-term, but through the capital market channel. Investors price capability in environmental sphere as a form of risk management. This is a more nuanced version of the Porter hypothesis than the more traditional one: the benefit of environmental investment does not necessarily come from higher profits, but from a lower discount rate applied to those profits.

The predicted divergence between accounting and market-based outcomes, that are exactly what data show, should be taken seriously as a finding in its own right and not as a measurement noise.

5.2.3 Regulatory intensity: substitution hypothesis

Looking at the market moderation models, the results offer a pattern that is, from a theoretical stand-point, unexpected and that consequently deserves careful interpretation rather than an immediate generalisation.

The environmental pillar presents what could be considered an "expected" pattern: Environmental performance generates higher financial returns in high regulatory intensity markets. In contrast, the other two pillars, the Governance and the Social dimensions, show exactly the opposite pattern: financial associations are weaker and less pronounced in high-regulatory intensity markets.

The asymmetry can be read through a substitution hypothesis, meaning that regulation and voluntary ESG performance create, in a way, overlapping functions in creating stakeholder value, such that voluntary ESG generates higher marginal returns in contexts where regulation does not already provide baseline assurances. So, the marginal value of voluntary ESG activities is not constant, but depends on the institutional environment in which each firm operates.

To clarify this concept, it is necessary to look at the relationship with the lens of stakeholder theory. As is well known, the value of strong social and governance performance comes from building strong relationships and trust with employees, customers, investors, and communities. In markets with strong regulatory intensity, so where minimum standards of employee protection, transparency and disclosure quality are already set, voluntary action in the two dimensions above the regulatory floor generates a smaller incremental signal, as stakeholders can already rely on a baseline level of institutional assurance.

Instead, in low-regulatory markets, the same level of performance carries a larger signal premium, helping reduce uncertainty and differentiate firms more clearly.

A related pattern emerges from the sector moderation model, where governance is

associated with a higher cost of capital in high-impact governance sectors. A possible reading is that in these sectors, where regulatory oversight is already intense and governance complexity is structural, investors may price high governance scores not only as a quality signal but also as a proxy for compliance burden and fiduciary constraints. The same characteristic that reduces financing costs in simpler contexts may carry a different meaning where governance obligations are already demanding by default.

The environmental pillar, however, seems to follow a partially different dynamic. Differently from the other two pillars, rather than fully substituted by regulation, environmental performance maintains, and in some cases, increases its relevance in more regulated countries. This element suggests that the regulation does not delete the informational or economic value of environmental performance, but may increase its importance for investors and stakeholders. In such contexts, the firms with higher environmental scores may be in a better position to better differentiate themselves, with a superior risk management or with a closer approach to the evolving expectations.

A possible explanation is that environmental issues are more forward-looking, risk-oriented and more subject to evolving standards compared to the other two dimensions. Even in highly regulated environments, compliance may represent only a minimum threshold, while superior environmental performance signals advanced capabilities in risk management, innovation, and strategic adaptation. This interpretation leads to the idea that firms with higher environmental scores may be perceived as better positioned to navigate future regulatory tightening, technological transitions, and climate-related risks.

The proposed interpretation is consistent with the legitimacy theory, but extends it in an important way. Differently from the traditional view that firms benefit from aligning with societal expectations, the present findings indicate that the value of legitimacy is context-dependent and varies across ESG dimensions. In high-regulatory countries, achieving legitimacy in governance and social dimensions may be more standardised, while for the environmental pillar remains more dynamic and differentiating, allowing firms to stand out even when regulatory frameworks are well developed.

To sum up, the findings suggest that the interaction between ESG performance and regulatory environments is not uniform across dimensions. The substitution effect appears to operate primarily for governance and social dimensions, while for the environmental pillar the relationship appears to be more complementary with regulation, leading to a direct implication for ESG investors. Investors who apply the same ESG weighting strategy across all markets may be systematically misallocating: overweighting Governance and Social in high-regulatory markets where their marginal signal value is lower, and underweighting Environmental in those same markets where its complementarity with regulation amplifies returns.

5.2.4 A unified theoretical synthesis

Taken together, the three theoretical implications presented above lead toward a synthesis that no single framework could have generated on its own, and that the existing

literature has only partially highlighted: ESG scores do not operate through a single mechanism, but it is a collection of various organisational capabilities, each operating through different channels, sensitive to different moderators and that generate different types of financial value with different time horizons and audiences.

This observation does not want to be simply a call for a pillar disaggregation, a point already highlighted by different papers, with different degrees of emphasis, recently. It wants to be a stronger claim: the frameworks presented in the second chapter are not competing explanations for the same phenomenon, but complementary explanations to different phenomena that happen under the same ESG label. The choice of treating these frameworks as rivals produces the appearance of theoretical inconsistency. But the reality is quite different: the apparent inconsistency is in fact a complementarity.

The Governance pillar seems to be best explained by the combination of resource-based view and stakeholder view.

The RBV theory well explains the cross-sectional premium: governance quality is path-dependent, socially complex, and difficult to imitate, which is why firms with stronger governance systematically outperform their peers. Instead, the Stakeholder theory offers an explanation of why this premium does not respond to within-firm variation over time: the relational capability generated by good governance performance is accumulated with repeated interactions with employees, investors and suppliers over years. Simply all these interactions cannot be destroyed or created within a single reporting cycle. Signalling theory offers another interesting layer: when the disclosure is not mandatory, the governance scores are a cumulative signal of the firm's identity rather than a snapshot of current practices. A signal that is more precise because not yet diluted by mandatory disclosure requirements.

The environmental pillar, by contrast, can be explained with the sum of multiple frameworks, but with some residual. The negative association with accounting metrics and the simultaneously negative association with the WACC, meaning a lower cost of capital, are not contradictory findings: they are two distinct mechanisms that operate through different channels and different audiences. The first, the operational cost channel, is consistent with agency theory and partially supported by the attenuation of the ROA coefficient when lagged scores are introduced, affects operating margins in the near term. The second instead, the risk reduction channel, consistent with signalling and legitimacy theories, affects how the investors and consequently the capital markets price environmental risk in the long run. An integrating logic is provided by the Porter Hypothesis: the benefit of environmental investment does not necessarily materialise through higher accounting profits, but through a lower discount rate applied to those profits. A hypothesis that offers a more nuanced version of the standard version tested in the literature.

The Social pillar occupies an intermediate position: more dynamic than the governance dimension, since the marginal within-firm significance in some specifications. But at the same time with mechanisms that are less complex to be read and interpreted than

the environmental dimension, since it mainly operates through stakeholder trust mechanisms. Channels that respond in a faster way to managerial action and with effects that are more likely to appear within standard reporting cycles, but without generating the same and deep structural premium associated with the governance dimension. So this is the pillar that is most consistent with the instrumental version of stakeholder theory proposed by Jones (1995), and the one whose financial relevance is most sensitive to the institutional context in which a firm operates.

Taken together, these perspectives converge toward a unified interpretation: ESG creates value through a combination of internal efficiency improvements, external signalling effects, and strategic resource development. In other words, the financial value of ESG performance is not intrinsic, but institutionally and dimensionally contingent in a theoretically predictable way. And the market moderation model highlights this aspect through the substitution hypothesis: voluntary ESG generates higher marginal financial returns in contexts where regulation does not already provide baseline assurances to stakeholders, and this substitution effect operates asymmetrically across pillars.

