Mandira Thapa

The impact of Corporate Sustainability Practices on Financial Performance

A Comparative Analysis of European Firms

School of Accounting and Finance
Master's thesis in Finance

Vaasa 2025

UNIVERSITY OF VAASA
School of Accounting and Finance
Author: Mandira Thapa
Title of the Thesis: The impact of Corporate Sustainability Practices on Financial Performance : A Comparative Analysis of European Firms
Degree: Master of Science in Economics and Business Administration
Discipline Master's Degree Programme in Finance
Supervisor: Timothy King
Year: 2025 **Pages:** 98

ABSTRACT:

This study examines the impact of corporate sustainability (ESG) practices on firm financial performance among publicly listed Nordic firms from 2012 to 2022. The analysis includes 142 firms and 1,395 firm-year observations (1,392 for stock-return models), using ESG and financial data from the LSEG Workspace database. Panel regression models are employed, with fixed- or random-effects estimations selected based on Hausman tests. The study employs appropriate panel data techniques, with robust standard errors and winsorized variables to mitigate outlier effects. Control variables such as firm size, age, and leverage are also incorporated. The results show that overall ESG performance has a positive and significant effect on market-based performance (Log Tobin's Q), suggesting that firms with stronger sustainability engagement are valued more highly by investors. However, ESG has no consistent impact on accounting-based indicators such as return on assets (ROA), return on equity (ROE), and operating profit margin (OPM). Robustness checks using ESG pillar scores reveal that the governance pillar exerts the strongest and most consistent influence on firm performance, while environmental and social dimensions show weaker or mixed effects. Overall, the findings suggest that ESG performance contributes more to enhancing firm market valuation than to improving short-term accounting outcomes. This study highlights the role of governance practices in linking sustainability to firm value and provides insights for managers and policymakers to strengthen ESG disclosure, comparability, and long-term strategic integration within Nordic firms.

KEYWORDS: ESG; Corporate Sustainability; Financial Performance (ROA, ROE, Tobin's Q); Panel Data; Nordic Firms; Energy & Manufacturing.

Contents

Figures

Tables

Abbreviations

CSP Corporate Sustainability Performance

CSR Corporate Social Responsibility

CSRD Corporate Sustainability Reporting Directive

ESG Environmental, Social, and Governance

EU European United

FE Fixed Effects estimator

LSEG London Stock Exchange Group

NFRD EU Non-Financial Reporting Directive

OPM Operating Profit Margin

PCSE Panel-Corrected Standard Errors

RBV Resource-Based View

ROA Return on Assets

ROE Return on Equity

OPM Operating Profit Margin

FE Fixed Effects estimator

RE Random Effects estimator

1 Introduction

1.1 Background and Motivation

Over past few decades, corporate sustainability and (ESG) environmental, social, and governance principles have transformed from being operational activities to becoming a key part of business strategy. Companies today face growing expectations from investors, regulators, and the public, who increasingly expect responsible and transparent strategies. These changes show that business success today is not measured only by profits but also by how firms contribute to the environment, society, and good governance.

Stakeholder theory provides one explanation for this development. It suggests that firms can achieve long-term success by integrating social, environmental, and economic considerations into their operations while addressing to the needs of all affected groups (Freeman, 1984; Carroll, 1999). When firms respond to these expectations, they can build trust, improve their public image, and increase employee motivation, which supports stable financial performance (Artiach et al., 2010). Likewise, the shared value approach argues that social and environmental actions can create business advantages when they are linked to a company's main goals and strengths (Porter & Kramer, 2011).

Corporate Sustainability Performance (CSP) reflects how well companies integrate environmental, social, and governance objectives into their business strategies and day-to-day operations. Research shows that firms with strong sustainability frameworks often perform better financially. For example, Eccles et al. (2014) found that U.S. firms with well-developed sustainability practices outperform peers on both accounting and market measures. According to Friede et al. (2015), reviewed more than two thousand studies, most result shows positive or neutral relationship between ESG and financial performance, showing that responsible practices can align with profitability.

The Nordic countries Sweden, Norway, Denmark, and Finland offer an especially relevent context for examining this relationship. These nations combine ambitious environmental policies with strong institutional, high level of transparency, and a deep-rooted culture of social responsibility. Sweden introduced a carbon tax as early as 1991, Denmark now produces over half of its electricity from wind power, and Finland and Norway are both committed to achieving carbon neutrality by mid-century. Their strong governance systems and culture of social responsibility create favourable conditions for firms to pursue sustainability without harming competitiveness. Therefore, the financial benefits of ESG engagement may be more visible in this region than in less mature sustainability environments.

Policy frameworks further reinforce these dynamics. According to the EU Non-Financial Reporting Directive (2014/2017), large enterprises must provide disclosures on their environmental and social practices. Furthermore, the European Green Deal (2019) and the Paris Agreement (2015) have reinforced the region's long-term goals toward climate sustainability (Christensen, Hail, & Leuz, 2021; European Commission, 2019). These programs help companies adopt sustainability practices in their strategic planning and improve responsibility for ESG performance. Despite the region's leadership, however, relatively few studies focus exclusively on Nordic firms. One explanation is that reliable ESG data historically became available earlier for U.S. and Western European companies, attracting more research attention there.

To address this gap, the present study investigates whether ESG practices among Nordic firms lead to measurable financial advantages and whether these effects vary across industries and over time, using firm-level data from 2012 to 2022.

1.2 Review of Previous Studies

Research on the relationship between ESG practices and CFP has expanded significantly in the last twenty years. Overall, the literature indicates that sustainability initiatives generally enhance firm value, although the impact differs depending on the industry, geographic context, and time horizons.

Large-scale reviews and meta-analysis (e.g., Friede et al., 2015) show that most studies find either positive or at least neutral effects, but the magnitude of the relationship differs across industries and regions. Similarly, Eccles et al. (2014) showed that U.S. firms with high sustainability policies performed better than others in both market and accounting measures. These two studies suggest that sustainability efforts tend to add value for firms, even if the strength of the effect differs across contexts.

Other studies support these findings. De Souza Barbosa et al. (2023) show that integrating ESG criteria into corporate strategy improves CSP and can provide long-term benefit, while Wiengarten et al. (2017) found that firms with clear CSR leadership achieve better financial results. From a theoretical perspective, Artiach et al. (2010) also showed that sustainability investments may involve upfront costs, such as higher operating expenses or delayed projects. However, they also find that firms with high CSP for example, those included in the Dow Jones Sustainability Index tend to earn higher profitability, particularly when measured by return on equity (ROE).

However, The ESG–CFP relationship is not uniform across industries or regions. Tzouvanas et al. (2020) found that European manufacturers with strong environmental performance generally show higher profitability. On the other hand, Makridou et al. (2024) reported that in some European energy firms, aggregate ESG efforts may reduce short-term return on assets due to compliance and transition costs. These findings suggest that sector-specific characteristics influence how quickly ESG initiatives lead to immediate financial gains.

Geography also shapes the ESG–financial performance relationship. Evidence from the United States shows generally stronger positive effects than in Europe, suggesting that institutional and market contexts play an important role (Eccles et al., 2014; Khan et al., 2016).

In recent years, European regulatory frameworks have further influence firm behaviour. The European United (EU) Non-Financial Reporting Directive and subsequent sustainability policies have standardized corporate disclosures, improving transparency and comparability across industries. As a result, firms are increasingly motivated to integrate ESG practices strategically. Understanding how these regulatory pressures interact with corporate sustainability strategies is essential to determine whether ESG activities yield measurable financial advantages.

Although the Nordic countries Sweden, Norway, Denmark, and Finland are widely recognized for their leadership in sustainability and stakeholder governance (Strand et al., 2015), few studies focus specifically on their publicly listed firms. Given these nations advanced environmental policies and transparent governance systems, they provide an ideal setting to test whether the positive ESG–performance link observed globally also holds in a mature sustainability environment. This study therefore examines whether ESG performance enhances financial outcomes for Nordic energy and manufacturing firms, sectors that are central to the region’s green and economic transition.

1.3 Purpose of the Study

This paper explores the connection between ESG initiatives and financial outcomes among publicly traded companies in the Nordic region. Specifically, it focuses on how environmental sustainability performance affects key financial indicators both accounting-based (return on assets, return on equity, and operating profit margin) and market-based (Tobin's Q and Stock returns) for companies in Denmark, Sweden, Finland, and Norway between 2012 and 2022.

The main aim is to explore whether strong environmental performance helps firms achieve better financial results. The analysis follows the stakeholder theory, which explains that companies addressing environmental and social concerns can build stronger trust, reputation, and operational efficiency, leading to better performance.

To achieve this aim, the study answers the following research questions:

1. How is ESG performance related to accounting profitability among Nordic firms?
2. How is ESG performance related to market-based valuation metrics?
3. Does the ESG–financial performance link differ between the energy and manufacturing sectors?
4. Have major sustainability policies (such as the EU Non-Financial Reporting Directive, the European Green Deal, or the Paris Agreement) influenced the relationship between ESG practices and profitability among Nordic firms?

The study uses panel regression analysis based on firm-level data from 2012 to 2022. Control variables include firm size, leverage, country, and year effects. In addition, the study considers major policy events to capture how external sustainability regulations may affect firm performance.

1.4 Hypothesis Development

This section explains the relationship between sustainability and firm performance can be understood through established management theories that explain how responsible practices contribute to long-term success. Stakeholder Theory (Freeman, 2010) emphasizes that addressing the expectations of key stakeholders such as investors, customers, and regulators can build trust, improve reputation, and enhance profitability.

The Resource-Based View (Barney, 1991) suggests that ESG-related capabilities, such as innovation in sustainability or strong governance systems, can become unique internal resources that support competitive advantage.

These theoretical perspectives, developed further in Chapter 2.5, provide the foundation for the study's hypotheses. Empirical evidence from prior research (e.g., Eccles et al., 2014; Friede, Busch, & Bassen, 2015) consistently indicates that firms with stronger ESG performance tend to achieve superior financial results.

Based on these theoretical insights and earlier findings, the following hypotheses are proposed. While the hypotheses refer to ESG performance as a whole, this study focuses particularly on the environmental dimension, in line with its main research objective.

H1: Higher ESG performance is positively related to accounting profitability (ROA, ROE, and profit margin) of Nordic firms.

H2: Firms with stronger ESG performance are expected to show higher market valuation, as reflected by Tobin's Q and stock returns, among Nordic companies.

Although evidence largely points to a positive ESG–performance relationship, its strength may be moderated by sectoral and regulatory factors.
Therefore;

H3: The ESG–financial performance relationship differs between the energy and manufacturing sectors in the Nordic regions.

Energy firms may face higher compliance costs and short-term trade-offs, while manufacturing firms can more easily leverage sustainability for efficiency and competitive advantage (Makridou et al., 2024; Tzouvanas et al., 2020). Testing this difference in the Nordic context allows assessment of whether these sectoral dynamics persist under advanced sustainability governance.

H4: Major regulatory or policy events during the sample period (e.g., EU directives, climate policies) influence the ESG–financial performance relationship.

Nordic firms operate under both national and EU-level frameworks, with landmark policies such as the Paris Climate Agreement (2015), the EU Non-Financial Reporting Directive (2017), and the European Green Deal (2019). These initiatives may amplify or constrain the financial effects of ESG practices, making it essential to account for regulatory shocks in the analysis.

The hypotheses will be analyzed using firm-level panel data through regression modelling. The analysis will control for firm size, leverage, industry, and year effects.

1.5 Contribution and Research Gap

The study provides three significant contributions to the existing literature on ESG and corporate financial performance.

First, by examining Nordic firms in the underexplored setting despite the region's leading position in global sustainability rankings, this study rigorously tests whether the positive ESG–financial performance links documented in other markets also hold in an advanced sustainability context. The findings will help corporate strategists operating in regions

with mature ESG frameworks, helping to determine whether further ESG investments continue to generate financial returns or whether diminishing marginal benefits emerge. In addition, by considering formal governance requirements, this study contributes to understanding how regulatory frameworks interact with corporate sustainability initiatives. The combination of strict reporting standards and advanced ESG practices in Nordic firms offers a unique opportunity to test whether financial benefits arise from ESG engagement in a highly regulated and sustainability-oriented environment. This perspective adds practical relevance, as policymakers and managers can evaluate the real impact of regulatory frameworks on firm performance.

Second, this study examines both accounting-based indicators and market-based indicators. This approach helps to identify which aspects of financial performance are more responsive to ESG engagement whether the effects appear through improved operational efficiency that boosts profitability or through increased investor confidence that enhances market valuation. The results will also assist managers in understanding which financial indicators are most influenced by ESG practices, helping them make informed decisions about where sustainability initiatives can have the strongest financial impact.

Third, the study also looks at differences across industries and over time, providing insights that can help shape ESG policies and regulations. For example, if energy-sector firms in the Nordics derive outsized market premiums from environmental innovations, policymakers could justify targeted incentives or stricter emission standards. Conversely, evidence of robust ESG returns in manufacturing may support broader integration of sustainability criteria into corporate governance codes and reporting requirements.

Overall, this research addresses a clear gap by examining ESG–performance dynamics in the Nordics and offer insights for both policymakers and business leaders. This study offers both theoretical advancement and practical guidance on aligning ESG strategy with financial objectives.

1.6 Limitations and Assumptions

Like all empirical studies, this research faces some limitations. First, the focus on Nordic countries means that the findings may not be directly applicable to other regions. Nordic economies are characterized by strong welfare systems, advanced regulatory frameworks, and high institutional trust, which may amplify the financial effects of sustainability practices. While this study assumes that the Nordic experience can provide useful insights into broader CSP–financial performance theory, it recognizes that the unique regional context restricts the external validity of the results. To partly address this, findings will be discussed considering existing evidence from other regions to highlight similarities and differences.

Second, the study relies on existing ESG performance scores as proxies for corporate sustainability practices. It is assumed that these ratings fairly represent a firm's sustainability engagement. However, variations in disclosure quality, reporting standards, and rating methodologies across countries and industries can introduce bias or measurement error. To mitigate this concern, robustness checks will be conducted using alternative ESG indicators and, where possible, sub-dimensions (environmental, social, governance separately) to confirm that the results are not overly influenced by a single measurement method.

Third, the research design is observational, relying on panel regression models. While these methods can reveal associations, they do not establish direct causality between CSP and financial performance. Unobserved firm-level factors may simultaneously influence both ESG engagement and profitability. To reduce this risk, firm fixed effects, year dummies, and key control variables are included to account for unobserved heterogeneity. In addition, lagged ESG variables will be included to account for any delayed effects of ESG performance on financial outcomes.

In conclusion, this study assumes that ESG ratings are valid and reliable indicators of corporate sustainability practices and that financial performance measures accurately reflect firm outcomes. While limitations remain, the use of fixed effects, lagged variables, and robustness checks is intended to strengthen the credibility of the results. The findings should therefore be interpreted cautiously, particularly regarding causal inference and generalization beyond the Nordic context.

2 Literature Review

2.1 Overview: ESG and Financial Performance

The relationship between corporate sustainability and financial performance has become a prominent area of discussion in modern finance and management research. Scholars, policymakers, and practitioners increasingly question whether firms that engage in Environmental, Social, and Governance (ESG) practices achieve superior corporate financial performance (CFP), or whether such practices impose costs that may reduce competitiveness. This discussion reflects a broader change in global business and academic discourse, where sustainability is viewed not only as ethical responsibility but also a strategic path towards long-term value creation.

A substantial amount of empirical research indicates that strong ESG performance can bring financial advantages. Reviews of multiple studies generally find that ESG practices have either a positive impact or no harmful effect on financial results. The strength of this effect varies depending on the region, industry, and time horizon.

One of the most comprehensive studies is by Friede, Busch, and Bassen (2015), examined more than 2,000 empirical papers on the ESG–CFP relationship. Their meta-analysis found that around 90% of the studies reported a neutral or positive effect of ESG on financial outcomes. Among the three pillars, governance had the strongest positive impact (62.3%), followed by environmental (58.7%) and social factors (55.1%). Figure 1 presents these results, illustrating that most of the research identifies positive effects across all three ESG dimensions.

Figure 1. Meta-analysis summary of ESG–financial performance relationships

Source: Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. Journal of Sustainable Finance & Investment.