An asymmetry that has important theoretical consequences and that may partially reframe the debate about whether the ESG creates or destroys value: the question is not whether ESG creates or destroys value, but rather through which mechanism, over which time horizon, and in which institutional context each dimension creates value. The answer is not universal, but neither random: it is context-dependant in a structured and predictable way.

5.3 Practical Implications

All the above considerations can be translated into concrete implications for the three key audiences, whose decisions may be shaped, directly or indirectly, by the ESG-financial performance relationship: corporate managers, institutional investors and policymakers. Practical implications that, it is worth highlighting once again, are collected from a temporal context that is different from the present one, especially considering the fundamental transformation, most notably through the introduction of the SFDR, the CSRD, and the EU Taxonomy in Europe. All elements that substantially altered the incentive of managers, investors and policymakers.

So the below consideration should not be read as prescriptions, but as evidence-based insights of the underlying mechanisms through which the ESG performance creates value. Mechanisms that remain relevant even in the present regulatory context.

5.3.1 For managers

The most important implication for managers is a reframing of how ESG investments should be evaluated. The evidence of the pre-mandatory disclosure period makes clear suggestions: benchmarking ESG improvements against short-term financial KPIs, next year's ROA, Tobin's Q, or similar metrics, is structurally inadequate for the Governance pillar. The Governance pillar accumulates over years and the benefits, such as better

access to capital, stronger stakeholder relationships, and lower operational risk, are not visible in year-to-year variations within the same firm. Managers who expect short-term returns are likely to underestimate the most durable source of ESG-related value.

A practical consequence follows: firms should resist the pressure of demonstrating ESG ROI on annual cycle for the governance dimension. The within-firm results make clear that governance improvements do not translate into measurable financial gains within few years.

For the environmental pillar, the dual channel mechanism has practical implications still today. Indeed, the cost of environmental performance is real, particularly as standards tighten. At the same time, the cost-of-capital benefit operates with a different timescale and through a different audience, capital markets and not operating margins. It is necessary that managers evaluate investments in this dimension through two lenses: short-term impact on profitability and longer-term impact on financing conditions. In sectors with high environmental exposure the data suggest that strong environmental performance is associated with a lower cost of capital even when it reduces short-term profitability. A trade-off that should be made explicit in investment decisions.

For Social dimension, the positive effect on ROA and Tobin's Q suggest that this pillar generates value through mechanisms that are more immediate and faster responsive to managerial action than governance. The pillar and its characteristics represent levers that can be adjusted and with effects that are more likely to appear within standard reporting cycles with respect to governance and environmental dimension that require longer-term commitment.

5.3.2 For investors

For institutional investors, the most actionable finding of this study is that Governance and Social scores carried significant information about structural firm quality that was not fully captured by standard financial metrics in the 2014-2018 period. The critical question for investors in 2026 is to understand how much this advantage still persists in a context where ESG disclosure has become largely mandatory.

The structural premium to governance quality is unlikely to have disappeared with regulation, since it reflects deep organisational characteristics that are difficult to build quickly. Regulation can formalise and standardise governance disclosure, but it cannot replicate the relational capital and path-dependent capabilities that distinguish genuinely well-governed firms. This implies that governance scores, even in a mandatory disclosure regime, retain some information value that go beyond what financial metrics capture.

The within-firm dynamics carry important implications directly for portfolio construction. Since governance is structural rather than dynamic, it should not be treated as a momentum signal: investors should not expect that firms improving their governance score in a given year will outperform in the following one. The governance premium is cross-sectional, not time-series: it distinguishes high-quality firms from low-quality ones

persistently. It does not respond to short-term score changes. So the governance scores, practically, should be used to identify structurally superior firms rather than for timing decisions based on changes in score.

Looking at the environmental pillar, investors who look for environmental performance are accessing two types of financial value: an operational cost channel, less consistent and present mainly in the short term, and a risk reduction channel. The second one is particularly relevant for long-horizon investors and for those who invest in sectors with high environmental materiality: firms with higher scores in environmental performance in this sample faced systematically lower financing costs, a structural advantage in capital allocation. An element that may have strengthened the climate risk centrality in the financial analysis.

Also the substitution hypothesis has an implication for portfolio construction: ESG weighting strategies may need to be calibrated to the regulatory context of each market.

5.3.3 For policymakers

Some of the most interesting implications are, undoubtedly, for policymakers. The finding that positive ESG-financial associations existed before mandatory disclosure requirements carry a clear policy implication: the value-creation mechanisms identified in this study are not a product of regulation. Insights that are precious especially from the rising policy debate, in which some observers have questioned whether the ESG-performance relationship documented in post-2018 studies is a genuine signal or a regulatory artefact. The evidence suggested in the present thesis suggest it both: the underlying mechanisms are genuine, but regulation shapes which dimensions generate the largest premiums and for which firms.

The evidence that ESG-financial associations existed in the voluntary context of 2014-2018 continues to provide empirical support for the broader regulatory agenda. The concern that mandatory disclosure might convert what started as a genuine signal into a compliance exercise is partially addressed by the finding that the underlying value-creation mechanisms, such as stakeholder trust, risk reduction, governance quality, operate independently of regulatory pressure. Indeed, higher regulation can formalise and standardise all these mechanisms but without destroying the financial relevance.

The pillar-specific patterns identified in the thesis suggest that regulation may be most effective if targeted at dimensions where voluntary adoption is weakest. The environmental dimension showed the most context-dependent effects and the strongest complementarity with regulation. This makes a clear suggestion: regulatory pressure on environmental disclosure and performance may amplify, rather than crowd out, the financial incentives for voluntary environmental investment.

Chapter 6

Conclusions

6.1 Summary of Main Findings

This thesis opened with a precise analytical question: is the relationship between ESG performance and financial outcomes a genuine economic phenomenon or is it a product, at least in part, of the regulatory environment that progressively reshaped the ESG landscape since 2020? The answer to this question provided by this study is unambiguous, though layered. ESG performance also creates financial value in an almost entirely voluntary environment and it does so through mechanisms that are dimensionally specific, institutionally contingent and operating across different time horizons. It is not true that the regulatory wave that followed created these mechanisms. These mechanisms were already at work in a pre-mandatory disclosure phase.

This conclusion is based on a global sample of firms observed over the period 2014-2018, a sample period chosen exactly to precede the major mandatory disclosure waves that transformed ESG from a strategic choice to a legal obligation. A pre-mandatory disclosure framing that is not a constraint of the analysis, but a central contribution. Isolating this period offers the possibility of a cleaner test of whether the ESG value creation is intrinsic or compliance-driven and the results are clear: the evidence supports the former hypothesis.

H1 - ESG and financial performance - is broadly confirmed. ESG pillar scores are overall positively associated with firm financial performance and negatively associated with cost of capital, results that are consistent and robust to the inclusion of controls, year fixed effects, and lagged ESG scores. One partial exception deserves mention: the Governance pillar shows a positive rather than negative association with WACC, a result that runs counter to H1's prediction.

Overall the results support the view that ESG practices were already generating economic value through different channels such as stakeholder trust, governance quality and risk reduction, before regulation. This finding carries a direct implication for the literature: the positive associations documented in post-2018 papers and studies are not purely a regulatory artefact.

H2 - Pillar heterogeneity - is confirmed and substantially extended.

The three pillars seem to operate not as a component of a single construct, but as three distinct organisational capabilities. Each operates through different mechanisms, responding to different audiences and generating different types of financial value. The Governance pillar emerges as the most consistent and dominant dimension in the cross-sectional specifications, confirming the hypothesis. But the most interesting findings go beyond the H2 hypothesis: the complete collapse of its coefficients in the within-firm fixed effects specifications that reveals governance quality functions as an organisational identity. A path-dependent and structural characteristic that distinguishes persistently high-performing firms from their peers and that does not respond to within-firm variation over a short time horizon. An element that should not be read as a statistical inconvenience but as theoretically meaningful result, able to reframe the interpretation of the pillar in both research and practice.

The environmental dimension, instead, does not show an effect that is weak or absent, as expected, but it reveals a more complex and theoretically demanding pattern: a dual-channel mechanism, in particular the data suggest an operational cost, that depresses near-term accounting returns, and simultaneously a risk reduction channel, that reduces the cost of capital. The highlighted divergence is not noise, but a signal that offers a more nuanced version of the Porter hypothesis, the benefit of environmental investment may not materialise through higher profits, but through a lower discount rate applied to those profits.

The Social pillar occupies an intermediate position, with positive and dynamic effects consistent with the instrumental version of stakeholder theory.

H3 - contextual moderation - is confirmed, with an asymmetry that the initial hypothesis did not fully anticipate. The tested relationship is moderated by both sectoral exposure and regulatory intensity, but not symmetrically across dimensions. The market moderation models suggests and support the substitution hypothesis: the voluntary governance and social performances generate higher marginal financial returns in markets where regulation does not already provide baseline assurances, while there is a decreasing incremental signal value where institutional frameworks already guarantee minimum standards. The environmental pillar, instead, presents a complementary rather than substitutive relationship with regulation. The financial relevance of this pillar is maintained and in some specifications amplified in highly regulated markets, consistent with the view that environmental performance signals forward-looking risk management capabilities that remain differentiating even where compliance floors already exist. This finding is one of the most theoretically consequential findings of the thesis.

Looking at all the findings together, the results support the three hypotheses, but the thesis offers more than confirmation. It is possible to say that the debate about whether ESG creates or destroys value might not be totally on point. The right questions should be more precise: through which mechanism does each pillar create value? Over which time horizon? In which institutional context? And for which audience, operating margins

or capital markets? The answers this thesis provides are not universal. But they are structured, theoretically grounded, and empirically stable across specifications. That, in itself, is a result worth building on.

6.2 Limitations of the Study

There are some limitations that constrain the strength of the thesis's claims; making them explicit strengthens its credibility.

Firstly, the pre-mandatory disclosure framing that motivates the study also partially constrains it temporally. The window of five years, while analytically justified, is a relatively short panel especially for mechanisms that are themselves argued to operate on long time horizons. For the Governance pillar and its interpretation of value-generating variable through a path-dependent processes accumulated over years, the panel may be too short to fully detect within-firm improvements. This is not an incidental limitation: it is a structural trade-off that is embedded in the pre-mandatory disclosure window itself. While the interpretation of the collapse of the governance coefficients in the firm fixed effects specifications is given, a longer panel would allow a more direct test of that interpretation, permitting observation of whether within-firm governance improvements eventually translate into measurable financial gains over longer horizons.

The analysis is based exclusively on FTSE Russell ESG scores. But as extensively documented by Berg, Kolben and Rigobon (2022), the patterns identified here, especially the dual-channel environmental mechanism, may be sensitive to the rating agency and methodology employed. The results should be interpreted as properties of ESG performance as measured by FTSE Russell, not necessarily as universal features of these practices. A multi-provider replication would be required to assess the generalisability of the findings.

A structural limitation on the causal interpretation of the results concerns the identification strategy. The thesis does not employ an instrumental variable approach or a quasi-experimental design, such as a difference-in-differences strategy exploiting regulatory discontinuities or a regression discontinuity design. In the absence of such strategies, the estimated coefficients cannot be interpreted as causal effects, but as associative evidence.

To conclude, the use of lagged ESG scores and firm fixed effects represents the most credible available strategy within the present constraints, attenuating but not eliminating endogeneity concerns. In particular, the reverse causality channel, whereby firms with superior financial performance have greater resources to invest in ESG, cannot be fully ruled out, a limitation shared by the large majority of the empirical ESG literature but that remains a real one.

6.3 Directions for future research

The limitations outlined above give naturally some possible extensions to the present thesis.

The most direct and consequential one is a post-regulatory study, that gives space for a direct comparison of the 2014-2018 predominantly voluntary period with a post-2020 mandatory disclosure environment. What this thesis establishes is how the ESG-financial performance relationship was before the major regulatory wave, but a follow-up study could test how the tested relationships may have changed: whether the value-creation mechanisms identified here were amplified, standardised, or crowded out by the wave of mandatory disclosure. A comparison that would speak directly to one of the most contested questions in ESG policy debates: whether mandatory disclosure enhances or dilutes the value of these data.

A multi-provider study, repeating the same pillar-level analysis with the other major score providers, would confirm or, more generally, assess whether the key patterns identified here are robust to rating methodology or specific to the provider used. If the major findings are confirmed, the theoretical interpretation would be substantially strengthened. If they do not, that divergence would itself be an important finding, pointing toward the rating methodology as a first-order determinant of ESG research conclusions.

Finally, a study that replaces the binary High/Low market classification with a continuous measure of regulatory stringency would be valuable and allow for a more granular test of the substitution hypothesis. The binary variable employed would inevitably compress heterogeneity within each group. A continuous variable would allow testing whether the substitution effect intensifies smoothly as regulatory pressure increases, or whether it operates through threshold dynamics, a distinction that would bring meaningful implications for both theory and ESG policy design.

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Chapter 7

Appendix A: Stepwise Models

7.1 Baseline models

Table 7.1. ROA Regression Results - Stepwise Models

	Baseline	Controls	Year FE
Intercept	4.801*** (0.041)	4.959*** (0.038)	5.090*** (0.086)
E_score_c	-0.739*** (0.050)	-0.128** (0.049)	-0.151*** (0.049)
S_score_c	0.583*** (0.058)	0.499*** (0.055)	0.504*** (0.056)
G_score_c	0.301*** (0.047)	0.465*** (0.047)	0.510*** (0.046)
Size_c	-	-1.251***	-1.243***
Leverage_c	-	-1.607***	-1.509***
Capex intensity_c	-	0.003	0.007
Cash holdings_c	-	0.012***	0.015***
GDP_c	-	0.196***	-
Observations	9411	8547	8586
Number of Firms	2146	1994	2003
R-squared	0.030	0.219	0.218
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.2. ROE Regression Results - Stepwise Models

	Baseline	Controls	Year FE
Intercept	12.147*** (0.144)	12.399*** (0.148)	12.586*** (0.328)
E_score_c	-0.720*** (0.167)	0.132 (0.187)	0.092 (0.188)
S_score_c	0.679*** (0.199)	0.467* (0.212)	0.336 (0.216)
G_score_c	1.132*** (0.179)	1.341*** (0.197)	1.501*** (0.191)
Size_c	-	-1.531***	-1.476***
Leverage_c	-	1.097	1.550
Capex intensity_c	-	-0.045	-0.017
Cash holdings_c	-	0.054***	0.067***
GDP_c	-	0.888***	-
Observations	9378	8526	8565
Number of Firms	2151	1996	2005
R-squared	0.009	0.040	0.038
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.3. Tobin's Q Regression Results - Stepwise Models