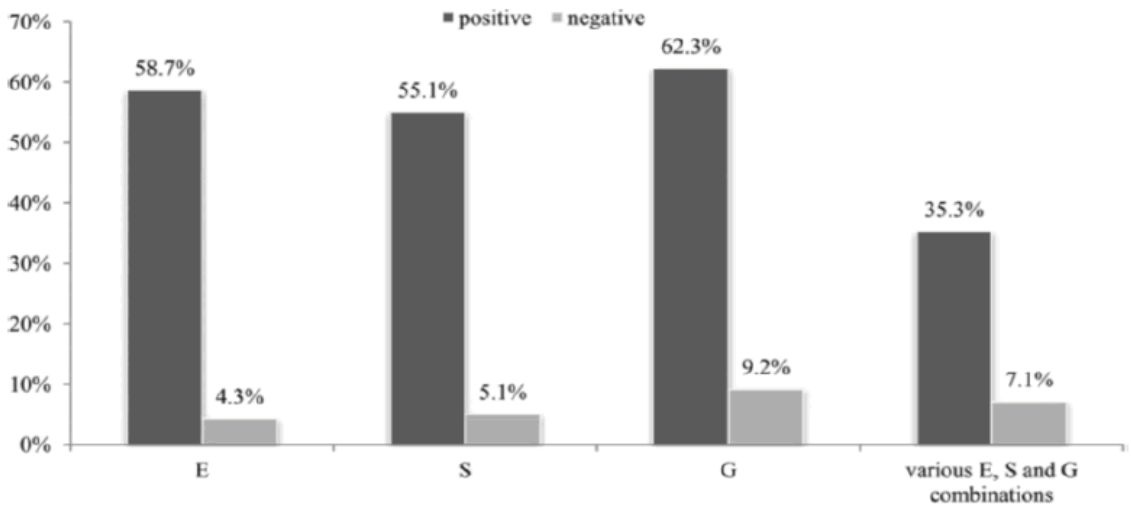

Figure 1
META ANALYSIS SUMMARY
Source: Friede G., Busch T., Bassen A., "ESG and financial performance: aggregated evidence from more than 2000 empirical studies", in *Journal of Sustainable Finance & Investment*, 2015.

This figure provides a valuable benchmark for ESG research, confirming the widely held view that sustainability practices tend to support, rather than hinder, firm value. It also supports the baseline assumption of this study that higher ESG scores are expected to improve or at least not harm firm performance. Importantly, the finding that the governance pillar shows the most consistent positive effect aligns with the empirical results of this thesis, where governance performance similarly shows as the strongest and most stable contributor to financial outcomes among Nordic firms.

However, the overall meta-analytic findings conceal important differences across industries, regions, time periods, and ESG measurement methods. These limitations justify the current study's focus on sector-specific analysis, particularly in the energy and manufacturing industries. This study also uses both accounting and market-based indicators

of performance, and applies various robustness checks, such as alternative ESG data sources, lagged models and fixed effects to ensure reliability.

In addition to Friede et al. (2015), several other studies report comparable findings. Orlitzky et al. (2003) observed a small but positive link between corporate social responsibility and financial performance. Similarly, Revelli and Viviani (2015) found that portfolios focused on socially responsible investments (SRI) tend to perform at least as well as, and sometimes slightly better than, traditional investment portfolios. This evidence supports the view that strong ESG performance can coexist with financial success, although outcomes still depend on context and methodology.

At the policy level, global and regional regulations have highlighted the significance of ESG practices in corporate strategy. In Europe, the Non-Financial Reporting Directive (2014/2017) requires large firms to disclose sustainability information, promoting transparency and comparability. The European Green Deal (2019) set ambitious climate and environmental goals, pushing businesses to integrate sustainability into long-term strategies. Similarly, the Paris Climate Agreement (2015) has raised expectations for corporate environmental responsibility (Christensen, Hail, & Leuz, 2021; European Commission, 2019). These policy developments are particularly relevant in Nordic countries, where firms are recognized as global leaders in sustainability reporting and governance.

Despite extensive research, some areas remain underexplored. Few studies focus specifically on individual sectors such as energy and manufacturing, even though these industries are central to both regional economies and global sustainability transitions. Understanding the ESG–CFP relationship in these sectors is crucial due to their economic significance and substantial environmental and social impacts.

In summary, the literature demonstrates that ESG integration generally enhances firm value, but the magnitude and direction of the relationship vary across sectors, regions,

and measurement approaches. This highlights the need for context-specific analysis especially within the Nordic region and its key industries. The next sections build on this overview by examining sectoral evidence, regional differences, and methodological insights in greater detail.

2.2 Sector-Specific Review

ESG performance affects financial outcomes differently depending on the industry. ESG factors are not equally relevant to all firms; their impact depends on resource intensity, regulatory exposure, and stakeholder expectations (Khan, Serafeim, & Yoon, 2016). In the Nordic region, the energy and manufacturing sectors are especially important because they are both economically central and environmentally intensive. These industries face growing scrutiny due to their contribution to carbon emissions and social responsibility concerns.

Energy Sector

Research on the energy sector shows mixed results. Makridou et al. (2024), studying 85 European energy firms from 1995 to 2020, found that higher environmental scores were weakly negatively related to profitability (ROA). This outcome was attributed to compliance costs under strict environmental regulations and the legacy of carbon-intensive operations. In the short term, social and governance dimensions also deliver limited financial benefits, as regulatory and operational costs often offset potential gains from sustainability initiatives.

However, long-term evidence shows a more positive picture. For example, Denmark's Ørsted transformed from a fossil-fuel-based utility into a leading global company in offshore wind, with renewable energy now forming the main source of its profitability (Dzhengiz, Henry, & Malik, 2023). Norway presents a more complex case, remaining a major oil exporter while also leading in hydropower and electric mobility (Ueckerdt,

Brecha, Luderer, & Bauer, 2017). These examples show that while short-term ESG performance may appear costly in the energy sector, long-term benefits emerge through improved legitimacy, reduced risk, and stronger value creation (Busch, Bauer, & Orlitzky, 2016).

Manufacturing Sector

In comparison, ESG engagement in manufacturing companies generally leads to stable positive outcomes. Tzouvanas et al. (2020), examining 288 European manufacturing firms, found that environmental performance positively correlated with profitability, especially among high-performing firms. Sustainability initiatives in manufacturing often enhance competitiveness through cost savings, innovation, and stronger reputation. Nordic manufacturers, particularly in Finland and Sweden, operate in export-oriented markets where compliance with international ESG standards is increasingly curical for supply chain integration and investor trust (Eccles, Ioannou, & Serafeim, 2014).

Previous research shows that proactive environmental strategies help reduce operating costs, enhance brand reputation, and improve access to financing (Hart & Dowell, 2011; Eccles, Ioannou, & Serafeim, 2014). Additionally, strong social and governance practices such as employee welfare programs, diversity initiatives, and transparent leadership strengthen stakeholder confidence and long-term relationships (Awaysheh, Heron, Perry, & Wilson, 2020).

Sectoral Comparison

Overall, the evidence shows that the ESG–CFP relationship differs sharply between sectors. In energy firms, environmental efforts often involve transition costs that delay financial returns. In manufacturing, ESG engagement more consistently supports profita-

bility through innovation and operational efficiency. This contrast highlights the importance of treating ESG as a sector-dependent phenomenon rather than a universal driver of performance (Clark, Feiner, & Viehs, 2015).

For the Nordic region, both industries demonstrate that sustainability initiatives can create reputational and financial value. However, the strength and timing of these benefits depend on industry structure, regulatory intensity, and investment horizon. This understanding provides the basis for a sector-sensitive analytical framework, essential for evaluating how ESG factors translate into financial outcomes across Nordic firms.

2.3 Regional Variation and Nordic Context

The link between corporate sustainability and financial performance is influenced not only by industry but also by regional and institutional settings. Eccles et al. (2014) showed that U.S. companies with a long-term commitment to sustainability tend to perform better than their peers on both market-based and accounting-based measures. Similarly, Khan et al. (2016) found that concentrating on ESG issues that are most relevant to a company's industry leads to stronger financial outcomes. In contrast, European studies present more mixed findings. Revelli and Viviani (2015) reported neutral average returns for socially responsible investment funds, while Tzouvanas et al. (2020) found positive effects only under specific conditions. These variations highlight the importance of analyzing ESG performance within its regional context.

The Nordic Setting

The Nordic region offers a distinctive environment for studying ESG and financial outcomes. Countries such as Sweden, Denmark, Finland, and Norway are recognized globally for strong sustainability policies, advanced governance systems, and stakeholder-oriented corporate models. National laws and EU regulations, including the Non-Financial Reporting Directive (Directive 2014/95/EU), help promote ESG practices. Strand et

al. (2015) note that Nordic companies frequently combine the goal of generating shareholder value with attention to social and environmental responsibilities, fostering a corporate culture built on trust and accountability. This institutional foundation supports transparent and comparable ESG reporting across the region. (Eccles, Ioannou, & Serafeim, 2014; Awaysheh, Heron, Perry, & Wilson, 2020).

However, Nordic countries are not identical. Treating them as a single unit often conceals meaningful national differences. For example, Denmark has combined strong regulatory support for renewable energy with board-level accountability for ESG implementation (Busch et al., 2016). Sweden, with its high level of investor activism and public trust, also shows a consistent positive ESG–CFP relationship. Both countries show how mature governance systems and transparent reporting strengthen the connection between sustainability and performance.

Finland, by contrast, takes a more efficiency-oriented approach. Firms, particularly in manufacturing and energy, tend to view ESG to reduce operational risks and improve productivity. Studies have linked Finnish ESG engagement to higher profitability and valuation (Bhandari, Ranta, & Salo, 2022), though reporting practices remain less standardized than in Sweden or Denmark. Norway presents a different paradox. While the country leads in renewable energy and electric mobility, its economy remains dependent on oil exports. This dual role creates trade-off between environmental ambitions and short-term profitability. For Norwegian firms, ESG activities enhance legitimacy and resilience, but financial benefits are less immediate.

Regional Implications

Overall, Nordic firms share high governance standards, strong regulatory support, and well-developed stakeholder models, yet the financial effects of ESG differ by country. Sweden and Denmark show consistent positive relationships, Finland demonstrates efficiency-based gains, and Norway reflects the trade-offs of transitioning from fossil fuels.

These variations challenge the view that Nordic firms can be analyzed as a homogeneous group.

A closer, country-specific approach is therefore essential to understand how national institutions, industry structures, and policy frameworks shape the ESG–CFP relationship. This rationale justifies the present study's focus on comparative analysis among Nordic and broader European firms to uncover the mechanisms linking sustainability practices with financial outcomes.

2.4 Leadership and Governance Mechanisms

Leadership and governance structures play a decisive role in how effectively firms implement ESG practices and convert them into financial performance. Research shows that board composition, executive leadership, and oversight mechanisms strongly influence sustainability outcomes (Bouichou et al., 2022; Donkor et al., 2023). In the Nordic region, where institutional frameworks and corporate cultures emphasize accountability and transparency, these governance features are especially important for linking ESG performance with financial results.

Governance: Board Composition and Oversight

Board features, including independence, diversity, and oversight duties, contribute meaningfully to a firm's ESG performance. Research on eight hundred ninety-nine Nordic firms in Sweden, Finland, Denmark, and Norway shows that more diverse. Boards with greater female representation and employee involvement tend to achieve stronger ESG outcomes and better financial results, such as higher return on equity (Yahya, H. 2023).

Nordic boards are also distinguished by high transparency and a stakeholder-oriented decision-making style, both of which enhance accountability and investor confidence.

Compared with many European counterparts, Nordic firms tend to institutionalize governance practices that emphasize strategic, long-term development rather than instant financial outcomes.

Leadership: Ethical Management and Corporate Culture

Ethical leadership is central to creating a corporate culture that supports sustainability. In Scandinavian firms, leaders often pursue a stakeholder-based model that balances the interests of shareholders, employees, communities, and regulators (Strand et al., 2015). This type of leadership builds trust, increases employee engagement, and strengthens a company's reputation, factors that contribute to better financial performance. When management sets a clear tone on ethical conduct and social responsibility, firms are better positioned to maintain legitimacy and manage stakeholder relationships effectively over time.

Regulatory Influence on Governance Practices

Regulation further reinforces the alignment between governance quality and ESG outcomes. The EU Non-Financial Reporting Directive (2014/2017) mandates greater disclosure and board-level accountability for sustainability performance, leading firms to embed ESG oversight within their strategic decision-making (Christensen, Hail, & Leuz, 2021). Nordic firms often exceed these regulatory requirements due to strong institutional trust and proactive corporate governance traditions. As a result, investors generally perceive Nordic companies as transparent and well-governed, which supports both reputational value and long-term financial stability.

To analyze the impact of these regulatory frameworks, this study includes variables representing the implementation of key policy events such as the EU Non-Financial Reporting Directive (2014) and the Paris Agreement (2015). Interaction terms between these

events and firm-level ESG scores allow for assessment of how policy changes influence the ESG–financial performance relationship across sectors.

Link to ESG Dimensions

Leadership and governance mechanisms affect all three ESG dimensions:
Environmental: Board oversight and ethical leadership guide environmental compliance, emission reduction, and climate strategy.
Social: Leadership and board policies affect Labor standards, employee wellbeing, diversity, and stakeholder engagement.
Governance: Transparent decision-making, independent oversight, and diverse boards strengthen accountability and strategic ESG management.

Overall, Nordic firms demonstrate that effective leadership and governance can amplify the financial benefits of ESG engagement. Strong institutional frameworks, stakeholder-oriented cultures, and proactive regulation enable these firms to integrate sustainability into their strategic management processes. These mechanisms are particularly influential in energy and manufacturing industries, where responsible leadership and rigorous governance are critical for balancing environmental performance with long-term financial success.

2.5 Theoretical Frameworks

As briefly outlined in Chapter 1.4, the relationship between Environmental, Social, and Governance (ESG) practices and corporate financial performance can be understood through two complementary theoretical perspectives: Stakeholder Theory and the Resource-Based View (RBV).

These frameworks together provide both a conceptual and practical foundation for understanding how sustainability initiatives can create long-term value, strengthen, competitive advantage and enhance firm performance particularly within the Nordic context, where sustainability and stakeholder orientation are deeply institutionalized.

Stakeholder Theory

According to stakeholder theory, firms generate sustainable value by considering the expectations of both internal and external groups, such as shareholders, management, regulatory authorities, and other relevant parties (Freeman, 1984; Carroll, 1999). This framework helps explain how corporate strategies influence long-term performance and build legitimacy among affected parties. In the Nordic countries, where stakeholder interests are deeply embedded in corporate governance and culture, this approach is particularly relevant. ESG practices that responds to these concerns such as promoting employee wellbeing, maintaining labour standards, supporting diversity, and engaging with local community help build trust, and strengthen legitimacy. Strong stakeholder relationships can lead to better financial outcomes. Research shows that firms with stakeholder-oriented strategies tend to outperform their peers on both accounting- and market-based measures (Eccles et al., 2014). Nordic firms benefit from well-established and systematic stakeholder engagement, which can enhance the financial gains from ESG initiatives.

Resource-Based View (RBV)

The RBV complements Stakeholder Theory by focusing on the internal resources and capabilities that ESG practices create. When ESG initiatives are implemented effectively, they can become valuable, rare, and inimitable resources, giving firms a lasting competitive advantage (Barney, 1991). These capabilities help firms to differentiate themselves, increase efficiency, and achieve long-term profitability (Bhandari, Ranta, & Salo, 2022).

In the Nordic context, firms benefit from strong institutional support, regulatory incentives, and advanced reporting standards, which further enhance these ESG capabilities making them more effective across industries like energy and manufacturing.

Integrative Perspective

Together, these two perspectives offer a full picture of how ESG practices influence financial performance. Stakeholder Theory explains how firms create value by aligning with social and governance expectations, while RBV shows how ESG-related capabilities can provide a competitive edge. This combination helps explain why Nordic firms, with strong governance, transparency, and proactive sustainability practices, can translate ESG initiatives into measurable financial gains. In short, both social and resource-based mechanisms play a role in linking ESG practices to firm performance in this region.

Figure 2: Theoretical Framework on ESG Practices to Financial Performance in Nordic Firms

Note: Author's own illustration, based on concepts from Freeman (2010) and Barney (1991).

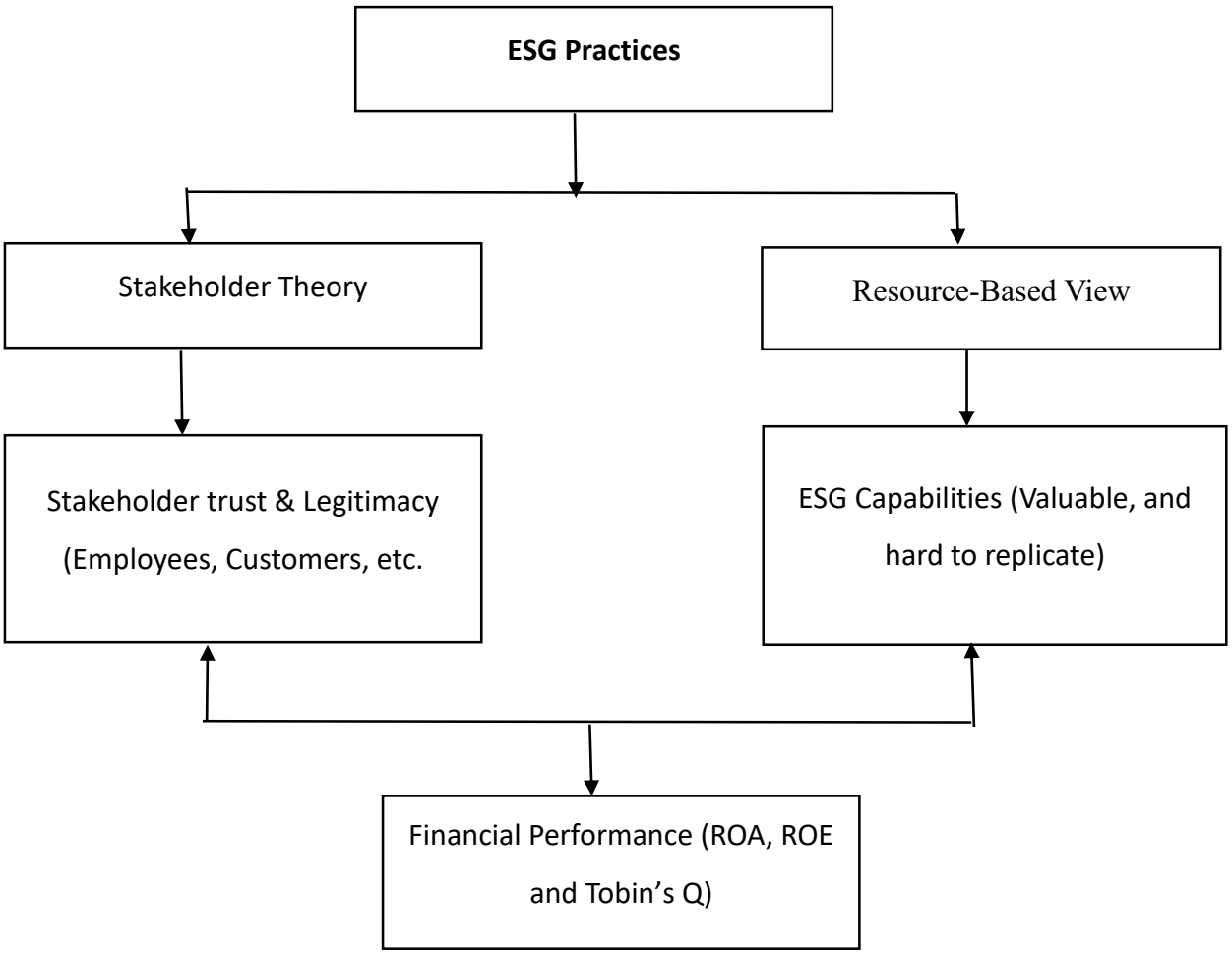

Figure 2 explains how ESG practices affect financial performance through two main mechanisms: the stakeholder mechanism and the resource-based mechanism.

The stakeholder mechanism illustrates that aligning business practices with the expectations of relevant groups through social, environmental, and governance initiatives helps firms build credibility and strengthen their public image. By addressing these expectations, organizations can foster stronger relationships with employees, customers, regulators, and communities, ultimately supporting long-term value creation. These outcomes improve both accounting-based and market-based financial performance by fostering loyalty, reducing risk, and attracting long-term investors.

The Resource-Mechanism focuses how ESG initiatives create unique and valuable resources capabilities, such as investments in environmental innovation, transparent governance and ethical operations create resources that are difficult for competitors to replace. These resources contribute to sustained profitability and competitive advantage.

Both mechanism work together to improve financial performance, measured by metrics such as ROA, ROE, and Tobin's Q. The figure highlights that the financial benefits of ESG come from both social mechanisms (trust and legitimacy) and resource-based mechanisms (capabilities and competitive advantage). This combined effect is particularly relevant in Nordic context, where strong governance system and institutionalized sustainability values amplify the financial advantages of ESG practices.

2.6 Methodological Implications from the Literature

The empirical relationship between ESG practices and corporate financial performance (CFP) is highly sensitive to variable measurement choices, research design, and firm-specific characteristics. Earlier studies show that variables such as financial performance indicators, ESG metrics, firm-level controls, governance features and analytical techniques significantly affects results (Friede, Busch, & Bassen, 2015; Velte, 2017). Understanding these methodological issues is crucial for designing reliable analyses, particularly within the Nordic context.

Financial Performance Measures

Financial performance can be evaluated using both accounting-based and market-based measures. Accounting indicators, such as ROA, ROE, and Operating Profit Margin, show how efficiently a company manages its operations and generates profits (Waddock & Graves, 1997; Orlitzky et al., 2003). Market indicators, including Tobin's Q and stock returns, reflect investor expectations and the firm's ability to generate value over the long term (Margolis & Walsh, 2003; Velte, 2017). In this study, ROA, ROE, and Tobin's Q are

used together to capture a comprehensive picture of firm performance from both internal operations and market perspectives.

ESG Measurement Approaches

ESG performance can be measured using external ratings (e.g., MSCI, Sustainalytics, Refinitiv, Bloomberg) or through disclosure-based indices derived from company reports. Variations in these approaches explain much of the inconsistency in prior findings (Chatterji et al., 2016). Disaggregating ESG into Environmental, Social, and Governance factors offers a more nuanced perspective in the context of Nordic firms. Environmental factors are often most material in energy-intensive sectors, while social and governance dimensions are more important in manufacturing (Clark, Feiner, & Viehs, 2015; Khan, Serafeim, & Yoon, 2016). Aggregated ESG scores may obscure these distinctions; therefore, this study focuses on disaggregated measures to capture sector-specific materiality. Missing or inconsistent ESG data are addressed through imputation and validation checks to ensure data quality and analytical robustness.

Firm-Level Controls

To mitigate omitted variable bias, prior research incorporates firm-specific characteristics, including:

Firm size: Larger firms typically have greater capacity to implement sustainability initiatives (Waddock & Graves, 1997).

Leverage (debt-to-equity ratio), highly leveraged firms may face constraints that limit ESG investment (Jo & Harjoto, 2011).

Firm age: Older companies often experience greater pressure to maintain legitimacy, which can lead to higher levels of ESG engagement (Peng & Beamish, 2014).

Industry and year effects: Including these controls accounts for differences in ESG relevance across industries and over time, helping to isolate the true impact of ESG practices (Khan, Serafeim, & Yoon, 2016).

Additional controls such as ownership structure, R&D intensity, and capital intensity are also relevant, particularly in resource-intensive or innovation-driven industries (Eccles, Ioannou, & Serafeim, 2014).

Analytical Methods

Most ESG–CFP studies use panel regression models with fixed effects to control for firm-specific heterogeneity (Velte, 2017). Researchers often address potential endogeneity where financially strong firms may also be more likely to engage in ESG by employing advanced methods such as lagged ESG variables, instrumental variables, or generalized method of moments (GMM) estimators (Friede, Busch, & Bassen, 2015). While these approaches enhance causal inference, the present study applies a fixed-effects panel regression estimated with Panel Corrected Standard Errors (PCSE). This approach accounts for heteroskedasticity and contemporaneous correlation across firms, ensuring more reliable and efficient estimates. The method aligns with established ESG–CFP research while remaining appropriate for the structure and scope of the dataset.

Implications for this research

This study adopts the following approach:
Measures financial performance using ROA, ROE, and Tobin's Q to cover both accounting and market perspectives.
Examines ESG scores separately for each sector to capture industry-specific differences.
Includes firm-level controls such as size, age, leverage, industry, and year to reduce potential bias.

Use fixed-effects panel regression with lagged ESG variables to address endogeneity and strengthen the reliability of the results.

This methodological framework aligns with previous research while addressing the unique institutional and sectoral characteristics of Nordic firms, allowing for a rigorous analysis of ESG's financial impact.

2.7 Summary of Literature Gap

Despite extensive research on ESG and corporate financial performance (CFP), several important gaps remain, especially regarding sectoral variation and the Nordic context.

First, sector-specific evidence is still limited. While studies such as Tzouvanas et al. (2020) and Makridou et al. (2024) examine manufacturing and energy sectors individually, few directly compare them. This is important because energy firms often face high regulatory and transition costs, while manufacturing firms may benefit from efficiency gains and innovation linked to sustainability practices. Without cross-sector analysis, it is difficult to assess how ESG engagement affects financial outcomes in industries that are both environmentally intensive and economically significant for the Nordic region.

Second, Nordic firms remain underrepresented in empirical ESG research. Despite being recognized globally for sustainability leadership and advanced governance systems, most prior studies focus on broader European or global samples. This approach risks overlooking region-specific institutional and cultural factors. Recent research (Yahya, 2023) has begun addressing this gap, but comprehensive cross-sectoral analysis of Nordic firms is still limited.

Third, governance mechanisms unique to the Nordic model are not well explored. Institutional features such as gender quotas, employee board representation, and high trust

in regulatory systems may be key determinants of ESG adoption and financial performance. Few studies examine how this governance structures mediate the ESG–CFP link.

Fourth, the influence of regulatory frameworks requires closer attention. EU-level directives such as the Non-Financial Reporting Directive (2014/2017) and the upcoming Corporate Sustainability Reporting Directive (CSRD) interact with national policies, creating a complex institutional environment. Few studies assess how these overlapping regulations shape corporate sustainability practices or financial outcomes in the Nordic setting.

Finally, methodological challenges persist. Results in the ESG–CFP literature vary depending on measurement choices, time horizons, and analytical models (Friede et al., 2015). For Nordic firms, additional context-specific factors such as energy intensity, innovation capacity, and stakeholder pressures should be incorporated into empirical designs. Moreover, differences between rating-based and disclosure-based ESG measures continue to limit comparability across studies.

Overall, these gaps justify a focused study on Nordic energy and manufacturing firms. By comparing sectors, including Nordic-specific governance variables, and accounting for regulatory effects, this research aims to provide a more precise understanding of thefinancial implications of ESG engagement. The next chapter outlines the methodological framework used to examine these relationships in detail.

3 Methodology

This chapter presents the methodology applied to explore the link between ESG performance and financial results among publicly listed companies in the Nordic region. This begins by describing the overall research design, explaining the approach taken to ensure that the study's objectives are addressed systematically. Following this, the chapter outlines the procedures used to gather data, including the sources of information, the criteria for selecting firms, and the period covered by the analysis and define the sample. Next, it describes how the key variables for both ESG and financial performance measures are defined, and it presents the econometric models applied to test the proposed hypotheses. The chapter concludes by discussing potential methodological limitations, such as data availability, and by evaluating the rigor and credibility of the outcomes to ensure the findings are robust and meaningful.

3.1 Research Approach

Following Creswell and Creswell (2018), this research utilizes a quantitative design to investigate how Environmental, Social, and Governance (ESG) performance relates to financial outcomes in publicly listed Nordic firms over the period 2012–2022. Given the emphasis on measurable relationships, a quantitative framework provides the statistical rigor necessary for hypothesis testing and the objective evaluation of variable associations. This design aligns with the study's broader goal of empirically assessing whether sustainable business practices translate into enhanced financial performance. Moreover, this approach also enables the examination of potential causal relationships between variables and allows the findings to be generalized from the sample firms to the broader corporate population (Saunders et al., 2019).

Furthermore, a quantitative methodology makes it possible to explore potential causal relationships among the variables and ensures that the findings from the selected sample can be reasonably generalized to the wider population of firms. This approach also supports the use of panel regression models, which provide robust insights into the dynamics of ESG performance and financial metrics over time, considering firm-level differences and other significant variables (Saunders et al., 2019).

3.2 Research Design

A panel data research design is employed, integrating both cross-sectional and time-series observations, which allow researchers to examine how relationships develop both across firms and over time (Wooldridge, 2016). This design provides several advantages over pure cross-sectional or time-series approaches, including more information and variation in the data, lower risk of multicollinearity, and the capacity to control for firm-level characteristics that do not differ over time (Hsiao, 2104).

Both descriptive and analytical statistical methods are applied. Descriptive statistics are used to summarize key data attributes, including mean, median, standard deviation, and range, which aid in understanding the data distribution and detecting potential outliers. Following, (Leone et al., 2015), ROA, ROE, Operating Profit Margin, and Stock Return were winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. Other variables were not winsorized, as their distributions did not exhibit extreme skewness or kurtosis. In contrast, analytical methods are applied to test the research hypotheses and evaluate the effect of ESG measures on firms' financial outcomes (Fama & French, 2020).

All analyses are carried out in EViews 13. The workflow begins with descriptive summaries and correlation analysis to give an initial picture of the data and to gauge relationships among variables. The main estimations employ panel regression models with fixed effects to assess how ESG disclosure relates to multiple indicators of firm performance. Accounting-based metrics indicator Return on Assets (ROA), Return on Equity (ROE), and

Operating Profit Margin, while market-based proxies include Tobin's Q and Stock returns. A set of control variables, such as firm size, log leverage, and log firm age, is included in the models to limit omitted-variable bias and bolster the reliability of the estimated results (Baltagi, 2021).

Furthermore, combined regressions are performed for large-cap and mid-cap firms to explore whether the impact of ESG on performance depends on firm size. m This comparative approach strengthens the robustness and interpretive depth of the findings by revealing potential differences in sustainability performance dynamics across firm categories. ‘

3.3 Data Collection and Source

This research utilizes secondary data obtained from LSEG Workspace which provides comprehensive and standardized firm-level information on Environmental, Social, and Governance (ESG) which offers extensive and standardized firm-level data on Environmental, Social, and Governance (ESG) metrics, along with corresponding financial performance indicators.

The use of secondary data on this study is appropriate because it maintains consistency and comparability of the variables across time, ensuring reliable measurement of the research conduct (Zikmund et al., 2013). Moreover, the data retrieved from LSEG Workspace is well established in sustainability and finance research and is recognized for its methodological rigor, making it a dependable foundation for empirical analysis in sustainable finance (Berg et al., 2022).

The dataset covers publicly listed Nordics companies over an 11-year period (2012–2022). Banks and financial insurance companies were removed from the sample because their reporting convention and regulatory requirements differ from financial firms. The initial dataset included 151 firms, consisting of 89 mid-cap and 62 large-cap firms, with a total of 1,661 firm-year observations.

After cleaning the data, the Number of observations shows minor variation across the models. First, a conservative approach, removed any firm-year with missing values for any variable used in any model (ESG scores, all pillar scores, accounting variables, market variables and controls). This gave a main sample of 1,395 observations used in analyses that combine variables across models. Second, for each specific model, only the variables required for that model were considered. For example, accounting-based models could include firm-years with complete accounting data even if some market or pillar variables were missing, resulting in 1,406 observations. Similarly, market-based regressions using stock returns excluded firm-years with missing price data, resulting from 1,392 to 1,403 observations depending on the model.

Table 1 summarizes the sample at each stage of cleaning and the final observation counts used in model groups. number of observations used in each type of regression. The differences in observation counts arise because some firm-year records are missing specific variables, and model-specific listwise deletion allows each regression to use all available data without introducing bias.

Table 1. Sample selection and final observation counts

Step	Firms	Firm-Year Observations	Notes
Initial dataset	151	1,661	Raw data from 2012–2022
After removing missing ESG/ financial data (conservative approach)	142	1,395	Main sample for combined analyses
Accounting-based regressions (ROA, ROE, OPM, market-based log Tobin's Q)	151	1,406	Includes firm-years with complete accounting data, even if market/pillar variables are missing
Market-based analysis (stock returns)	151	1,392	Firm-years with missing stock prices removed
Market-based regressions (pillar-level stock return)	151	1,403	Model-specific sample for pillar-level regressions

The ESG scores, including the overall ESG and the three pillar scores (environmental, social, and governance), were collected from LSEG Workspace. Financial performance variables (ROA, ROE, OPM, Tobin's Q, Stock Return) and control variables (firm size, leverage, firm age) were also obtained from LSEG. Extreme values in ROA, ROE, operating profit margin, and stock return were addressed by winsorizing at the 1st and 99th percentiles. Other variables were not winsorized, as their distributions appeared sufficiently normal without extreme values. Transformations, such as log transformations for firm size, leverage and Tobin's Q, were applied in the regression. These details are described further in the Estimation and Diagnostics section.