	Baseline	Controls	Year FE
Intercept	1.177*** (0.013)	1.204*** (0.012)	1.175*** (0.026)
E_score_c	-0.197*** (0.017)	-0.005 (0.017)	-0.019 (0.017)
S_score_c	0.091*** (0.019)	0.083*** (0.018)	0.083*** (0.018)
G_score_c	0.119*** (0.016)	0.166*** (0.016)	0.186*** (0.015)
Size_c	-	-0.408***	-0.399***
Leverage_c	-	-0.893***	-0.855***
Capex intensity_c	-	-0.009***	-0.005*
Cash holdings_c	-	0.009***	0.011***
GDP_c	-	0.110***	-
Observations	9126	8332	8364
Number of Firms	2095	1950	1959
R-squared	0.026	0.237	0.235
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.4. WACC Regression Results - Stepwise Models

	Baseline	Controls	Year FE
Intercept	5.489*** (0.036)	5.463*** (0.035)	5.731*** (0.085)
E_score_c	-0.088* (0.046)	-0.196*** (0.047)	-0.257*** (0.046)
S_score_c	0.056 (0.052)	0.199*** (0.051)	0.201*** (0.052)
G_score_c	0.224*** (0.041)	0.275*** (0.044)	0.364*** (0.040)
Size_c	-	-0.015	0.009
Leverage_c	-	-5.799***	-5.599***
Capex intensity_c	-	0.007	0.019**
Cash holdings_c	-	0.003	0.009**
GDP_c	-	0.450***	-
Observations	6855	6348	6348
Number of Firms	1816	1707	1707
R-squared	0.006	0.120	0.102
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

7.2 Sector moderation models

Table 7.5. ROA Regression Results - ESG x High-Impact Sectors with Industry FE

	Baseline ESG	(1)+Controls	(2) + Year FE	(3)+ Industry FE
Intercept	4.812*** (0.041)	4.967*** (0.038)	5.087*** (0.086)	3.763*** (0.180)
E score c	-0.682*** (0.053)	-0.024 (0.052)	-0.042 (0.052)	-0.063 (0.052)
S score c	0.588*** (0.069)	0.537*** (0.065)	0.541*** (0.065)	0.390*** (0.065)
G score c	0.507*** (0.059)	0.679*** (0.057)	0.726*** (0.056)	0.775*** (0.056)
E score c : HighImpactEnv	-0.141* (0.064)	-0.325*** (0.060)	-0.337*** (0.060)	-0.306*** (0.060)
S score c : HighImpactSocial	0.000 (0.067)	-0.032 (0.062)	-0.030 (0.061)	-0.049 (0.061)
G score c : HighImpactGov	-0.536*** (0.089)	-0.574*** (0.081)	-0.583*** (0.081)	-0.602*** (0.081)
Size c	-	-1.261***	-1.255***	-0.981***
Leverage c	-	-1.665***	-1.576***	-1.352***
Capex intensity c	-	0.003	0.008	0.014
Cash holdings c	-	0.011***	0.014***	0.013***
GDP c	-	0.182***	-	-
Observations	9411	8547	8586	8586
Number of Firms	2146	1994	2003	2003
R-squared	0.035	0.225	0.225	0.275
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.6. ROE Regression Results - ESG x High-Impact Sectors with Industry FE

	Baseline ESG	(1)+Controls	(2) + Year FE	(3)+ Industry FE
Intercept	12.195*** (0.145)	12.450*** (0.148)	12.581*** (0.328)	4.848*** (0.788)
E score c	-0.505** (0.176)	0.410* (0.199)	0.397* (0.201)	0.353* (0.203)
S score c	0.450* (0.225)	0.182 (0.249)	0.023 (0.252)	0.121 (0.257)
G score c	2.012*** (0.228)	2.218*** (0.236)	2.384*** (0.231)	2.249*** (0.235)
E score c : HighImpactEnv	-0.505* (0.245)	-0.731*** (0.244)	-0.812*** (0.243)	-0.842*** (0.243)
S score c : HighImpactSocial	0.399* (0.222)	0.481* (0.231)	0.528* (0.230)	0.385 (0.233)
G score c : HighImpactGov	-2.224*** (0.321)	-2.296*** (0.328)	-2.325*** (0.327)	-2.154*** (0.331)
Size c	-	-1.551***	-1.502***	-1.293***
Leverage c	-	0.758	1.177	2.096
Capex intensity c	-	-0.043	-0.017	0.097*
Cash holdings c	-	0.052***	0.063***	0.040***
GDP c	-	0.844***	-	-
Observations	9378	8526	8565	8565
Number of Firms	2151	1996	2005	2005
R-squared	0.016	0.048	0.047	0.078
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.7. Tobin's Q Regression Results - ESG x High-Impact Sectors with Industry FE

	Baseline ESG	(1)+Controls	(2) + Year FE	(3)+ Industry FE
Intercept	1.181*** (0.013)	1.206*** (0.013)	1.175*** (0.026)	0.883*** (0.054)
E score c	-0.185*** (0.018)	0.019 (0.018)	0.008 (0.018)	-0.030 (0.017)
S score c	0.103*** (0.022)	0.107*** (0.021)	0.108*** (0.021)	0.096*** (0.021)
G score c	0.173*** (0.018)	0.215*** (0.017)	0.237*** (0.017)	0.244*** (0.017)
E score c : HighImpactEnv	-0.017 (0.020)	-0.071*** (0.018)	-0.082*** (0.018)	-0.052*** (0.018)
S score c : HighImpactSocial	-0.020 (0.022)	-0.031 (0.020)	-0.032 (0.020)	-0.052** (0.020)
G score c : HighImpactGov	-0.148*** (0.032)	-0.136*** (0.029)	-0.144*** (0.029)	-0.108*** (0.030)
Size c	-	-0.410***	-0.401***	-0.341***
Leverage c	-	-0.906***	-0.870***	-0.677***
Capex intensity c	-	-0.008**	-0.005	0.002
Cash holdings c	-	0.009***	0.011***	0.009***
GDP c	-	0.107***	-	-
Observations	9126	8332	8364	8364
Number of Firms	2095	1950	1959	1959
R-squared	0.029	0.240	0.239	0.307
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.8. WACC Regression Results - ESG x High-Impact Sectors with Industry FE

	Baseline ESG	(1)+Controls	(2) + Year FE	(3)+ Industry FE
Intercept	5.480*** (0.036)	5.455*** (0.035)	5.722*** (0.085)	6.915*** (0.196)
E score c	-0.050 (0.049)	-0.156*** (0.049)	-0.204*** (0.049)	-0.215*** (0.050)
S score c	0.024 (0.066)	0.173** (0.067)	0.171** (0.068)	0.176** (0.069)
G score c	0.169*** (0.050)	0.234*** (0.052)	0.327*** (0.049)	0.368*** (0.050)
E score c : HighImpactEnv	-0.191*** (0.058)	-0.174*** (0.059)	-0.219*** (0.058)	-0.193*** (0.058)
S score c : HighImpactSocial	0.063 (0.062)	0.049 (0.064)	0.059 (0.065)	0.047 (0.066)
G score c : HighImpactGov	0.191** (0.076)	0.173** (0.073)	0.160* (0.074)	0.179** (0.075)
Size c	-	-0.021	0.001	-0.022
Leverage c	-	-5.772***	-5.577***	-5.314***
Capex intensity c	-	0.005	0.017**	0.010
Cash holdings c	-	0.004	0.009***	0.011***
GDP c	-	0.442***	-	-
Observations	6855	6348	6348	6348
Number of Firms	1816	1707	1707	1707
R-squared	0.009	0.122	0.105	0.125
Controls	No	Yes	Yes	Yes
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Table 7.9. ROA Regression Results - Stepwise Models with Regulatory Intensity