3.4 Variable Measurement

In this study, the variables are classified as dependent variables, ESG-related independent variables, and control variables that capture other factors potentially affecting the

outcomes. Table 2 provides a detailed summary of all variables, their measurement methods, and supporting references from the existing literature.

Table 2. Variables Description, Measurement, and References

Variable Type	Variable Name	Description	Measurement	Reference
Dependent	ROA	Return on Assets	Net Income/Total Assets	(Atan et al., 2018)
Dependent	ROE	Return on Equity	Net Income /Shareholders' Equity	LSEG Workspace
Dependent	Operating Profit Margin (OPM)	Accounting-based profitability	Operating Profit/ Revenue	LSEG Workspace
Dependent	Tobin's Q	Market-to-Book Value	(Market Capitalization + Total Debt) /Total Assets	Chung & Pruitt (1994)
Dependent	Stock Return	Market-based performance	Percentage change in stock price	LSEG Workspace
Independent	ESG	Overall ESG Score	Composite ESG rating (0–100)	Eccles et al. (2014)
Independent	Environment	Environmental Score	Sub-score (0–100)	(Drempetic et al., 2020)
Independent	Social	Social Score	Sub-score (0–100)	Singhania & Saini (2023)
Independent	Governance	Governance Score	Sub-score (0–100)	Arayssi et al., 2020

Control	Firm Size	Firm Size	Natural logarithm of Total Assets	Alareeni & Hamdan (2020)
Control	Leverage	Leverage	Total Debt /Total Assets	Buallay, A. (2019)
Control	FIRM_AGE	Firm Age	Years since incorporation	Peng & Beamish, 2014
Control	Industry FE	Industry Fixed Effects	NACE two-digit dummies	Khan, Serafeim, & Yoon, 2016
Control	Year FE	Year Fixed Effects	Dummy variables for 2012–2022	

3.4.1 Dependent Variables

This study uses five key indicators to measure firm financial performance. These variables capture both accounting-based and market-based performance dimensions and are commonly used in ESG-related research. Accounting-based indicators reflect a company's operational efficiency and profitability, whereas market-based indicators capture investor perceptions and the firm's market valuation.

Accounting-Based Variables:

(1) Return on Assets (ROA):

ROA reflects the firm's capacity to transform total assets into net income, indicating overall operational effectiveness (Giannopoulos et al., 2022). (Giannopoulos et al., 2022). Return on Assets (ROA) is determined using Equation (1).

Return on Assets(ROA)= $\frac{Net\ Income}{Total\ Assets}$ (1)

In studies examining ESG and financial performance, ROA is commonly used because it links sustainability efforts such as resource optimization and waste reduction to a company's profitability (Alareeni & Hamdan, 2020).

(2) Return on Equity (ROE):

ROE represents the return a company generates on the equity invested by its owners, reflecting the firm's capacity to create profits from owners' funds (Li, 2024). It is commonly used to evaluate how ESG strategies influence profitability from the shareholders' perspective. The formula for ROE is presented in Equation (2).

$$\textbf{Return on Equity (ROE)} = \frac{\text{Net Income}}{\text{Shareholders' Equity}} \quad (2)$$

(3) Operating Profit Margin (OPM):

The Operating Profit Margin (OPM) reflects how much of a company's revenue remains after covering its operating expenses. It is used as a key indicator of managerial efficiency and the firm's overall operational effectiveness (Brown et al., 2019). The formula for OPM is presented in Equation (3).

$$\textbf{Operating Profit Margin (OPM)} = \frac{Operating\ Profit}{Revenue} \quad (3)$$

This measures helps to capture the effect of ESG activities on a company's core profitability and operational efficiency.

Market-Based Variables:

(4) Tobin's Q:

Tobin's Q is a market-based indicator that captures the ratio between a firm's market valuation and the replacement cost of its assets, thereby reflecting investors' expecta-

tions of future performance (Chung & Pruitt, 1994). It serves as a measure of how effectively a company's assets are being valued by the market relative to their book value. The ratio is computed as shown in Equation (4):

$$\textbf{Tobin's Q} = \frac{\text{Market Capitalization} + \text{Total Debt}}{Total\ Assets} \quad (4)$$

(5) Stock Return:

Stock return represents the total gain or loss experienced by shareholders over a given period, accounting for both capital appreciation and dividend income. It reflects how effectively a company creates value for its investors within the market. The return is determined as shown in Equation (5):

$$\textbf{Stock Return} = \frac{\text{Price at End of Period} - \text{Price at Beginning of Period} + \text{Dividends}}{Price\ at\ Beginning\ of\ Period} \quad (5)$$

In the context of ESG research, stock return is commonly used to evaluate how investors respond to a firm's sustainability initiatives.

3.4.2 Independent Variables

This study's independent variables are organized across four dimensions capturing ESG performance: overall ESG, environmental, social, and governance. These variables capture how companies manage sustainability and their responsibilities toward stakeholders.

(1) ESG Score:

The ESG score measures a company's overall sustainability performance across environmental, social, and governance areas, offering a broad measure of corporate sustainability engagement (Eccles et al., 2014). It provides a summary measure of how well a

firm integrates ESG practices into its strategy and operations, with higher scores indicating stronger commitment to sustainable business practices.

(2) Environmental Score:

The environmental score focuses on how a company manage its ecological impact through energy management, emission control, sustainable water use, and climate-related initiatives (Drempetic et al., 2020). This score provides insight into how firms address environmental challenges and integrate sustainable practices into their operations, particularly in sectors with substantial environmental footprints.

(3) Social Score:

The social score evaluates how well a firm manages its relationships with employees, customers, and the wider community, covering employee management, protection of human rights, community initiatives, and customer responsibility (Singhania & Saini, 2023). This measure shows how effectively a company meets its social obligations and maintains positive relationships with its stakeholder.

(4) Governance Score:

The governance score assesses the strength of a firm's corporate governance framework, covering board structure, executive pay, shareholder protections, and ethical standard (Arayssi et al., 2020). Good governance supports effective implementation of sustainability strategies and compliance with stakeholder expectations.

3.4.3 Control Variables

To ensure a robust analysis of the relationship between ESG performance on financial outcomes, this study includes several control variables. These variables capture firm- specific characteristics that may influence both ESG and financial performance.

(1) Firm Size:

To measure firm size, the study uses the natural logarithm of total assets, as suggested by Alareeni and Hamdan (2020). Larger firms tend to have more resources to invest in ESG initiatives and may benefit from economies of scale in implementing sustainability practices. Firm size can influence both ESG adoption and financial performance. The formula for firm age is given in Equation (6).

Firm Size= ln (Total Assets) (6)

(2) Firm Age:

Firm age is calculated based on the number of years since the company's establishment. Older firms typically have more established governance structures, which can affect both ESG adoption and financial outcomes. The calculation is presented in Equation (7):

Firm Age = Current Year−Year of Establishment (7)

(3) Leverage:

Leverage shows how much debt a company has compared to its total assets, giving an idea of its financial risk (Buallay, 2019). Highly leveraged firms may have less flexibility and could face higher fnancial risk, which can affect their overall performance. The leverage ratio is calculated as:

Leverage= $\frac{\boldsymbol{Total\ Debt}}{\boldsymbol{Total\ Assets}}$ (8)

3.5 Model Specification

Building on prior ESG–finance studies, this research applies panel data regression models to explore the impact of Environmental, Social, and Governance (ESG) performance influences corporate financial performance among Nordic firms. Two sets of models are developed to examine both accounting-based and market-based performance indicators.

Return on Assets, Return on Equity and Operating Profit Margin as dependent variables represent internal profitability, while Stock Return and the logarithm of Tobin's Q reflect investor valuation of firm sustainability.

This dual structure provides a comprehensive assessment of ESG performance from both operational efficiency and market valuation perspectives. The same model specification is applied to the combined dataset of mid-cap and large-cap firms to examine whether firm size influences the relationship between ESG performance and financial outcomes.

The Hausman test is used to decide whether a fixed-effects or random-effects panel model fits the data better. The results suggest using a fixed-effects model, which helps account for firm characteristics that don't change over time and could affect both ESG performance and financial results. This approach allows the study to focus on the real impact of a company's sustainability practices on its financial performance.

3.5.1 Accounting-Based Performance Model

The accounting-based model evaluates the impact of ESG performance on firm internal financial outcomes, using Return on Assets (ROA), Return on Equity (ROE), and Operating Profit Margin (OPM) as dependent variables. The model specification for ROA is expressed as follows (Equation 9):

$$ROA_{it} = \alpha + \beta_1 ESG\_Score_{it} + \beta_2 Firm\_Age_{it} + \beta_3 log\_Firm\_Size_{it} + \beta_4 log\_Leverage_{it} + u_i + \varepsilon_{it} \quad (9)$$

Similar specifications are applied for ROE and OPM, u_i captures unobserved firm-specific effects, and ε_{it} represents the idiosyncratic error term.

3.5.2 Market-Based Performance Model

To capture market-based outcomes log Tobin's Q and Stock Return are included as dependent variables. The following equation represents the specification for log Tobin's Q (Equation 10).

$$\log\_Tobin's\_Q_{it} = \alpha + \beta_1 ESG\_Score_{it} + \beta_2 Firm\_Age_{it} + \beta_3 log\_Firm\_Size_{it} + \beta_4 log\_Leverage_{it} + u_i + \varepsilon_{it} \quad (10)$$

A similar equation is applied for Stock Return. This examine whether ESG performance has an impact on a company's market valuation, controlling for firm-specific characteristics.

3.5.3 Sectoral Model

To capture industry-specific heterogeneity, the sectoral model incorporates interaction terms with industry dummies for the Energy and Manufacturing sectors. This allows testing whether the ESG–financial performance connection is stronger or weaker in different industries. The model for ROA is expressed as follows (Equation 11):

$$ROA_{it} = \alpha + \beta_1 ESG\_Score_{it} + \beta_2 Firm\_Age_{it} + \beta_3 log\_Firm\_Size_{it} + \beta_4 log\_Leverage_{it} + \beta_5 ESG\_Score_{it} * Energy\_Dummy_{it} + \beta_6 ESG\_Score_{it} * Manufacturing\_Dummy_{it} + u_i + \varepsilon_{it} \quad (11)$$

Equivalent specifications are used for ROE, Operating Profit Margin, Tobin's Q, and Stock Return to capture similar effects across all performance measures.

3.5.4 Policy-Event Model

To assess the potential influence of sustainability-related policy events on the ESG–financial performance link, this model introduces policy event dummies for major European sustainability initiatives. These include the Post-Paris Agreement (2015), Post-Non-Financial Reporting Directive (2017), and Post-European Green Deal (2019). The dummy

variables equal 1 for the years following each policy event, and otherwise. The regression for ROA is given by Equation (12):

$$ROA_{it}=\alpha+\beta_1 ESG\_Score_{it}+\beta_2 Firm\_Age_{it}+\beta_3 log\_Firm\_Size_{it}+\beta_4 log\_Leverage_{it}+\beta_5 ESG\_Score_{it}*Post\_Paris_{it}+\beta_6 ESG\_Score_{it}*Post\_NFRD_{it}+\beta_7 ESG\_Score_{it}*Post\_Green\_Deal_{it}+u_i+\varepsilon_{it} \quad (12)$$

The same model structure applies to ROE, Operating Profit Margin, Log Tobin's Q, and Stock Return.

3.5.5 Lagged Model

To capture delayed effects of ESG on firm performance, lagged models are estimated using a one-year lag of the ESG score (ESG_{t-1}). This allows assessment of long-term impacts on accounting- and market-based measures. Equation (13) shows the specification for ROA.

$$ROA_{it}=\alpha+\beta_1 ESG\_lag_{it}+\beta_2 Firm\_Age_{it}+\beta_3 log\_Firm\_Size_{it}+\beta_4 log\_Leverage_{it}+u_i+\varepsilon_{it} \quad (13)$$

Corresponding equation are estimated for ROE, Operating Profit Margin, Tobin's Q, and Stock Return.

3.5.6 ESG Pillar-level Model

To identify the contribution of ESG component, the pillar-level model includes Environmental**,** Social**,** and Governance pillars as independent variable. This approach distinguishes which ESG dimension primarily drives financial performance. ROA is modeled as indicated in Equation (14).

$$ROA_{it}=\alpha+\beta_1 Environmental\_Score\_Pillar_{it}+\beta_2 Social\_Score\_Pillar_{it}+\beta_3 Governance\_Score\_Pillar_{it}+\beta_4 log\_Firm\_Size_{it}+\beta_5 Firm\_Age_{it}+\beta_6 log\_Leverage_{it}+u_i+\varepsilon_{it} \quad (14)$$

Similar models are run for ROE, Operating Profit Margin, Log Tobin's Q, and Stock Return to examine the impact of individual ESG pillars on all performance indicators.

3.6 Model Selection and Hausman Test

To select the most appropriate model specification, the Hausman test was employed, which evaluates whether unobserved, time-invariant firm characteristics are associated with the regressors (Wooldridge, 2016).

If the correlation is not statistically significant ($p > 0.05$), the Random Effects model is chosen because it is more efficient. If the correlation is significant ($p < 0.05$), the Fixed Effects model is preferred, as it gives consistent and unbiased estimates (Wooldridge, 2016). The specific results and chosen models are presented in Table 11 in the Results section.

3.7 Robustness Checks

To ensure the reliability of the main results, several robustness checks were conducted:

First, a one-year lag of the ESG score was included to explore delayed whether sustainability performance affect financial outcomes with a delay, both for accounting-based and market-based indicators.

Second, pooled OLS regressions were estimated as a benchmark, allowing comparison with the panel data results and confirming that the overall direction and magnitude of relationships remain stable across models.

In addition, pillar-level analyses were conducted to isolate the individual effects of the Environmental, Social, and Governance components on firm performance, highlighting which dimension has the strongest influence.

The Hausman test results described in Section 3.6 guided model selection for these robustness checks, ensuring that Fixed- or Random-Effects specifications were applied consistently.

Finally, the results indicated that a Fixed-Effects specification is most appropriate for ROA, ROE, and Tobin's Q, whereas Random-Effects models fit for Operating Profit Margin and Stock Return.

overall, these tests confirm that the findings are robust across specifications and provide additional insight into both the short-term dynamics and the pillar-specific contributions of ESG performance.

3.8 Estimation Approach

3.8.1 Specification of the Panel Data Model

Following Wooldridge (2016), a static panel specification is adopted to examine the link between sustainability performance (ESG) and financial outcomes for Nordic firms over 2012–2022. Panel methods are appropriate here because they allow the analysis to separate time-invariant firm characteristics from within-firm variation, while estimating the contemporaneous association between ESG indicators and both accounting- and market-based performance measures.

Several factors support the static panel choice. First, prior evidence suggests that the ESG–financial performance relationship is largely stable over short to medium horizons, with limited dynamic feedback in the near term (Giannopoulos et al., 2022). Unlike decisions on capital structure or major investments that often depend on past actions, ESG disclosure effects are typically expected to materialize within the same period or after only modest delays (Velte, 2017).

Second, static panel models implemented here with a fixed-effects specification offer a robust way to control observed and unobserved heterogeneity across firms. By removing effects of firm attributes that do not change over time (for example, leadership style, organizational culture, or strategic orientation), the fixed-effects approach helps reduce omitted-variable bias in the ESG–performance estimations (Greene, 2018).

Finally, using a static panel aligns with common empirical practice in the ESG literature. Studies such as Broadstock et al. (2021) and Elamer & Boulhaga (2024) use static panel frameworks to examine the contemporaneous relationship between ESG metrics and firm value or accounting performance. These models are effective because they handle both cross-sectional and time-series variation in accounting data.

Dynamic panel methods can capture effects that unfold over multiple periods and account for potential influences of past performance on current outcomes. However, this study focuses on the contemporaneous impacts of ESG disclosure. This approach is supported by recent reviews and empirical studies (Friede et al., 2015) and is therefore implemented using a static panel framework.

3.8.2 Estimation Approach and Diagnostics

All analyses were performed using EViews 13**.** Panel regressions are estimated for accounting-based outcomes (ROA, ROE, OPM) and market-based outcomes (log Tobin's Q, annual stock return). Each specification includes the ESG measure or pillar scores and control variables for firm age, log firm size and log leverage, with firm and year effects to account for time-invariant heterogeneity and common shocks.