	Baseline	Controls	Year FE
Intercept	4.861*** (0.043)	5.027*** (0.041)	5.179*** (0.088)
E_score_c	-0.798*** (0.057)	-0.223*** (0.056)	-0.248*** (0.057)
S_score_c	0.714*** (0.067)	0.646*** (0.065)	0.666*** (0.067)
G_score_c	0.348*** (0.052)	0.546*** (0.052)	0.596*** (0.051)
E_score_c × HighRegulatoryIntensity	0.332*** (0.118)	0.514*** (0.103)	0.523*** (0.102)
S_score_c × HighRegulatoryIntensity	-0.522*** (0.138)	-0.591*** (0.122)	-0.621*** (0.121)
G_score_c × HighRegulatoryIntensity	-0.281** (0.122)	-0.486*** (0.109)	-0.527*** (0.107)
Size_c	-	-1.260***	-1.255***
Leverage_c	-	-1.666***	-1.583***
Capex intensity_c	-	0.004	0.007
Cash holdings_c	-	0.010***	0.013***
GDP_c	-	0.172***	-
Observations	9411	8547	8586
Number of Firms	2146	1994	2003
R-squared	0.034	0.224	0.224
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.10. ROE Regression Results - Stepwise Models with Regulatory Intensity

	Baseline	Controls	Year FE
Intercept	12.321*** (0.153)	12.526*** (0.155)	12.767*** (0.333)
E_score_c	-0.854*** (0.189)	-0.128 (0.206)	-0.154 (0.209)
S_score_c	1.088*** (0.230)	0.870*** (0.245)	0.763*** (0.253)
G_score_c	1.190*** (0.202)	1.367*** (0.225)	1.561*** (0.218)
E_score_c × HighRegulatoryIntensity	0.763* (0.413)	1.303*** (0.433)	1.247*** (0.429)
S_score_c × HighRegulatoryIntensity	-1.626*** (0.486)	-1.737*** (0.504)	-1.731*** (0.501)
G_score_c × HighRegulatoryIntensity	-0.318 (0.426)	-0.206 (0.451)	-0.429 (0.443)
Size_c	-	-1.538***	-1.490***
Leverage_c	-	1.019	1.436
Capex intensity_c	-	-0.041	-0.016
Cash holdings_c	-	0.052***	0.063***
GDP_c	-	0.850***	-
Observations	9378	8526	8565
Number of Firms	2151	1996	2005
R-squared	0.011	0.042	0.040
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.11. Tobin's Q Regression Results - Stepwise Models with Regulatory Intensity

	Baseline	Controls	Year FE
Intercept	1.185*** (0.014)	1.214*** (0.013)	1.192*** (0.027)
E_score_c	-0.230*** (0.019)	-0.039* (0.019)	-0.054*** (0.019)
S_score_c	0.126*** (0.022)	0.113*** (0.021)	0.120*** (0.022)
G_score_c	0.120*** (0.017)	0.187*** (0.017)	0.211*** (0.017)
E_score_c × HighRegulatoryIntensity	0.164*** (0.037)	0.182*** (0.034)	0.188*** (0.034)
S_score_c × HighRegulatoryIntensity	-0.166*** (0.044)	-0.133*** (0.040)	-0.151*** (0.039)
G_score_c × HighRegulatoryIntensity	-0.016 (0.045)	-0.138*** (0.037)	-0.160*** (0.036)
Size_c	-	-0.410***	-0.402***
Leverage_c	-	-0.903***	-0.868***
Capex intensity_c	-	-0.008***	-0.005*
Cash holdings_c	-	0.009***	0.011***
GDP_c	-	0.106***	-
Observations	9126	8332	8364
Number of Firms	2095	1950	1959
R-squared	0.028	0.240	0.239
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7.12. WACC Regression Results - Stepwise Models with Regulatory Intensity

	Baseline	Controls	Year FE
Intercept	5.507*** (0.037)	5.470*** (0.036)	5.753*** (0.086)
E_score_c	-0.110* (0.053)	-0.249*** (0.054)	-0.308*** (0.054)
S_score_c	0.057 (0.061)	0.223*** (0.060)	0.242*** (0.061)
G_score_c	0.308*** (0.046)	0.319*** (0.049)	0.420*** (0.044)
E_score_c × HighRegulatoryIntensity	0.146 (0.103)	0.267** (0.106)	0.275** (0.104)
S_score_c × HighRegulatoryIntensity	0.013 (0.120)	-0.108 (0.121)	-0.160 (0.120)
G_score_c × HighRegulatoryIntensity	-0.474*** (0.101)	-0.282** (0.110)	-0.346*** (0.103)
Size_c	-	-0.021	0.000
Leverage_c	-	-5.810***	-5.617***
Capex intensity_c	-	0.007	0.019**
Cash holdings_c	-	0.003	0.008**
GDP_c	-	0.446***	-
Observations	6855	6348	6348
Number of Firms	1816	1707	1707
R-squared	0.009	0.122	0.105
Controls	No	Yes	Yes
Year FE	No	No	Yes
Firm FE	No	No	No

Notes: Standard errors in parentheses are robust (HC3).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Chapter 8

Appendix B: Firm FE full tables

8.1 Baseline models

Table 8.1. ROA Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
Intercept	-	-	-
E_score_c	-0.162*** (0.059)	-0.141** (0.061)	-0.133* (0.072)
S_score_c	0.101** (0.048)	0.146*** (0.049)	0.146** (0.061)
G_score_c	-0.042 (0.071)	0.005 (0.066)	0.024 (0.082)
Size_c	-	-0.642***	-0.687**
Leverage_c	-	-6.718***	-6.458***
Capex intensity_c	-	0.134***	0.135***
Cash holdings_c	-	0.008	0.009
GDP_c	-	-0.007	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.003	0.102	0.102
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.2. ROE Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE)
Intercept	-	-	-
E_score_c	-0.263 (0.371)	-0.145 (0.405)	-0.228 (0.471)
S_score_c	0.065 (0.278)	0.151 (0.301)	-0.063 (0.374)
G_score_c	-0.171 (0.345)	0.042 (0.354)	-0.226 (0.456)
Size_c	-	-1.099	-2.094
Leverage_c	-	-3.035	-2.093
Capex intensity_c	-	0.183	0.199
Cash holdings_c	-	0.020	0.017
GDP_c	-	-0.231	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.0003	0.004	0.002
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.3. Tobin's Q Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE)
Intercept	-	-	-
E_score_c	-0.025 (0.021)	-0.024 (0.022)	-0.036 (0.026)
S_score_c	-0.003 (0.015)	0.037** (0.015)	0.025 (0.018)
G_score_c	0.021 (0.019)	0.043** (0.019)	0.007 (0.023)
Size_c	-	-0.843***	-0.886***
Leverage_c	-	-0.537***	-0.679**
Capex intensity_c	-	0.001	0.003
Cash holdings_c	-	0.003**	0.003*
GDP_c	-	0.054***	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.001	0.149	0.138
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.4. WACC Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
Intercept	-	-	-
E_score_c	-0.207*	-0.219*	-0.218*
	(0.097)	(0.102)	(0.121)
S_score_c	0.160*	0.224**	0.210*
	(0.077)	(0.079)	(0.095)
G_score_c	-0.055	-0.001	-0.006
	(0.103)	(0.106)	(0.129)
Size_c	-	0.024	-0.126
Leverage_c	-	-8.361***	-7.899***
Capex intensity_c	-	-0.020	-0.016
Cash holdings_c	-	0.004	0.005
GDP_c	-	-0.030	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1676
R-squared (Within)	0.002	0.023	0.023
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8.2 Sector moderation models