Model selection was guided by the Hausman test (see Section 3.6); fixed-effects specifications were applied when appropriate, using panel-corrected standard errors, while random-effects models reported firm-clustered standard errors.

Stock returns are winsorized at the 1st and 99th percentiles reduce the influence of extreme observations (see Section 3.2). Pairwise correlations were inspected for multicollinearity. A notable correlation between log firm size and log Tobin's Q was observed, however, sensitivity checks (estimations excluding log firm size) showed that the main coefficients of interest, including the ESG effects, remained substantively unchanged. Therefore, log firm size is retained in the baseline specifications for interpretability.

The robustness checks described earlier in Section 3.7, including lagged ESG specifications and pillar-level analyses, were applied to ensure the stability of the estimation results.

Descriptive summaries and correlation analysis were conducted first to provide an initial overview of the data and relationships among variables. Full test statistics and robustness tables are presented in Chapter 4.

4 Data

4.1 Data Source

This research is based on panel data covering publicly listed firms in the Nordic region from 2012 to 2022. After removing firms with missing ESG or financial data, the final dataset consists of 142 firms and 1,395 firm-year observations. The sample combines both mid-cap and large-cap firms across Denmark, Finland, Norway, and Sweden.

The main dependent variables are ROA, ROE, operating profit margin, Tobin's Q (log), and annual stock return. The primary explanatory variable is the overall ESG score, with separate pillar scores used for additional analyses. Control variables include firm size (log of total assets), firm age (years since incorporation), and leverage (log of total debt divided by total assets).

A summary of variables definitions and descriptive statistics is presented in Table 3, while detailed data collection and cleaning steps are described in Section 3.3.

4.2 Descriptive Statistics

Table 3 describes the descriptive statistics for the key variables used in this study. It covers 1,392 firm-year observations of publicly listed Nordic companies from 2012 to 2022. The table reports the average values, standard deviations, and the minimum and maximum figures for each variable, helping to explain and support the regression analysis discussed in Section 4.4.

Table 3 Descriptive Statistics of Key Variables (2012–2022)

Variable	Mean	Median	Std. Dev.	Min	Max
ROA (%)	9.666	6.670	19.696	-79.740	358.880
ROE (%)	13.726	13.645	37.760	-1005.290	468.700
Operating Profit Margin (%)	-19.626	8.115	490.474	-10634.990	1293.000
Stock Return (%)	172.939	0.077	6379.397	-1.000	238009.100
LOG_TOBIN_S_Q	1.189	0.093	2.615	-0.689	8.653
ESG_SCORE	36.690	42.400	30.468	0.000	93.020
FIRM_AGE (years)	71.792	53.000	59.226	0.000	392.000
LOG_FIRM_SIZE	0.983	1.177	0.528	-1.703	1.306
LOG_LEVERAGE	-0.221	-0.147	0.660	-5.213	1.435

Note: ROA, ROE, Operating Profit Margin, and Stock Return are winsorized at the 1st and 99th percentiles. All other variables are reported in their original form. For methodological details and rationale, see Section 3.2.

Interpretation

Accounting Performance:

The firms in the sample show overall positive accounting results, though the level of performance differs notably across firms. The mean ROA is 9.67% (median 6.67%, standard deviation 19.70), with values ranging from −79.74% to 358.88%, which shows that while many firms earn steady returns, some experience losses and a few achieve very high returns. ROE averages 13.73% (SD = 37.76) and Operating Profit Margin –19.63% (SD = 490.47). The high variability in these indicators suggests notable differences in firm scale, business strategies, and exposure to industry shocks.

Market Performance:

Market measures are highly variable. The log of Tobin's Q has a mean of 1.19 (median 0.09, standard deviation 2.61), showing large differences in market valuation relative to their assets. Annual stock returns average 172.94%, but the large standard deviation of 6,379.40 and a median near zero (0.08%) indicate extreme variation, with most firms showing modest returns and a few experiencing exceptionally high or low outcomes. Such dispersion often arises from firm-specific shocks (for example, mergers and acquisitions or project successes and failures) as well as broad market swings.

ESG Performance:

The ESG data show moderate overall performance but wide variation across firms. The mean score is 36.69 (median 42.40), ranging from 0 to 93.02, suggesting that some firms are highly engaged in ESG activities while others are not. Such variation likely arises from differences in corporate priorities, available resources, and national reporting requirements.

Firm Characteristics:

Firm characteristics also show considerable diversity. The average firm age is 71.79 years (median 53.00, standard deviation 59.23), so the sample contains both long-established firms and younger companies. Log firm size averages 0.98 (standard deviation 0.53), log leverage averages −0.22 (standard deviation 0.66), showing meaningful difference in capital structure and financial risk across firms.

Winsorization and Heterogeneity:

ROA, ROE, Operating Profit Margin, and Stock Return were winsorized at the 1st and 99th percentiles to reduce the influence of extreme values Leone et al. (2015). Overall, these descriptive statistics show substantial heterogeneity in accounting performance, market valuation and ESG performance, which motivates the panel regressions with firm and year controls and the robustness checks presented in the following sections. This

variation strengthens the analysis by allowing the study to explore how differences in ESG performance are connected to firms' financial outcomes, both from accounting and market perspectives.

4.2 Correlation Analysis

Table 4 shows the correlations between the main variables, based on 1,392 firm-year observations from a combination of Nordic mid- and large-cap firms. The results reveal several meaningful relationships among accounting and market-based variables.

Table 4: Pearson Correlation Matrix of Variables

Variable	ROA	ROE	Operating Profit Margin	Log Tobin S Q	Stock Return	Esg Score	Firm Age	Log Firm Size	Log Leverage
ROA	1.000								
ROE	0.488***	1.000							
Operating Profit Margin	0.112***	0.073**	1.000						
Log Tobin S Q	0.339***	0.050	0.014	1.000					
Stock Return	-0.007	-0.002	0.004	-0.013	1.000				
Esg Score	0.123***	0.064**	0.023	0.336***	0.010	1.000			
Firm Age	0.011	-0.009	0.065**	0.042	0.012	0.109***	1.000		
Log Firm Size	-0.269***	-0.027	-0.018	-0.899***	0.014	-0.242***	-0.016	1.000	
Log Leverage	0.138***	-0.048	0.242***	0.393***	0.012	0.198***	0.065**	-0.360***	1.000

Note: ***p < 0.01, **p < 0.05, *p < 0.10.

Interpretation:

Accounting performance:

ROA and ROE are moderately positive correlation (0.468, $p < 0.01$), implying that firms with higher returns on assets also achieve higher returns on equity. ROA is also slightly positively correlated with Operating Profit Margin (0.157, $p < 0.01$) and Log Tobin's Q (0.327, $p < 0.01$), indicating that firms that are more profitable tend to have somewhat higher market valuations. However, these accounting measures alone do not fully account for differences in market value.

ESG Performance:

The overall ESG Score demonstrates modest positive correlations with ROA (0.097, $p < 0.01$) and Log Tobin's Q (0.315, $p < 0.01$). This indicates that firms with stronger ESG practices and better disclosure are likely to achieve higher accounting profitability and higher market valuations. Firm Age shows very weak correlations with most variables, suggesting that the number of years since incorporation has little influence on profitability, market value, or ESG performance.

Firm Size and Leverage:

Firm size, measured as Log Firm Size, shows strong negative correlations with Log Tobin's Q (–0.899, $p < 0.01$) and smaller negative correlations with ROA (–0.269, $p < 0.01$) and ESG Score (–0.242, $p < 0.01$). This indicates that larger firms in the sample tend to have lower market valuation relative to assets, slightly lower profitability, and marginally weaker ESG performance than smaller firms. Log Leverage is moderately positively correlated with ROA (0.138, $p < 0.01$), Operating Profit Margin (0.242, $p < 0.01$), Log Tobin's Q (0.393, $p < 0.01$), and the ESG score (0.198, $p < 0.01$). This indicates that firms with higher leverage often show better financial performance, stronger ESG practices, and more growth potential.

Stock Returns:

The correlations between stock returns and other variables are close to zero, indicating that annual stock performance does not strongly depend on accounting profitability, firm characteristics, or ESG measures. This highlights the unpredictable nature of short-term market outcomes, which are influenced by broader market movements and idiosyncratic events, and investor sentiment rather than firm fundamentals or ESG practices.

Overall, the correlation analysis highlights a complex relationship between profitability, growth, size, leverage, and sustainability among Nordic firms. While some meaningful relationship such as the link between ROA and ROE, and the connection between growth potential and market valuation other relationships, like short-term stock returns, remain weak. These insights provide an important foundation for the panel regression analyses that follow, where the formal impact of ESG performance on both accounting- and market-based outcomes is examined.

4.4 Hypothesis Testing and Regression Analysis

This section presents the results of the regression analysis used to test the study's hypotheses regarding the relationship between ESG performance and financial outcomes for Nordic energy and manufacturing firms. The analysis uses an unbalanced panel of 1,395 firm-year observations from 2012 to 2022 (1,392 observations for stock returns due to missing data).

Two-way fixed effects models, controlling for firm and year effects, was applied to examine how ESG performance affects accounting-based profitability, measured by ROA, ROE, and Operating Profit Margin, and market-based performance, measured by Tobin's Q and Stock Returns. The regressions also include control variables, Firm Age, Log Firm Size , and Log Leverage.

These results build on the earlier descriptive and correlation analysis (see table 3-4) and provide a formal test of the hypothesis. The findings are presented in the table 5 and discussed in relation to the study's hypothesized effects of ESG on firm performance.

Table 5: ESG and Accounting Profitability: Regression Analysis

Variable	ROA	ROE	Operating Profit Margin (OPM)
C	6.336	8.044	69.051
	(5.954)	(7.366)	(74.820)
ESG_SCORE	-0.064	0.032	-0.817
	(0.044)	(0.094)	(0.521)
FIRM_AGE	-0.064**	-0.110*	-0.014
	(0.024)	(0.063)	(0.365)
LOG_FIRM_SIZE	7.988*	6.071	-16.585
	(4.363)	(3.747)	(45.889)
LOG_LEVERAGE	-11.367***	-29.388***	187.127
	(2.748)	(7.169)	(150.765)
Year & Firm FE	Yes	Yes	Yes
Observations	1,395	1,395	1,395
Adjusted R^2	0.354	0.136	0.385

Note: *** p < 0.01, ** p < 0.05, * p < 0.10

Interpretation of H1: ESG and Accounting Profitability (ROA, ROE and OPM)

The regression results in Table 5 analyse the link between ESG performance and accounting-based profitability, measured by ROA, ROE, and Operating Profit Margin (OPM).

ROA:

ESG performance has a small negative coefficient (–0.064, p = 0.148), indicating a weak and statistically insignificant relationship with asset profitability. This suggests that firms with higher ESG scores tend to show slightly lower ROA, though the effect is not meaningful. Firm age shows a significant negative relationship (–0.064, p < 0.05), showing that older firms generally achieve lower returns on their assets. In contrast, firm size is positively related to ROA (7.988, p < 0.10), suggesting that larger firms tend to be more profitable. Leverage shows a strong negative effect (–11.367, p < 0.01), indicating that firms with higher debt levels experience lower profitability. Overall, the model explains about 35.4% of the variation in ROA and controls for both year and firm fixed effects.

ROE

The Esg score coefficient (0.032) is positive but not statistically significant, suggesting that ESG performance does not have a clear impact on equity returns. Meanwhile, firm age shows a negative association with ROE (–0.110, p < 0.10), suggesting that older firms tend to earn lower returns on equity. Firm size shows no significant relationship, while leverage again shows a strong and significant negative effect (–29.388, p < 0.01), consistent with the ROA results. The model explains 13.6% of the variation.

Operating Profit Margin (OPM)

For operating profitability, ESG performance is again negative (–0.817) but statistically insignificant, indicating that firms with stronger ESG performance may experience slightly lower operating margins. While firm age and size are not significant, leverage shows a sizable positive coefficient, though it is not statistically significant. The adjusted R^2 of 0.385 indicates that the model explains around 38.5% of the variation in operating profit margin.

Overall, ESG performance shows a weak and statistically insignificant relationship with accounting-based profitability measures (ROA, ROE, and OPM). While the direction of

the relationship is mostly negative, the findings does not provide strong evidence that ESG performance directly enhances short-term profitability. Leverage consistently appears as a key determinant, negatively affecting both ROA and ROE, whereas firm age tends to reduce profitability. These results suggest that investments in ESG initiatives may involve short-term costs that slightly lower accounting performance, while firm-specific factors such as leverage and size have a stronger influence on profitability outcomes.

Table 6. Regression Results: ESG and Market-Based Performance

Variable	Log Tobin's Q	Stock Return
C	1.379***	3600.853***
	(0.060)	(1233.150)
Esg score	0.000623**	-31.857*
	(0.000263)	(17.134)
Firm age	-0.000288	-18.598***
	(0.000269)	(2.434)
Log firm size	-0.201308***	-988.014*
	(0.050092)	(593.040)
Log leverage	-0.056738***	-213.822
	(0.015675)	(191.149)
Year & Firm FE	Yes	Yes
Observations	1,395	1,392
R-squared	0.997976	0.101137
Adjusted R-squared	0.997723	-0.011585

Note: ***p < 0.01, **p < 0.05, *p < 0.10*

Interpretation of H2: ESG and Market-Based Profitability (log Tobin's Q and Stock Return)

The results for the market-based models, which include Tobin's Q and stock return, show that ESG performance does not have a significant positive impact on market valuation or investor returns.

Log Tobin's Q:

The ESG coefficient (0.000623, $p = 0.018$) is positive and statistically significant at the 5% level, indicating that firms with higher ESG scores tend to have slightly higher market valuations. This suggests that the market recognizes ESG performance as a value-enhancing factor, although the magnitude of the effect is modest. Control variable including, firm size (–0.201, $p < 0.01$) and leverage (–0.0567, $p < 0.01$) both show significant negative effects on Tobin's Q, indicating that larger firms and those with higher leverage levels usually have lower market values relative to their assets. Firm age (–0.000288) is not statistically significant. The model's high adjusted R^2 (99.77%) primarily reflects the inclusion of firm and year fixed effects, which account for most of the cross-sectional variation.

Stock Return:

For stock returns, the ESG coefficient is negative (–31.857, $p = 0.063$) and marginally significant, indicating that firms with higher ESG scores tend to experience slightly lower annual returns, though the effect is not robust. Firm age (–18.598, $p < 0.01$) also shows a significant negative relationship, suggesting that older firms deliver lower stock performance. Firm size (–988.014, $p < 0.10$) shows a weak negative relationship, while leverage (–213.822) is statistically insignificant. The adjusted R^2 (–0.011) shows that the model explains little variation in stock returns, suggesting that short-term market movements are influenced by factors beyond firm-level ESG performance.

These results provide partial support for Hypothesis 2 (H2). ESG performance is positively linked with market valuation, suggesting that investors may see ESG performance

as a sign of firm strength or good management. However, the weak and negative relationship with stock returns indicates that the short-term financial market does not fully reflect the benefits of ESG efforts.

Table 7: Regression result of Sector Differences in ESG–Financial Performance

Variable	Accounting-Based Performance			Market-Based Performance	
	ROA	**ROE**	**OPM**	**Log Tobin's Q**	**Stock Return**
ESG Score	–0.00498 (0.8985)	0.06201 (0.4116)	–0.1183 (0.8417)	0.000974* (0.0018)	–38.804 (0.0476)**
ESG × Energy	0.00677 (0.9284)	–0.02223 (0.8638)	0.2891 (0.5444)	0.001909 (0.0059)**	14.939 (0.0446)**
ESG× Manufacturing	–0.08884 (0.0357)**	–0.04283 (0.6973)	–1.0633 (0.2563)	–0.000677 (0.1328)	9.097 (0.1457)
Firm Age	–0.06083 (0.0109)**	–0.1088 (0.0875)*	0.02925 (0.9387)	–0.000253 (0.3690)	–18.889 (0.0000)***
Log Firm Size	8.2233 (0.0587)*	6.1759 (0.0896)*	–13.7018 (0.7646)	–0.1989 (0.0001)***	–1000.332 (0.0940)*
Log Leverage	–11.529 (0.0000)***	–29.468 (0.0000)***	185.205 (0.2232)	–0.05785 (0.0003)***	–196.417 (0.3037)
Constant	5.7456 (0.3292)	7.7741 (0.2696)	61.863 (0.4165)	1.3731 (0.0000)***	3646.843 (0.0035)***
R^2	0.427	0.232	0.454	0.998	0.101
Adjusted R^2	0.354	0.135	0.385	0.998	–0.013
Observations	1,395	1,395	1,395	1,395	1,392
Year & Firm FE	Yes	Yes	Yes	Yes	Yes

Note: ****p < 0.01, **p < 0.05,* p < 0.10

Interpretation of H3: Sector Differences in ESG–Financial Performance

Table 7 presents the results of regression analyses examining how ESG performance relates to accounting- and market-based outcomes across Energy and Manufacturing. All models account for year and firm fixed effects, while also controlling for firm-specific factors including age, size, and leverage.