Table 8.5. ROA Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
E_score_c	-0.156** (0.065)	-0.137** (0.069)	-0.130 (0.081)
S_score_c	0.149*** (0.056)	0.142** (0.064)	0.140* (0.076)
G_score_c	0.057 (0.088)	0.097 (0.076)	0.114 (0.093)
E_score_c:HighImpactEnv	0.010 (0.121)	0.004 (0.115)	0.009 (0.136)
S_score_c:HighImpactSocial	-0.064 (0.075)	0.014 (0.079)	0.018 (0.092)
G_score_c:HighImpactGov	-0.290** (0.145)	-0.291** (0.136)	-0.283* (0.160)
Size_c	-	-0.643***	-0.685**
Leverage_c	-	-6.709***	-6.455***
Capex intensity_c	-	0.133***	0.134***
Cash holdings_c	-	0.008	0.008
GDP_c	-	-0.006	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.004	0.104	0.104
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.6. ROE Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
E_score_c	-0.250 (0.406)	-0.092 (0.454)	-0.150 (0.531)
S_score_c	0.104 (0.330)	0.183 (0.391)	-0.053 (0.474)
G_score_c	0.219 (0.409)	0.415 (0.398)	0.137 (0.508)
E_score_c:HighImpactEnv	0.073 (0.689)	-0.091 (0.723)	-0.173 (0.841)
S_score_c:HighImpactSocial	-0.019 (0.403)	-0.009 (0.447)	0.023 (0.523)
G_score_c:HighImpactGov	-1.147* (0.685)	-1.172 (0.721)	-1.132 (0.849)
Size_c	-	-1.106	-2.100
Leverage_c	-	-2.984	-2.064
Capex intensity_c	-	0.182	0.197
Cash holdings_c	-	0.018	0.015
GDP_c	-	-0.229	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.001	0.005	0.003
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.7. Tobin's Q Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
E_score_c	-0.038 (0.026)	-0.035 (0.028)	-0.044 (0.033)
S_score_c	0.011 (0.015)	0.036** (0.017)	0.028 (0.020)
G_score_c	0.029 (0.021)	0.048** (0.020)	0.013 (0.023)
E_score_c:HighImpactEnv	0.048 (0.033)	0.036 (0.034)	0.024 (0.039)
S_score_c:HighImpactSocial	-0.021 (0.022)	0.001 (0.023)	-0.005 (0.027)
G_score_c:HighImpactGov	-0.026 (0.042)	-0.018 (0.044)	-0.019 (0.050)
Size_c	-	-0.841***	-0.884***
Leverage_c	-	-0.538***	-0.680***
Capex intensity_c	-	0.001	0.003
Cash holdings_c	-	0.003***	0.003*
GDP_c	-	0.054***	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.002	0.150	0.138
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.8. WACC Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
E_score_c	-0.255** (0.111)	-0.306** (0.120)	-0.304** (0.141)
S_score_c	-0.130 (0.097)	-0.119 (0.103)	-0.138 (0.123)
G_score_c	-0.030 (0.132)	0.021 (0.132)	0.012 (0.159)
E_score_c:HighImpactEnv	0.169 (0.179)	0.239 (0.185)	0.236 (0.218)
S_score_c:HighImpactSocial	0.459*** (0.122)	0.496*** (0.126)	0.503*** (0.149)
G_score_c:HighImpactGov	-0.081 (0.192)	-0.074 (0.196)	-0.057 (0.229)
Size_c	-	0.019	-0.129
Leverage_c	-	-8.434***	-7.974***
Capex intensity_c	-	-0.020	-0.017
Cash holdings_c	-	0.005	0.005
GDP_c	-	-0.026	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.004	0.026	0.026
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8.3 Market moderation models

Table 8.9. ROA Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
Intercept	-	-	-
E score_c	-0.166** (0.070)	-0.169** (0.074)	-0.1545* (0.0879)
S score_c	0.100* (0.055)	0.153** (0.056)	0.1538* (0.0696)
G score_c	0.048 (0.082)	0.085 (0.080)	0.1048 (0.0983)
E score_c:HighReg	0.046 (0.129)	0.126 (0.127)	0.1069 (0.1491)
S score_c:HighReg	-0.046 (0.122)	-0.078 (0.116)	-0.0732 (0.1362)
G score_c:HighReg	-0.329* (0.165)	-0.317** (0.139)	-0.3155* (0.1613)
Size_c	-	-0.651**	-0.6909**
Leverage_c	-	-6.699***	-6.4389***
Capex intensity_c	-	0.134***	0.1350***
Cash holdings_c	-	0.008	0.0087
GDP_c	-	-0.010	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1676
R-squared (Within)	0.004	0.104	0.1037
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.10. ROE Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
Intercept	-	-	-
E_score_c	-0.267 (0.413)	-0.099 (0.455)	-0.177 (0.533)
S_score_c	0.010 (0.299)	0.055 (0.319)	-0.191 (0.395)
G_score_c	0.199 (0.363)	0.358 (0.371)	0.080 (0.462)
E_score_c:HighReg	0.119 (0.920)	-0.083 (1.010)	-0.127 (1.202)
S_score_c:HighReg	0.070 (0.745)	0.299 (0.832)	0.466 (0.985)
G_score_c:HighReg	-1.342 (0.901)	-1.205 (0.938)	-1.165 (1.101)
Size_c	-	-1.124	-2.117
Leverage_c	-	-2.965	-2.014
Capex intensity_c	-	0.186	0.201
Cash holdings_c	-	0.020	0.017
GDP_c	-	-0.245	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.001	0.005	0.003
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.11. Tobin's Q Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
Intercept	-	-	-
E_score_c	0.000 (0.027)	0.001 (0.028)	-0.015 (0.032)
S_score_c	-0.004 (0.018)	0.041* (0.017)	0.029 (0.021)
G_score_c	0.019 (0.022)	0.043 (0.023)	0.011 (0.027)
E_score_c:HighReg	-0.082 (0.042)	-0.076 (0.044)	-0.065 (0.051)
S_score_c:HighReg	-0.007 (0.031)	-0.041 (0.032)	-0.037 (0.037)
G_score_c:HighReg	0.012 (0.041)	0.000 (0.039)	-0.011 (0.046)
Size_c	-	-0.849***	-0.890***
Leverage_c	-	-0.532**	-0.673**
Capex intensity_c	-	0.001	0.002
Cash holdings_c	-	0.003**	0.003*
GDP_c	-	0.053***	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.003	0.152	0.141
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8.12. WACC Regression Results - Firm and Two-way Fixed Effects

	Firm FE	(1)+ Controls	(2)+Year FE
E_score_c	-0.225* (0.123)	-0.198 (0.131)	-0.191 (0.154)
S_score_c	0.163* (0.089)	0.232** (0.090)	0.217* (0.108)
G_score_c	0.088 (0.122)	0.105 (0.124)	0.103 (0.150)
E_score_c:HighReg	0.114 (0.195)	-0.019 (0.206)	-0.039 (0.241)
S_score_c:HighReg	-0.088 (0.183)	-0.120 (0.192)	-0.109 (0.228)
G_score_c:HighReg	-0.526** (0.221)	-0.417* (0.230)	-0.415 (0.272)
Size_c	-	0.003	-0.138
Leverage_c	-	-8.327***	-7.862***
Capex intensity_c	-	-0.019	-0.016
Cash holdings_c	-	0.004	0.005
GDP_c	-	-0.035	-
Observations	6529	6052	6052
Number of Firms	1777	1673	1673
R-squared (Within)	0.003	0.024	0.024
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Notes: Standard errors in parentheses are cluster-robust (firm).