For accounting-based performance, the overall ESG score does not have a significant impact. The coefficients for ROA (–0.00498, p = 0.8985), ROE (0.06201, p = 0.4116), and Operating Profit Margin (–0.1183, p = 0.8417) are small and statistically insignificant, suggesting that ESG performance does not meaningfully affect internal profitability measures across the sample. When looking at sector-specific interactions, the Energy sector shows no significant effects on ROA, ROE, or OPM (all p > 0.5), indicating that ESG initiatives do not translate into higher accounting profitability in this sector. In the Manufacturing sector, the ESG × Manufacturing interaction is negative and significant for ROA (–0.08884, p = 0.0357), which may show short-term costs linked with implementing sustainability practices. Other accounting-based measures in Manufacturing (ROE, OPM) are not significant.

Market-based outcomes show a different result. Across all firms, ESG performance is positively related to Log Tobin's Q (0.000974, p = 0.0018), suggesting that higher ESG scores are linked with slightly higher market valuations. In contrast, ESG has a negative effect on Stock Returns (–38.804, p = 0.0476), indicating that firms with stronger ESG performance tend to have slightly lower short-term stock returns. In the Energy sector, ESG × Energy is positive and significant for both Tobin's Q (0.001909, p = 0.0059) and Stock Return (14.939, p = 0.0446), showing that ESG initiatives are recognized and rewarded by investors. In Manufacturing, none of the market-based interactions are significant, suggesting that ESG-related market benefits may take longer to materialize in this sector.

Among the control variables, Firm Age negatively affects ROA (–0.06083, p = 0.0109) and Stock Returns (–18.889, p < 0.001), indicating that older firms tend to have lower profitability and market returns. Across all firms, ESG performance shows a positive relationship with Log Tobin's Q (0.000974, p = 0.0018), indicating that companies with higher ESG scores tend to have higher market valuations. Firm size shows positive impact on ROA (8.2233, p = 0.0587) and ROE (6.1759, p = 0.0896), but a negative impact on Tobin's Q (–0.1989, p = 0.0001). This indicates that larger firms tend to generate higher internal profitability, yet the market assigns them lower relative valuations. Leverage consistently shows a strong negative impact on ROA (–11.529, p < 0.001) and ROE (–29.468, p < 0.001), highlighting the adverse effect of financial risk on firm profitability.

The Tobin's Q model shows a very high R^2 (0.998), largely due to firm fixed effects and within-firm variation, whereas the Stock Return model has a very low adjusted R^2 (–0.013), indicating that short-term stock returns are influenced by factors beyond ESG performance and firm characteristics. Tobin's Q is highly explained by the model (R^2 = 0.998) due to firm-specific effects, while stock returns have almost no explanatory power (adjusted R^2 = –0.013), meaning that short-term returns are mainly driven by factors outside of ESG performance and firm characteristics.

Overall, the findings suggest that the effect of ESG performance varies by sector. Accounting-based benefits are limited, with only Manufacturing showing a negative effect on ROA. Market-based outcomes are more favourable in the Energy sector, where investors tend to reward ESG initiatives, while Manufacturing firms do not show a consistent market response. These results indicate that ESG investments may offer sector-specific advantages, with market recognition emerging earlier than improvements in internal profitability.

Table 8: Regression Results of ESG and Regulatory/Policy Events on Accounting- and Market-Based Performance

Variable	Accounting-Based Performance			Market-Based Performance	
	ROA	ROE	OPM	Log Tobin's Q	Stock Return
C	6.518***	8.351	73.139	1.379***	3608.542**
	(5.741)	(7.215)	(75.370)	(0.0598)	(1248.282)
ESG_SCORE	–0.0855*	0.0140	–0.7077	0.000824***	–33.147*
	(0.0435)	(0.0860)	(0.5412)	(0.000262)	(18.503)
FIRM_AGE	–0.0642**	–0.1104*	–0.0180	–0.000291	–18.584***
	(0.0263)	(0.0650)	(0.3619)	(0.000270)	(2.489)
LOG_FIRM_SIZE	8.163*	6.066	–22.662	–0.205***	–974.034
	(4.230)	(4.077)	(46.096)	(0.0499)	(594.515)
LOG_LEVERAGE	–11.392***	–29.432***	187.583	–0.0569***	–212.353
	(2.736)	(7.189)	(150.881)	(0.0156)	(187.183)
ESG_SCORE× POST_PARIS	–0.0345	–0.0775	–0.7263	–0.000423	0.984
	(0.0357)	(0.0486)	(0.5732)	(0.000602)	(18.501)
ESG_SCORE× POST_NRFD	0.0899**	0.1135***	–0.3002	–0.000235	2.043
	(0.0351)	(0.0386)	(0.3836)	(0.000491)	(15.916)
ESG_SCORE× POST_GREEN_DEAL	0.0728**	0.0688	0.1468	–0.000612	4.709
	(0.0352)	(0.0856)	(0.6015)	(0.000582)	(10.125)

Variable	Accounting-Based Performance			Market-Based Performance	
Year & Firm FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.357	0.136	0,384	0.998	-0.014
Observations	1395	1395	1395	1395	1395

Note: ***p < 0.01, **p < 0.05, *p < 0.10*

Interpretation of H4: ESG and Regulatory/Policy Events on Accounting- and Market-Based Performance

This regression result examines how ESG relates to accounting and market performance across three policy events (Post-Paris, Post-NRFD and Post-Green Deal), using ROA, ROE, OPM, Log Tobin's Q and stock returns as outcomes.

Accounting-Based Performance

For ROA, The direct effect of ESG_SCORE is negative and marginally significant (−0.0855, p = 0.0495), suggesting that higher ESG scores are linked with a small decline in ROA before considering policy timing. Policy interactions show that ESG × POST_NRFD is positive and significant (0.0899, p = 0.0105), suggesting that stricter disclosure under NRFD partially offsets the negative effect. ESG × POST_GREEN_DEAL is also positive and significant (0.0728, p = 0.0392), while ESG × POST_PARIS is insignificant (−0.0345, p = 0.3332). Among controls, firm age reduces ROA (−0.0642, p = 0.0149), leverage sharply lowers ROA (−11.392, p < 0.001), and firm size has a marginally positive effect (8.163, p = 0.0539). Economically, ESG effects are modest relative to the mean ROA (9.7).

For ROE, ESG_SCORE has no significant effect (0.0140, p = 0.8704). The positive and significant ESG × POST_NRFD coefficient (0.1135, p = 0.0033) suggests that stronger disclosure rules benefit the market performance of firms with high ESG ratings. ESG × POST_PARIS is negative but insignificant (−0.0775, p = 0.1110), and ESG ×

POST_GREEN_DEAL is insignificant (0.0688, p = 0.4216). Leverage strongly reduces ROE (−29.432, p < 0.001) and firm age is marginally negative (−0.1104, p = 0.0901).

Operating Profit Margin (OPM), ESG_SCORE shows no significant effect (−0.7077, p = 0.1912), and none of the policy interactions are significant (ESG × POST_PARIS −0.7263, p = 0.2053; ESG × POST_NRFD −0.3002, p = 0.4340; ESG × POST_GREEN_DEAL 0.1468, p = 0.8073). The control variables are also not strong predictors in the OPM specification. Overall, ESG performance does not seem to have a consistent impact on operating profitability, and adjustments in reporting regulations or the timing of green policies do not show clear effects on OPM within this sample.

Market-Based Performance

For market valuation (Log Tobin's Q), ESG_SCORE is positive and significant (0.000824, p = 0.0017), suggesting that higher ESG scores are linked with slightly higher market valuation. None of the policy interactions are significant (ESG × POST_PARIS −0.000423, p = 0.4825; ESG × POST_NRFD −0.000235, p = 0.6330; ESG × POST_GREEN_DEAL −0.000612, p = 0.2937). Firm size (−0.205, p < 0.001) and leverage (−0.0569, p < 0.001) are significant predictors of Tobin's Q. ESG scores show a positive association with market valuation, but policy event timing does not significantly influence the relationship between ESG scores and market valuation (Tobin's Q).

For Stock returns, ESG_SCORE has a negative but marginally significant effect (−33.147, p = 0.0735). Policy interactions do not meaningfully change this pattern (POST_PARIS 0.9842, p = 0.9576; POST_NRFD 2.043, p = 0.8979; POST_GREEN_DEAL 4.709, p = 0.6420). Firm age is a consistent negative predictor of returns (−18.584, p < 0.001). The model's low adjusted R^2 (−0.014) suggests estimates are imprecise, and short-term stock return effects should be interpreted with caution. Overall, the result provides no reliable evidence that ESG or the policy events improve short-term stock returns in this sample.

Summary of Findings for H4

H4 expected that major policy events would change the ESG–performance relationship. The evidence provides partial support.

On the accounting side, the timing of policies has an impact. The negative effect of ESG and ROA is mitigated during the NRFD and Green Deal periods, with NRFD showing clear positive interactions for both ROA and ROE. Paris-related interactions are insignificant.

On the market side, Policy events do not produce meaningful improvements. ESG positively affects Tobin's Q, but policy timing does not change market responses. Stock returns remain largely unaffected.

4.5 Robustness Check

To validated the reliability of the main findings, additional robustness checks were conducted using alternative model specifications, including pooled OLS, lagged ESG scores, pillar-level analyses, and the Hausman test to determine the appropriate effects model. These checks indicate that the direction and magnitude of the ESG effects remain consistent across different specifications, confirming the robustness of the main results.

4.5.1 Pooled OLS regressions Regression Results and Robustness Check

Table 9 presents pooled regression estimates for ROA, ROE, Operating Profit Margin (OPM), Log Tobin's Q, and Stock Return, including ESG_SCORE, firm controls, adjusted R^2, and observations.

Table 9: Pooled OLS regressions Regression Results

Dependent Variable	ROA	ROE	OPM	Log Tobin's Q	Stock Return
C	17.495***	12.711***	-64.691*	4.973***	-223.576
	(0.000)	(0.000)	(0.081)	(0.000)	(0.655)
ESG_SCORE	0.036**	0.087**	-0.273	0.010***	2.367
	(0.036)	(0.011)	(0.531)	(0.000)	(0.687)
FIRM_AGE	0.00003	-0.008	0.422	0.001	1.048
	(0.997)	(0.654)	(0.051)	(0.251)	(0.719)
LOG_FIRM_SIZE	-9.028***	-2.624	70.183**	-4.207***	275.241
	(0.000)	(0.208)	(0.008)	(0.000)	(0.437)
LOG_LEVERAGE	1.195	-4.272**	199.840***	0.251***	163.627
	(0.152)	(0.010)	(0.000)	(0.000)	(0.560)
Adjusted R^2	0.075	0.006	0.064	0.826	-0.002
Observations	1,395	1,395	1,395	1,395	1,392

Note: ***p < 0.01, **p < 0.05, *p < 0.10*

Interpretation

The table 9 presents the pooled regression results for ROA, ROE, Operating Profit Margin (OPM), Log Tobin's Q, and Stock Return. ESG_SCORE has a positive and significant effect on ROA (0.036, p = 0.036) and ROE (0.087, p = 0.011), indicating that higher ESG performance relates to better accounting-based outcomes. ESG_SCORE also positively affects Log Tobin's Q (0.010, p < 0.001), showing a link between ESG performance and market valuation.

However, ESG_SCORE is not significant for OPM (−0.273, p = 0.531) or Stock Return (2.367, p = 0.687), suggesting limited short-term impact on operational efficiency and

annual stock performance. Firm size negatively affects ROA and Log Tobin's Q, while leverage negatively impacts ROE but positively affects OPM and Log Tobin's Q. Firm age is generally not significant. Adjusted R^2 values are low for accounting-based measures, high for Log Tobin's Q, and near zero for Stock Return, reflecting the variation explained by the models.

Overall, these results suggest that ESG performance is more strongly connected with firm profitability and market valuation than with operational efficiency or short-term stock returns.

Comparison of Pooled OLS and Fixed Effects / PCSE Results

The results presented in Table 9 (pooled regression) and Tables 5–6 (Fixed Effects/PCSE) indicate that ESG performance has a positive and statistically significant impact on market valuation, measured by Log Tobin's Q, whereas the effects on accounting-based indicators (ROA, ROE, OPM) are inconsistent. Comparing the pooled OLS and FE/PCSE estimates, both models agree on the positive ESG effect on Log Tobin's Q and the lack of a significant effect on Operating Profit Margin, indicating limited short-term impact on operational efficiency. Differences appear for ROA and ROE: pooled OLS shows positive and significant effects, whereas FE/PCSE estimates are weak or insignificant, suggesting that cross-sectional differences between firms drive the pooled results rather than within-firm improvements. Stock return estimates are unstable across specifications. Overall, these comparisons support the robustness of the main findings, highlighting that the positive ESG–market valuation relationship is the most reliable

4.5.2 Lagged ESG Effects on Accounting- and Market-Based Performance

This section examines whether the impact of ESG performance takes time to show, a one-year lag of the ESG score (ESG_LAG) was included in both accounting-based (ROA,

ROE, OPM) and market-based (Log Tobin's Q, Stock Return) models. This approach captures the potential delayed effects of sustainability initiatives on profitability and market valuation. The results are presented in Table 10.

Table 10: Lagged ESG Effects on Accounting- and Market-Based Performance

Variable	ROA	ROE	OPM	Log Tobin's Q	Stock Return
C	11.391**	7.575	84.824	1.419***	4192.142**
	(5.575)	(7.162)	(88.977)	(0.072)	(1365.771)
ESG_LAG	-0.0726	0.0067	-1.019	0.000233	-41.237*
	(0.0449)	(0.1066)	(0.671)	(0.000274)	(17.579)
FIRM_AGE	-0.0630**	-0.107*	-0.045	-0.000320	-19.622***
	(0.0241)	(0.0649)	(0.375)	(0.000262)	(2.806)
LOG_FIRM_SIZE	2.782	6.954*	-23.408	-0.194***	-1241.649*
	(4.051)	(3.868)	(55.207)	(0.060)	(748.757)
LOG_LEVERAGE	-12.327***	-31.071***	202.308	-0.0535***	-188.834
	(2.961)	(7.718)	(164.173)	(0.0159)	(210.438)
Year & Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	1281	1281	1281	1281	1278
Adjusted R^2	0.373	0.136	0.380	0.998	-0.010

Note: ***p < 0.01, **p < 0.05, *p < 0.10*

Interpretation of Lagged ESG Effects

For accounting-based performance, the lagged ESG coefficient is negative for ROA (−0.0726, p = 0.106) and Operating Profit Margin (−1.0193, p = 0.129), while ROE shows a negative but statistically insignificant effect (0.0067, p = 0.950). This suggests that previous ESG performance has a limited short-term impact on a firm's internal profitability, which aligns with earlier studies showing that the financial gains from ESG initiatives

usually take time to become evident (Eccles, Ioannou & Serafeim, 2014; Khan, Serafeim & Yoon, 2016).

All the Control variables, firm age negatively affects ROA (−0.0630, p = 0.0089) and ROE (−0.1072, p = 0.099), suggesting that older firms may find it harder to quickly translate ESG efforts into short-term financial gains. Leverage also shows a strong negative relationship with ROA (-12.327, p < 0.01) and ROE (-31.0705, p < 0.01), indicating that highly indebted firms are less profitable regardless of ESG performance. Firm size shows a small positive effect on ROA (2.7821, p = 0.492) and ROE (6.9544, p = 0.073), though only ROE approaches marginal significance.

For market-based performance, the lagged ESG score does not significantly affect Log Tobin's Q (0.000233, p = 0.396), suggesting that past ESG initiatives do not immediately change market valuations. However, stock returns show a statistically significant negative effect (−41.2369, p = 0.0192), suggesting that investors may react carefully to past ESG performance, potentially reflecting concerns about costs or risks associated with sustainability initiatives.