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Chapter 9

Appendix C: Robustness models

9.1 Baseline models

Table 9.1. Baseline Model – Lagged ESG Robustness Check (Cross-Sectional)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	−0.068 (0.050)	0.261 (0.205)	−0.008 (0.017)	−0.169*** (0.045)
S_score_lag_c	0.454*** (0.059)	0.268 (0.236)	0.093*** (0.019)	0.071 (0.054)
G_score_lag_c	0.500*** (0.052)	1.506*** (0.221)	0.163*** (0.017)	0.296*** (0.043)
Size_c	−1.230*** (0.033)	−1.399*** (0.132)	−0.386*** (0.013)	0.016 (0.034)
Leverage_c	−1.181*** (0.309)	1.884 (1.384)	−0.852*** (0.098)	−5.520*** (0.237)
Capex intensity_c	−0.001 (0.010)	−0.009 (0.044)	−0.005* (0.003)	0.021*** (0.008)
Cash holdings_c	0.014*** (0.003)	0.055*** (0.012)	0.010*** (0.001)	0.008*** (0.003)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	6882	6848	6592	4991
Number of Firms	1984	1980	1914	1660
R-squared	0.208	0.035	0.218	0.097

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9.2. Baseline Model – Lagged ESG Robustness Check (Within-Firm)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	−0.113 (0.083)	−0.125 (0.496)	−0.006 (0.028)	−0.143 (0.148)
S_score_lag_c	0.009 (0.096)	0.223 (0.626)	−0.012 (0.030)	−0.090 (0.162)
G_score_lag_c	0.046 (0.105)	−0.285 (0.609)	0.013 (0.026)	0.050 (0.151)
Size_c	−0.926** (0.389)	−2.568 (2.043)	−0.963*** (0.106)	−0.033 (0.362)
Leverage_c	−6.284*** (1.087)	−0.890 (8.176)	−0.383 (0.272)	−6.135*** (1.426)
Capex intensity_c	0.145*** (0.031)	0.240 (0.195)	−0.001 (0.005)	0.022 (0.029)
Cash holdings_c	0.015 (0.011)	0.018 (0.034)	0.003 (0.002)	−0.002 (0.009)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	4728	4728	4728	4728
Number of Firms	1601	1601	1601	1601
R-squared (Within)	0.107	0.003	0.141	0.011

Notes: robust standard errors at firm level in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

9.2 Sector moderation models

Table 9.3. Sector Moderation Model – Lagged ESG Robustness Check (Cross-Sectional)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	0.044 (0.053)	0.537** (0.221)	0.019 (0.019)	−0.101** (0.049)
S_score_lag_c	0.524*** (0.070)	−0.222 (0.287)	0.121*** (0.022)	0.063 (0.076)
G_score_lag_c	0.723*** (0.063)	2.453*** (0.266)	0.214*** (0.020)	0.237*** (0.052)
E_score_lag_c × HighImpactEnv	−0.338*** (0.068)	−0.605** (0.285)	−0.083*** (0.021)	−0.290*** (0.064)
S_score_lag_c × HighImpactSocial	−0.076 (0.071)	0.759*** (0.272)	−0.036 (0.023)	0.042 (0.076)
G_score_lag_c × HighImpactGov	−0.612*** (0.090)	−2.518*** (0.371)	−0.144*** (0.033)	0.229*** (0.081)
Size_c	−1.241*** (0.033)	−1.426*** (0.134)	−0.388*** (0.013)	0.006 (0.034)
Leverage_c	−1.264*** (0.308)	1.489 (1.376)	−0.871*** (0.098)	−5.494*** (0.237)
Capex intensity_c	−0.001 (0.009)	−0.006 (0.044)	−0.005 (0.003)	0.018** (0.008)
Cash holdings_c	0.013*** (0.003)	0.052*** (0.012)	0.009*** (0.001)	0.009*** (0.003)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	6882	6848	6592	4991
Number of Firms	1984	1980	1914	1660
R-squared	0.215	0.045	0.222	0.102

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9.4. Sector Moderation Model – Lagged ESG Robustness Check (Within-Firm)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	−0.122 (0.106)	−0.066 (0.579)	−0.007 (0.038)	−0.108 (0.182)
S_score_lag_c	0.111 (0.130)	0.550 (1.054)	0.003 (0.039)	−0.407* (0.222)
G_score_lag_c	0.140 (0.119)	0.567 (0.610)	0.006 (0.025)	0.136 (0.186)
E_score_lag_c × HighImpactEnv	0.041 (0.157)	−0.013 (0.972)	0.002 (0.046)	−0.082 (0.277)
S_score_lag_c × HighImpactSocial	−0.131 (0.165)	−0.341 (1.152)	−0.021 (0.052)	0.454*** (0.279)
G_score_lag_c × HighImpactGov	−0.311* (0.190)	−2.801** (1.167)	0.022 (0.065)	−0.265 (0.273)
Size_c	−0.922** (0.388)	−2.570 (2.043)	−0.962*** (0.106)	−0.052 (0.365)
Leverage_c	−6.248*** (1.085)	−0.719 (8.133)	−0.381 (0.272)	−6.197*** (1.430)
Capex intensity_c	0.145*** (0.031)	0.236 (0.194)	−0.001 (0.005)	0.022 (0.029)
Cash holdings_c	0.015 (0.011)	0.019 (0.034)	0.003 (0.002)	−0.002 (0.010)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	4728	4728	4728	4728
Number of Firms	1601	1601	1601	1601
R-squared (Within)	0.109	0.007	0.142	0.013

Notes: robust standard errors at firm level in parentheses

Significance: *** p < 0.01, ** p < 0.05, * p < 0.1.

9.3 Market moderation models

Table 9.5. Market Moderation Model – Lagged ESG Robustness Check (Cross-Sectional)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	−0.150** (0.057)	−0.068 (0.229)	−0.044** (0.019)	−0.215*** (0.052)
S_score_lag_c	0.642*** (0.072)	0.875*** (0.280)	0.129*** (0.023)	0.130** (0.063)
G_score_lag_c	0.578*** (0.058)	1.508*** (0.250)	0.188*** (0.019)	0.327*** (0.047)
E_score_lag_c × HighReg	0.449*** (0.100)	1.628*** (0.456)	0.191*** (0.036)	0.245** (0.104)
S_score_lag_c × HighReg	−0.646*** (0.125)	−2.358*** (0.537)	−0.145*** (0.043)	−0.231 (0.125)
G_score_lag_c × HighReg	−0.514*** (0.121)	−0.230 (0.554)	−0.170*** (0.041)	−0.208** (0.113)
Size_c	−1.244*** (0.033)	−1.418*** (0.132)	−0.389*** (0.013)	0.009 (0.034)
Leverage_c	−1.286*** (0.307)	1.706 (1.385)	−0.868*** (0.098)	−5.545*** (0.237)
Capex intensity_c	−0.001 (0.009)	−0.005 (0.044)	−0.005* (0.003)	0.021*** (0.008)
Cash holdings_c	0.012*** (0.003)	0.050*** (0.012)	0.009*** (0.001)	0.008** (0.003)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	6882	6848	6592	4991
Number of Firms	1984	1980	1914	1660
R-squared	0.215	0.038	0.224	0.099

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9.6. Market Moderation Model – Lagged ESG Robustness Check (Within-Firm)

	ROA	ROE	Tobin's Q	WACC
E_score_lag_c	−0.150 (0.105)	−0.539 (0.571)	0.010 (0.037)	−0.105 (0.191)
S_score_lag_c	0.094 (0.116)	0.507 (0.723)	0.006 (0.036)	−0.048 (0.190)
G_score_lag_c	0.069 (0.133)	−0.112 (0.652)	0.023 (0.032)	0.136 (0.182)
E_score_lag_c × HighReg	0.139 (0.166)	1.442 (1.168)	−0.044 (0.053)	−0.079 (0.282)
S_score_lag_c × HighReg	−0.373 (0.200)	−1.132 (1.437)	−0.093 (0.058)	−0.249 (0.365)
G_score_lag_c × HighReg	−0.102 (0.185)	−0.816 (1.481)	−0.034 (0.051)	−0.305 (0.308)
Size_c	−0.943** (0.388)	−2.600 (2.055)	−0.970*** (0.106)	−0.054 (0.361)
Leverage_c	−6.271*** (1.087)	−0.771 (8.181)	−0.386 (0.271)	−6.138*** (1.422)
Capex intensity_c	0.145*** (0.031)	0.241 (0.194)	−0.001 (0.005)	0.022 (0.029)
Cash holdings_c	0.015 (0.011)	0.018 (0.033)	0.003 (0.002)	−0.002 (0.009)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	4728	4728	4728	4728
Number of Firms	1601	1601	1601	1601
R-squared (Within)	0.109	0.003	0.146	0.013

Notes: robust standard errors at firm level in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Chapter 10

Appendix D: R&D intensity

Table 10.1. Baseline Model – ESG with R&D Intensity (Cross-Sectional, Year FE)

	ROA	ROE	Tobin's Q	WACC
E_score_c	−0.135* (0.077)	−0.050 (0.298)	−0.093*** (0.024)	−0.340*** (0.063)
S_score_c	0.413*** (0.090)	0.706** (0.347)	0.002 (0.029)	0.237*** (0.075)
G_score_c	0.258*** (0.068)	1.048*** (0.304)	0.243*** (0.024)	0.256*** (0.060)
Size_c	−0.901*** (0.054)	−1.037*** (0.218)	−0.292*** (0.019)	0.074* (0.042)
Leverage_c	−1.031** (0.443)	1.539 (2.109)	−0.412*** (0.139)	−5.074*** (0.309)
Capex intensity_c	0.019 (0.015)	0.083 (0.059)	−0.003 (0.006)	0.028** (0.012)
Cash holdings_c	0.019** (0.008)	0.054** (0.027)	0.017*** (0.003)	0.015** (0.006)
R&D intensity_c	0.131*** (0.024)	−0.030 (0.104)	0.122*** (0.008)	0.035*** (0.011)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	4474	4453	4393	3575
Number of Firms	1069	1071	1053	992
R-squared	0.142	0.022	0.343	0.088

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10.2. Sector Moderation Model – ESG, High-Impact Interactions and R&D Intensity (Cross-Sectional)

	ROA	ROE	Tobin's Q	WACC
E_score_c	−0.011 (0.086)	0.330 (0.326)	−0.085*** (0.028)	−0.247*** (0.069)
S_score_c	0.454*** (0.125)	−0.248 (0.496)	0.013 (0.039)	0.428*** (0.116)
G_score_c	0.402*** (0.070)	2.082*** (0.320)	0.247*** (0.024)	0.231*** (0.071)
E_score_c × HighImpactEnv	−0.403*** (0.095)	−1.253*** (0.387)	−0.024 (0.030)	−0.307*** (0.086)
S_score_c × HighImpactSocial	−0.025 (0.113)	1.225*** (0.428)	−0.012 (0.036)	−0.206* (0.107)
G_score_c × HighImpactGov	−0.387*** (0.124)	−2.743*** (0.505)	−0.013 (0.046)	0.080 (0.105)
Size_c	−0.904*** (0.054)	−1.020*** (0.218)	−0.293*** (0.019)	0.064 (0.043)
Leverage_c	−1.183*** (0.447)	0.357 (2.102)	−0.417*** (0.141)	−5.073*** (0.312)
Capex intensity_c	0.022 (0.015)	0.105* (0.059)	−0.003 (0.006)	0.027** (0.012)
Cash holdings_c	0.020** (0.008)	0.051* (0.027)	0.017*** (0.003)	0.016*** (0.006)
R&D intensity_c	0.131*** (0.024)	−0.018 (0.101)	0.122*** (0.008)	0.035*** (0.011)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	4474	4453	4393	3575
Number of Firms	1069	1071	1053	992
R-squared	0.147	0.035	0.343	0.092

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10.3. Regulatory Moderation Model – ESG, HighReg and R&D Intensity (Cross-Sectional)

	ROA	ROE	Tobin's Q	WACC
E_score_c	−0.234*** (0.088)	−0.413 (0.336)	−0.113*** (0.027)	−0.423*** (0.074)
S_score_c	0.572*** (0.105)	1.247*** (0.405)	0.019 (0.033)	0.308*** (0.088)
G_score_c	0.322*** (0.078)	1.091*** (0.352)	0.264*** (0.028)	0.266*** (0.068)
E_score_c × HighReg	0.578*** (0.170)	1.932*** (0.695)	0.130** (0.059)	0.439*** (0.143)
S_score_c × HighReg	−0.708*** (0.198)	−2.413*** (0.797)	−0.079 (0.065)	−0.336** (0.164)
G_score_c × HighReg	−0.328** (0.153)	−0.324 (0.679)	−0.123** (0.060)	−0.108 (0.147)
Size_c	−0.902*** (0.054)	−1.031*** (0.219)	−0.293*** (0.019)	0.076* (0.042)
Leverage_c	−1.177*** (0.441)	1.252 (2.115)	−0.434*** (0.139)	−5.122*** (0.310)
Capex intensity_c	0.020 (0.015)	0.082 (0.058)	−0.003 (0.006)	0.027** (0.012)
Cash holdings_c	0.019** (0.008)	0.053** (0.027)	0.017*** (0.003)	0.014** (0.006)
R&D intensity_c	0.125*** (0.024)	−0.042 (0.104)	0.121*** (0.008)	0.033*** (0.011)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	4474	4453	4393	3575
Number of Firms	1069	1071	1053	992
R-squared	0.146	0.025	0.344	0.090

Notes: robust standard errors (HC3) in parentheses

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.