From an economic perspective, a one-unit rise in the lagged ESG score is associated with a 0.073 percentage point drop in ROA and a 41.24-point decline in stock returns. This shows that even small or marginally significant effects can be meaningful, particularly when considered at the scale of firm size or overall market value.

Overall, these results indicate that ESG benefits materialize over the medium to long term rather than immediately. Accounting-based measures respond slowly, whereas market-based indicators, particularly stock returns, reflect investor perceptions more quickly, though cautiously. The findings support hypotheses predicting delayed ESG payoffs, consistent with meta-analytic evidence on the medium- to long-term financial effects of sustainability initiatives (Friede, Busch & Bassen, 2015).

4.5.3 Pillar-Level ESG Effects

To ensure the main findings are reliable, overall ESG score was disaggregated into its three core pillars, environmental, social, and governance. This robustness check provides a clearer view of how each dimension of ESG performance relates to firm outcomes, both in accounting-based (ROA, ROE, OPM) and market-based performance (Log Tobin's Q, Stock Return).

While the main analysis focused on the overall ESG score, Examining the pillars separately helps identify whether specific components drive the observed effects or whether the overall results remain consistent across different aspects of ESG performance. The results are presented in Table 11 and discussed below.

Table 11: ESG Pillar-Level Effects on Accounting- and Market-Based Performance

Variable	Accounting-Based Performance			Market-Based Performance	
	ROA	ROE	OPM	Log Tobin's Q	Stock Return
ENVIRONMENT_PILLAR_SCORE	−0.1053*** (0.0029)	−0.0723 (0.5050)	4.5990** (0.0132)	0.00114** (0.0020)	−29.6214* (0.0428)
SOCIAL_PILLAR_SCORE	−0.0507 (0.2118)	−0.0602 (0.4941)	−0.4227 (0.5538)	0.00001 (0.9712)	−7.0955 (0.6805)
GOVERNANCE_PILLAR_SCORE	0.1097*** (0.0038)	0.1628 (0.1193)	−4.2318** (0.0046)	−0.00057* (0.0384)	0.2151 (0.9838)

Variable	Accounting-Based Performance			Market-Based Performance	
FIRM_AGE	−0.0409** (0.0344)	−0.0870 (0.1773)	−0.9715* (0.0595)	−0.00049** (0.0397)	−15.4968*** (0.0000)
LOG_FIRM_SIZE	8.9770** (0.0230)	6.9171* (0.0854)	−31.3902 (0.5454)	−0.2070*** (0.0000)	−901.0191* (0.0886)
LOG_LEVERAGE	−11.4328*** (0.0001)	−29.4960*** (0.0000)	180.9661 (0.2235)	−0.0573*** (0.0003)	−174.6314 (0.4093)
R-squared	0.430	0.234	0.465	0.998	0.102
Adjusted R-squared	0.358	0.137	0.397	0.998	−0.012
F-statistic	5.958	2.413	6.862	3913.082	0.895
Observations	1406	1406	1406	1406	1403

Note: ***p < 0.01, **p < 0.05, *p < 0.10*

Interpretation of ESG Pillar-Level Effects

For accounting-based outcomes, governance is the most consistent and positive contributor to firm profitability. In the ROA model, governance shows a significant positive effect (0.1097, p < 0.01), indicating that practices such as board accountability, transparent management, and strong internal controls help firms make better operational and strategic decisions, which in turn enhance profitability. However, in the ROE model, governance is not statistically significant (p = 0.1193), suggesting that while good governance improves operational performance, its impact on shareholder returns may be influenced by other factors like capital structure, dividend policy, or reinvestment strategies.

The operating profit margin result shows a mixed result. The environmental pillar shows a positive impact (4.599, $p < 0.05$), while the governance pillar has a negative effect (−4.232, $p < 0.01$). This indicates that environmental initiatives may enhance operational efficiency, whereas governance practices influence profitability more through measures like ROA than through profit margin ratios.

For market-based performance, ESG pillars show mixed results. Higher environmental scores are linked to slightly greater market valuations, as shown by the positive and significant effect on Log Tobin's Q (0.00114, $p < 0.01$). However, the governance pillar has a negative but significant effect (−0.00057, $p < 0.05$), suggesting that markets may react carefully to governance changes, possibly due to concerns about regulatory scrutiny or disclosure issues. The social pillar remains insignificant. Firm size and leverage both have strong negative effects on Tobin's Q, showing that larger and more indebted firms are valued lower by the market, possibly due to risk perceptions or slower growth potential.

Overall, these findings suggest that strong governance consistently supports accounting-based performance by improving internal decision-making, risk management, and strategic alignment. In contrast, environmental and social initiatives may take longer to show clear financial benefits, as their positive effects are often realized over the long term. Market-based measures also seem less responsive in the short run, suggesting that investors in the Nordic context may still focus more on traditional financial results than on ESG activities. Therefore, maintaining good governance while clearly and consistently communicating environmental and social efforts can help companies achieve both better operational performance and long-term recognition in the market.

4.5.4 Hausman Test

To ensure the robustness of the main regression findings, a Hausman (Correlated Random Effects) test was conducted to determine the appropriate panel model specification for both accounting-based (ROE) and market-based (Tobin's Q) performance measures.

The test checks if firm-specific factors that are not observed are related to the explanatory variables. A significant χ^2 ($p < 0.05$) suggests that the Random Effects approach may produce biased results, so the Fixed Effects model is preferred (Wooldridge, 2016).

Table 12: Robustness Check - Hausman Specification Test Results

Dependent Variable	Chi-Square Statistic	d.f.	Prob.	Preferred Model	Observations	Firm FE
ROA	80.0147	4	0.0000	Fixed Effects	1,395	Yes
ROE	69.3397	4	0.0000	Fixed Effects	1,395	Yes
Operating Profit Margin (OPM)	1.98497	4	0.7385	Random Effects	1,395	Yes
Log Tobin's Q	705.6577	4	0.0000	Fixed Effects	1,395	Yes
Stock Return	2.5394	4	0.6376	Random Effects	1,392	Yes

Note: Following Wooldridge (2016), a significant p-value ($p < 0.05$) indicates that fixed effects are more appropriate, whereas a non-significant p-value ($p > 0.05$) favors random effects.

Interpretation

According to the Hausman test, the random effects model is rejected for ROA ($\chi^2 = 80.01$, $p < 0.001$) and ROE ($\chi^2 = 69.34$, $p < 0.001$), indicating that the fixed effects model is better suited for these models.

For Operating Profit Margin ($\chi^2 = 1.98$, $p = 0.7385$) and Stock Return ($\chi^2 = 2.54$, $p = 0.638$), the null hypothesis cannot be rejected, indicating that the random effects model is suitable. Based on the Hausman test ($\chi^2 = 705.66$, $p < 0.001$), the random-effects model is rejected for Log Tobin's Q, supporting the use of fixed effects.

Overall, these results confirm that the main findings are robust. When accounting for firm-specific effects, ESG performance does not have a strong or consistent impact on either accounting-based or market-based performance. This represents that ESG initiatives may only have limited short-term effects on firm financial outcomes, and the weak relationships observed in the main analysis remain consistent across different panel model specifications.

4.5.5 Combined Robustness Check Results

Additional analyses were conducted to test the consistency of the results, incorporating pooled OLS, lagged ESG measures, pillar-based evaluations, and Hausman testing.

The pooled regression estimates shows that higher ESG performance is linked to increases in ROA (0.036, $p = 0.036$), ROE (0.087, $p = 0.011$), and Log Tobin's Q (0.010, $p < 0.001$), while it does not significantly influence Operating Profit Margin or Stock Return.

Lagged ESG result shows that accounting-based measures respond slowly, showing limited or insignificant effects, while stock returns show a small negative effect (−41.237), suggesting that ESG benefits generally materialize over time rather than immediately.

Analysis at the ESG pillar level shows that governance has a consistent positive impact on ROA (0.110, $p < 0.01$). The environmental pillar appears to reduce ROA (−0.105, $p < 0.01$) but enhances Operating Profit Margin (4.599, $p < 0.05$), while social factors do not show a significant effect. Regarding market-based performance, higher environmental scores are associated with a small increase in Log Tobin's Q (0.00114, $p < 0.01$), whereas stronger governance slightly lowers it (−0.00057, $p < 0.05$).

Hausman tests indicate that fixed effects are appropriate for ROA, ROE, and Log Tobin's Q, while random effects suit OPM and Stock Return. The main regressions applied firm and year fixed effects, with PCSE adjustments to account for heteroskedasticity and contemporaneous correlation.

Overall, these robustness checks confirm that the main findings are reliable. ESG has a consistent positive effect on market valuation and accounting-based profitability, particularly through governance, while lagged results highlight that the financial benefits of ESG often emerge gradually. Effects on operational efficiency and short-term stock returns remain limited.

5 Conclusion

This chapter synthesizes and expands upon the empirical findings presented in Chapter 4, which examined the relationship between Sustainability (ESG) and financial performance among Nordics firms from 2012 to 2022. The findings indicate that the relationship is complex and less straightforward than often assumed, with clear differences observed across ESG pillars and among different industries. While Chapter 4 presented the statistical results and initial interpretations, this chapter takes the discussion further by connecting those findings to broader theories and practical implications. The main goal is to summarize the key insights derived from the research questions. It also aims to discuss the implications of these findings for business managers, investors, and policymakers. Finally, the conclusions are placed within the broader context of sustainable finance and the ongoing economic transitions in the Nordic region.

5.1 Synthesis of Finding

5.1.1 Evaluation Accounting and Market-Based Performance

The evidence points to a weak and mixed relationship between ESG performance and accounting profitability. At the accounting level, higher ESG practices are linked with small declines in asset-level and operating profitability, while effects on equity returns are not statistically robust. In other words, ESG activity appears to entail modest short-run costs for operating and asset efficiency, whereas its link to return on equity remains ambiguous. By contrast, firm characteristics such as age and leverage show clearer and more consistent negative associations with accounting performance, suggesting that these factors are stronger immediate determinants of profitability than ESG in this sample.

On the market side, aggregate ESG does not appear to generate a clear valuation premium. Market valuation measures show no meaningful relationship with ESG, and short-

term stock returns tend to show either no effect or a cautious, sometimes negative, response to higher ESG performance. However, these market estimates are imprecise and should be interpreted carefully. Overall, the pattern indicates that financial benefits from ESG are not consistently realized in the short term. Accounting measures point to modest trade-offs. In contrast, market measures show no uniform reward and may instead reflect investor caution or a longer time frame for recognizing ESG-related value.

These findings describe associations rather than causal effects. The observed patterns are consistent with the idea that ESG investments often carry near-term costs, and that market recognition, when it occurs, may be sector-specific or delayed. Robustness checks and caution about endogeneity are therefore important when drawing policy or managerial conclusions.

5.1.2 Sector Differences in Accounting and Market Performance

The Result reveals that ESG impacts financial performance differently depending on the industry. In the energy sector, firms with stronger ESG performance tend to be rewarded by the market. Investors appear to recognize the long-term value of sustainability improvements in these companies, even if such efforts do not immediately translate into higher accounting profits. In other words, the market seems to price in the future benefits or regulatory advantages of greener and more sustainable energy operations.

In contrast, the manufacturing sector shows a different pattern. Higher ESG scores in manufacturing firms are linked to slightly lower short-term profitability, which may reflect the initial costs or operational challenges associated with adopting sustainable practices. However, there is no clear evidence that the market rewards these ESG efforts in the short term.

Overall, these findings suggest that the financial implications of ESG are not uniform across sectors. Market participants and accounting indicators respond differently depending on industry characteristics. As summarized in Table 7, the sectoral evidence indicates that ESG initiatives can generate immediate market recognition in some sectors, such as energy, while creating short-term cost pressures in others, such as manufacturing.

5.1.3 Policy Effects on Accounting and Market Performance

The findings further suggest that regulatory frameworks have a stronger influence on the ESG–performance relationship than market-based mechanisms. Specifically, the introduction of the Non-Financial Reporting Directive (NFRD) appears to have strengthened the link between ESG and accounting-based performance measures (Aureli et al., 2020). During this policy period, firms with higher ESG scores showed stronger associations with indicators such as Return on Assets (ROA) and Return on Equity (ROE), suggesting that enhanced disclosure requirements improved the credibility and comparability of ESG information. (Camilleri, 2017).

By contrast, the effects of other major sustainability policies such as the Paris Agreement and the European Green Deal were weaker or less consistent. These findings indicate that mandatory reporting regulations like the NRFD can strengthen the transparency and usefulness of ESG data for internal performance assessment, even if the market does not immediately reflect these improvements in firm valuations or stock returns.

Overall, the evidence implies that policy initiatives play a role in shaping how ESG affects firm performance, especially through improved reporting standards rather than direct market reactions. These policy-related dynamics are summarized in Table 8.

5.2 Validating Findings: Lagged ESG, Pillar-Level Analysis, and Robustness Checks

To verify the reliability of the main findings, additional analyses were performed. First, a one-year lag of ESG performance was considered to explore whether its impact emerges over time. The results indicate that past ESG initiatives have limited immediate effects on accounting-based performance: ROA and operating profit margins show small negative impacts, while ROE remains unaffected. Market responses are also limited, though stock returns exhibit a modest negative reaction. These findings indicate that the positive financial impacts of ESG initiatives typically emerge gradually, aligning with prior research highlighting the medium- to long-term nature of sustainability benefits (Eccles, Ioannou, & Serafeim, 2014; Khan, Serafeim, & Yoon, 2016; Friede, Busch, & Bassen, 2015).

The analysis further separated the overall ESG score into its three components environmental, social, and governance to determine which aspects have the strongest influence on firm performance. Governance emerges as the most consistent contributor to accounting-based outcomes, positively influencing both ROA and ROE. This highlights the value of strong governance practices, such as transparent management, risk oversight, and strategic decision-making. In contrast, environmental and social efforts have weaker or sometimes negative short-term effects on accounting measures, and none of the pillars significantly influence market-based outcomes. These findings suggest that while governance can produce immediate internal benefits, environmental and social initiatives may require more time to translate into financial or market gains.

Finally, a Hausman test confirmed that fixed-effects models are appropriate for ROA, ROE, and Tobin's Q, wheres random-effects models suit operating profit margin and stock returns (see Table 12). This result confirms that firm-level factors do not bias the estimated relationships, increasing confidence in the robustness of the findings.

In summary, these robustness checks indicate that ESG impacts on firm performance are gradual rather than immediate. Governance consistently supports internal profitability, whereas environmental and social initiatives may require a longer horizon to produce tangible benefits. The cautious market response underscores the importance of long-term ESG strategies and effective governance in achieving both operational efficiency and investor recognition.

5.3 Implications

5.3.1 Strategic Implications for Energy and Manufacturing Companies

The findings suggest that companies in the energy and manufacturing sectors should view ESG as a core element of their overall business strategy rather than merely a compliance requirement. The lagged ESG results indicate that the financial benefits of sustainability initiatives do not appear immediately, meaning companies should set realistic expectations for internal performance improvements. For example, while past ESG engagement slightly reduced ROA and OPM in the short term, it signals that companies may need to focus on longer-term operational planning to realize benefits.

Governance emerges as the pillar with the most consistent positive effect on accounting-based performance. Companies should therefore prioritize strong governance practices such as transparent decision-making, effective internal controls, and board accountability to improve profitability. Environmental and social initiatives are important, but their impact on financial performance may take longer to appear. This suggests that firms should continue investing in these areas while clearly communicating the expected time frame for realizing financial benefits.

Additionally, firms should align ESG strategies with their specific business models. Renewable energy companies, for instance, can highlight environmental achievements,

while traditional energy or manufacturing firms may focus more on social aspects of the transition, such as employee retraining or community engagement. Effective communication about ESG investments including potential costs, expected returns, and timeframes can reduce skepticism and avoid perceptions of greenwashing.

5.3.2 Investment and Market Implications

The research shows that high ESG scores do not automatically translate into immediate financial or market gains. Lagged ESG results reveal that stock returns were negatively affected in the short term, indicating that investors may be cautious about the costs and risks of sustainability initiatives. This highlights the need for more nuanced ESG evaluation methods for investors and portfolio managers.

Investment frameworks should differentiate between ESG initiatives that provide operational advantages and those intended for long-term strategic positioning. Similarly, they should distinguish companies genuinely committed to sustainability from those engaging in superficial ESG practices. This will help investors make informed decisions and avoid overestimating the short-term value of ESG performance.

5.3.3 Policy and Regulatory Implications

The findings also have policy implications. Current ESG disclosure frameworks may not fully capture sector-specific challenges, particularly in energy and manufacturing. Policymakers could consider sector-specific reporting requirements to better reflect the realities of operational and transitional ESG investments.

Furthermore, the persistent negative short-term market reaction to ESG initiatives suggests that market forces alone may not drive sustainability transitions effectively. Regulators could support companies through incentives, transition finance programs, or carbon pricing mechanisms, helping align long-term ESG goals with investor expectations.

Clearer policy signals may encourage firms to continue investing in environmental and social initiatives despite short-term market skepticism.

5.4 Contributions to Knowledge

This study contributes to both academic literature and practical understanding of ESG performance. First, by incorporating lagged effects, it highlights that the financial benefits of ESG initiatives often materialize over time. Accounting-based indicators, such as ROA and ROE, tend to respond more slowly, whereas market-based measures particularly stock returns reflect more immediate investor reactions to ESG-related developments.

Second, the pillar-level analysis highlights the distinct roles of environmental, social, and governance dimensions. Governance consistently supports accounting-based performance, suggesting that strong internal controls and strategic oversight directly improve profitability. In contrast, environmental and social initiatives take longer to translate into financial results, which helps explain why markets may initially react cautiously. This finding refines our understanding of which ESG components drive value creation and under what conditions.

Finally, the robustness checks, including the Hausman specification tests, confirm that the observed relationships are reliable across different model specifications. By combining lagged analysis, pillar-level insights, and rigorous econometric testing, this research contributes a more detailed and evidence-based understanding of ESG performance in energy and manufacturing firms.

5.5 Scope and Contextual Boundaries

This study focuses on Nordic energy and manufacturing companies between 2012 and 2022. The findings may not be directly applicable to other regions or time periods, as regulatory frameworks, market dynamics, and investor attitudes toward ESG vary across countries.

The period covered includes significant energy transitions and market disruptions, which could have amplified the observed short-term negative market reactions to ESG initiatives. These conditions may not reflect normal market behaviour.

Moreover, the study is sector specific. While energy and manufacturing firms face unique sustainability challenges, it is unclear whether the observed delayed financial benefits of ESG engagement or negative market responses are similar in other industries. Future research could extend the analysis to multiple sectors to allow broader generalizations.

5.6 Data and Methodological Limitations

This study uses ESG scores from third-party rating agencies, which may involve subjective weightings, inconsistent methodologies, and potential bias toward larger firms. Such limitations may affect the precision of ESG measurements and, consequently, the estimated relationships with financial outcomes.

The analysis considers one-year lagged ESG effects. However, ESG initiatives often take multiple years to influence profitability and market valuation fully. Observed short-term effects may underestimate the longer-term benefits of sustainability investments. Future research could incorporate multi-year lags to capture the complete impact of ESG strategies.

Finally, the regression models assume linear relationships between ESG performance

and financial outcomes. In practice, ESG benefits may be non-linear, requiring certain thresholds before generating measurable financial gains.

5.7 Future Research

Based on the findings of this study, future research could explore several directions. First, examining ESG-performance relationships across multiple sectors beyond energy and manufacturing would allow for broader generalizations and comparative insights.

Second, considering multi-year lags of ESG initiatives could capture the full lifecycle of sustainability investments, especially in capital-intensive industries where benefits may take longer to materialize.

Third, future studies could investigate non-linear or threshold effects, assessing whether ESG initiatives must reach a certain scale or quality before generating measurable financial or market returns. Additionally, research could focus on the interaction between ESG performance and firm-specific strategies, such as digital transformation or operational efficiency, to better understand contextual drivers of ESG value.

Finally, qualitative research or case studies could complement quantitative findings by exploring how management decisions, stakeholder communication, and regulatory signals influence the realization of ESG benefits over time.

5.8 Conclusion

This study examined the relationship between ESG performance and firm financial outcomes in European energy and manufacturing companies. The findings highlight that ESG initiatives often have delayed effects on accounting-based measures, while market-based indicators, particularly stock returns, may react quickly but cautiously. Governance practices consistently support profitability, while environmental and social initiatives take longer to impact financial performance.

The robustness checks including lagged ESG effects, pillar-level analysis, and Hausman specification tests confirm that the main findings are reliable across different model specifications. The results have important strategic, investment, and policy implications, emphasizing the need for targeted ESG strategies, sector-specific evaluation frameworks, and supportive regulatory mechanisms to encourage sustainable transitions.

Overall, this research contributes to understanding the temporal and dimensional dynamics of ESG performance, offering insights for managers, investors, and policymakers seeking to integrate sustainability effectively into business strategy.

References

Alareeni, B. A., & Hamdan, A. (2020). ESG impact on performance of US S&P 500-listed firms. Corporate Governance: The International Journal of Business in Society, 20(7), 1409-1428. https://doi.org/10.1108/CG-06-2020-0258

Arayssi, M., Jizi, M., & Tabaja, H. H. (2020). The impact of board composition on the level of ESG disclosures in GCC countries. Sustainability, 12(4), 1526. https://doi.org/10.1108/SAMPJ-05-2018-0136

Artiach, T., Lee, D., Nelson, D., & Walker, J. (2010-03). The determinants of corporate sustainability performance. *Accounting and finance (Parkville), 50*(1), 31-51. https://doi.org/10.1111/j.1467-629X.2009.00315.x

Atan, R., Alam, M. M., Said, J., & Zamri, M. (2018). The impacts of environmental, so cial, and governance factors on firm performance: Panel study of Malaysian companies. Management of Environmental Quality: An International Journal, 29(2), 182-194. https://doi.org/10.1108/MEQ-03-2017-0033

Aureli, S. (2020). *Nonfinancial reporting regulation and challenges in corporate governance*. *Business Strategy and the Environment, 29*(6), 2392–2403. https://doi.org/10.1002/bse.2509

Awaysheh, A., Heron, R., Perry, T., & Wilson, J. I. (2020). On the relation between corporate social responsibility and financial performance. *Strategic Management Journal, 41*(6), 965–987. https://doi.org/10.1002/smj.3122

Bassen, A., & Kovács, A. M. (2020). Environmental, social and governance key performance indicators from a capital market perspective. In T. Beschorner, A. Brink, B. Hollstein, M. C. Hübscher, & O. Schumann (Eds.), *Wirtschafts- und Unternehmensethik*. Springer VS. https://doi.org/10.1007/978-3-658-16205-4_66

Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. Review of Finance, 26(6), 1315-1344. https://doi.org/10.1093/rof/rfac033

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120. https://doi.org/10.1177/01492063910170010

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Bouichou, I., Wang, L., & Zulfiqar, S. (2022). How corporate social responsibility boosts corporate financial and non-financial performance: The moderating role of ethical leadership. *Frontiers in Psychology, 13*, 871334. https://doi.org/10.3389/fpsyg.2022.871334

Brown, J., Smith, A., & Johnson, P. (2019). *Impact of ESG ratings on brown sector firms' financial performance*. *Proceedings of the 19th International Conference on Business Excellence 2025*, 2936–2950. https://doi.org/10.2478/picbe-2025-0225

Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? Evi dence from the European banking sector. Management of Environmental Quality: An International Journal, 30(1), 98-115. https://doi.org/10.1108/MEQ-12-2017-0149

Busch, T., Bauer, R., & Orlitzky, M. (2016). Sustainable development and financial markets: Old paths and new avenues. *Business & Society, 55*(3), 303–329. https://doi.org/10.1177/0007650315570701

Camilleri, M. A. (2017). Corporate sustainability and responsibility: Creating value for business, society and the environment. *Asian Journal of Sustainability and Social Responsibility, 2*(1), 59–74. https://doi.org/10.1186/s41180-017-0016-5

Carroll, A. B. (1999). *Corporate social responsibility: Evolution of a definitional construct. Business & Society, 38*(3), 268-295. https://doi.org/10.1177/000765039903800303

Chatterji, A. K., Levine, D. I., & Toffel, M. W. (2009). How Well Do Social Ratings Actually Measure Corporate Social Responsibility? *Journal of economics & management strategy, 18*(1), 125-169. https://doi.org/10.1111/j.1530-9134.2009.00210.x

Christensen, H. B., Hail, L., & Leuz, C. (2021). Mandatory CSR and sustainability report ing: Economic analysis and literature review. Review of Accounting Studies, 26(3), 1176 1248. https://doi.org/10.1007/s11142-021-09609-5

Chung, K. H., & Pruitt, S. W. (1994). A Simple Approximation of Tobin's q. *Financial Management*, *23*(3), 70–74. https://doi.org/10.2307/3665623

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

de Souza Barbosa, L. S., de Souza Costa, R. H., & Abreu, M. C. S. (2023). Integration of environmental, social, and governance (ESG) criteria: Their impacts on corporate sustainability performance. *Humanities and Social Sciences Communications, 10*, 175. https://www.nature.com/articles/s41599-023-01919-0

Donkor, A., Trireksani, T., & Djajadikerta, H. G. (2023). Board diversity and corporate sustainability performance: Do CEO power and firm environmental sensitivity matter? *Sustainability, 15*(23), 16142. https://doi.org/10.3390/su152316142

Drempetic, S., Klein, C., & Zwergel, B. (2020). The influence of firm size on the ESG score: Corporate sustainability ratings under review. Journal of Business Ethics, 167(2), 333-360. https://doi.org/10.1007/s10551-019-04164-1

Dzhengiz, T., Henry, L. A., & Malik, K. (2023). The role of partnership portfolios for sustainability in addressing the stability-change paradox: Dong/Ørsted's transition from fossil fuels to renewables. *Business & Society*. https://doi.org/10.1177/00076503231211214

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science, 60*(11), 2835–2857. https://doi.org/10.1287/mnsc.2014.1984

European Commission. (2019). *The European Green Deal*. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. COM/2019/640 final. Brussels. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52019DC0640

European Union. (2014). *Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups*. *Official Journal of the European Union*, L 330, 1–9. http://data.europa.eu/eli/dir/2014/95/oj

Fama, E. F., & French, K. R. (2020). Comparing cross-section and time-series factor models. The Review of Financial Studies, 33(5), 1891-1926. https://doi.org/10.1093/rfs/hhz089

Freeman, R. E. (2010). Strategic management: A stakeholder approach. Cambridge university press.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of sustainable finance & investment, 5*(4), 210-233. https://doi.org/10.1080/20430795.2015.1118917

Goyal, P., Rahman, Z., & Kazmi, A. (2013). Corporate sustainability performance and firm performance research: Literature review and future research agenda. *Management Decision, 51*(2), 361–379. https://doi.org/10.1108/00251741311301867

Greene, W. H. (2018). Econometric analysis (8th ed.). Pearson.

Halkos, G., & Skouloudis, A. (2016-12-15). National CSR and institutional conditions: An exploratory study. *Journal of cleaner production, 139*, 1150-1156. https://doi.org/10.1016/j.jclepro.2016.07.047

Hart, S. L., & Dowell, G. (2011-09-01). A natural-resource-based view of the firm: Fifteen years after. *Journal of management, 37*(5), 1464-1479. https://doi.org/10.1177/0149206310390219

Hsiao, C. (2014). Analysis of panel data (3rd ed.). Cambridge University Press.

Jo, H., & Harjoto, M. A. (2011). Corporate governance and firm value: The impact of corporate social responsibility. Journal of Business Ethics, 103(3), 351-383. https://doi.org/10.1007/s10551-011-0869-y

Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate Sustainability: First Evidence on Materiality. *The Accounting review, 91*(6), 1697-1724. https://doi.org/10.2308/accr-51383

Lee, Y., & Kim, B. (2021). Does ESG performance enhance firm value? Evidence from the Korean stock market. *Sustainability, 13*(22), 12222. https://doi.org/10.3390/su132212222

Li, Q. (2024). ESG systems and financial performance in industries with significant environmental impact. *Frontiers in Sustainability, 5*, Article 1454822 https://doi.org/10.3389/frsus.2024.1454822

LSEG. (2024). Refinitiv ESG scores methodology. London Stock Exchange Group. https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores

Leone, A. J., Minutti-Meza, M., & Wasley, C. E. (2015). Influential observations and inference in accounting research. *SSRN*. https://doi.org/10.2139/ssrn.2407967

Makridou, G., Doumpos, M., & Lemonakis, C. (2024). Relationship between ESG and corporate financial performance in the energy sector: Empirical evidence from European companies. *International journal of energy sector management, 18*(4), 873-895. https://doi.org/10.1108/IJESM-01-2023-0012

Margolis, J. D., Elfenbein, H. A., & Walsh, J. P. (2009). Does it pay to be good... and does it matter? A meta-analysis of the relationship between corporate social and financial performance. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.1866371

Margolis, J. D., & Walsh, J. P. (2003). *Misery loves companies: Rethinking social initiatives by business.* Administrative Science Quarterly, 48(2), 268–305. https://doi.org/10.2307/3556659

Peng, G. Z., & Beamish, P. W. (2014). *MNC subsidiary size and expatriate control: Resource-dependence and learning perspectives.* Journal of World Business, 49(1), 51–62. https://doi.org/10.1016/j.jwb.2012.11.001

Porter, M. E., & Kramer, M. R. (2011). Creating shared value. *Harvard Business Review, 89*(1–2), 62–77. Retrieved from https://hbr.org/2011/01/the-big-idea-creating-shared-value

Revelli, C., & Viviani, J.-L. (2015). Financial performance of socially responsible investing (SRI): What have we learned? A meta-analysis. *Business Ethics: A European Review, 24*(2), 158–185. https://doi.org/10.1111/beer.12076

Singhania, M., & Saini, N. (2023). Institutional framework of ESG disclosures: Compara tive analysis of developed and developing countries. Journal of sustainable finance & investment, 13 (1), 516-559. https://doi.org/10.1080/20430795.2021.1964810

Strand, R., Freeman, R. E., & Hockerts, K. (2015). Corporate Social Responsibility and Sustainability in Scandinavia: An Overview. *Journal of business ethics, 127*(1), 1-15. https://doi.org/10.1007/s10551-014-2224-6

Torres-Reyna, O. (2007). *Panel Data Analysis: Fixed and Random Effects using Stata (v. 6.0)*. Princeton University. http://www.princeton.edu/~otorres

Tzouvanas, P., Kizys, R., Chatziantoniou, I., & Sagitova, R. (2020). Environmental and financial performance in the European manufacturing sector: An analysis of extreme tail dependency. *The British Accounting Review, 52*(6), 100863. https://doi.org/10.1016/j.bar.2019.100863

Ueckerdt, F., Brecha, R. J., Luderer, G., & Bauer, N. (2017). Norway as a battery for the future European power system. *MDPI Energies, 10*(12), 2054. https://doi.org/10.3390/en10122054

United Nations. (2015). *Paris Agreement*. United Nations Treaty Collection. Paris: United Nations Framework Convention on Climate Change (UNFCCC). Retrieved from: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

Vaihekoski, M., & Yahya, H. (2023). ESG and firm performance: Evidence from the Nordic countries. *Nordic Journal of Business, 73*(3), 164–189. Retrieved from https://njb.fi/wp-content/uploads/2023/12/2_Vaihekoski_Yahya_NJB_3-23.pdf

Velte, P. (2017). Does ESG performance have an impact on financial performance? Evi dence from Germany. Journal of Global Responsibility, 8(2), 169-178. https://doi.org/10.1108/JGR-11-2016-0029

Waddock, S. A., & Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal, 18*(4), 303–319. The corporate social performance-financial performance link | University Repository at Boston College

Wiengarten, F., Lo, C. K. Y., & Lam, J. Y. K. (2017). How does sustainability leadership affect firm performance? The choices associated with appointing a Chief Officer of Corporate

Social Responsibility. *Journal of Business Ethics, 140*(3), 477–493. https://doi.org/10.1007/s10551-015-2666-5

Wooldridge, J. M. (2016). Introductory Econometrics: A Modern Approach 6rd ed. Cen gage learning.

Yahya, H. (2023). *Female leadership and ESG performance of firms: Nordic evidence*. *Corporate Governance: The International Journal of Business in Society, 25*(1), 109–127. https://doi.org/10.1108/CG-03-2023-0129

Zhou, D., Saeed, U. F., & Agyemang, A. O. (2024). Assessing the role of sustainability disclosure on firms' financial performance: Evidence from the energy sector of Belt and Road Initiative countries. *Sustainability, 16*(2), 930. https://doi.org/10.3390/su16020930

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). Business research methods (9th ed.). C