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Assessing the Credibility of ESG Reporting in Finnish Listed Companies

Evidence on the Alignment Between ESG Disclosure and Environmental Performance

School of Accounting and Finance
Master's thesis in Accounting and Auditing
Master's Degree Programme in Accounting and Auditing

Vaasa 2026

VAASAN YLIOPISTO
Laskentatoimen ja rahoituksen akateeminen yksikkö
Tekijä: Jimi Vainionpää
Tutkielman nimi: Assessing the Credibility of ESG Reporting in Finnish Listed Companies: Evidence on the Alignment Between ESG Disclosure and Environmental Performance
Tutkinto: Kauppatieteiden maisteri
Koulutusohjelma: Laskentatoimen ja tilintarkastuksen maisteriohjelma
Opintosuunta: Laskentatoimi ja rahoitus
Työn ohjaaja: Tatiana King
Valmistumisvuosi: 2026 **Sivumäärä:** 135

TIIVISTELMÄ:
Tässä pro gradu -tutkielmassa tarkastellaan suomalaisten pörssiyhtiöiden ympäristövastuuseen liittyvän raportoinnin ja mitatun ympäristösuorituskyvyn välistä suhdetta. Viime vuosina ESG-raportoinnista on muodostunut keskeinen osa yritysten viestintää, sijoittajien päätöksentekoa sekä kestävyyttä koskevaa sääntelyä. Aiemmassa kirjallisuudessa on esitetty vaihtelevia tuloksia siitä, heijastaako yritysten julkaisema ESG-informaatio mitattua ympäristösuorituskykyä vai toimiiko se ensisijaisesti viestinnällisenä välineenä ilman vastaavia muutoksia yritysten toiminnassa.

Tutkimuksen tavoitteena on tarkastella, onko ESG-raportoinnilla tilastollisesti merkitsevä yhteys yritysten mitattuun ympäristösuorituskykyyn sekä vaihteleeko tämä yhteys toimialojen ja hallintorakenteiden (erityisesti hallituksen riippumattomuuden) mukaan. Tutkimuksessa nojataan useisiin teoreettisiin näkökulmiin, kuten legitimiteetti-, sidosryhmä-, signalointi- ja agenttiteoriaan sekä resurssiperustaiseen teoriaan. Näiden teorioiden avulla jäsennetään yritysten raportointikannustimia ja arvioidaan raportoinnin yhteyttä mitattuun suorituskykyyn.

Empiirinen tarkastelu perustuu LSEG Workspace -tietokannasta koottuun paneeliaineistoon, joka kattaa Nasdaq Helsingissä listatut yritykset ajanjaksolla 2014–2023. Yritysten ympäristösuorituskykyä mitataan LSEG:n ympäristöpilarin pisteytyksellä, kun taas ESG-raportointia mitataan ESG-pisteiden avulla. Analyysissa hyödynnetään paneeliregressiomalleja, joissa huomioidaan keskeiset yrityskohtaiset kontrollimuuttujat sekä yritys- ja vuosikohtaiset kiinteät vaikutukset. Lisäksi tarkastellaan toimialojen ja hallituksen riippumattomuuden roolia moderoivina tekijöinä.

Tulosten perusteella ESG-raportoinnin ja yritysten mitatun ympäristösuorituskyvyn välillä havaitaan positiivinen yhteys. Yritykset, joilla on korkeammat ESG-pisteet, saavuttavat keskimäärin parempia tuloksia ympäristöpilarin mittareilla. Toimialoittainen tarkastelu viittaa siihen, ettei yhteys ole vahvempi ainoastaan ympäristöllisesti intensiivisillä toimialoilla, vaan se on havaittavissa laajemmin eri toimialoilla. Hallituksen riippumattomuuden osalta analyysi ei anna vahvaa tilastollista näyttöä sen merkityksestä ESG-raportoinnin ja yritysten ympäristösuorituskyvyn välisen yhteyden kannalta. Tuloksia on kuitenkin tulkittava varoen, sillä käytetyt mittarit perustuvat osittain yritysten raportoimaan informaatioon, mikä voi heijastaa mittareiden välistä päällekkäisyyttä ja rajoittaa tulosten tulkintaa. Tulosten perusteella voidaan arvioida, että ESG-raportointi ei välttämättä yksiselitteisesti kuvasta yritysten todellista ympäristösuorituskykyä, vaan voi osittain heijastaa raportointikäytäntöjen rakenteellisia piirteitä.

AVAINSANAT: ESG-raportointi, ympäristösuorituskyky, ESG-pisteet, yritysvastuu, hallituksen riippumattomuus, pörssiyhtiöt.

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Abbreviations

AI – Artificial Intelligence

CEO – Chief Executive Officer

COO – Chief Operating Officer

CSR – Corporate Social Responsibility

CSRD – Corporate Sustainability Reporting Directive

DCP – Dynamic Capabilities Perspective

EMS – Environmental Management System

ENSCORE – Environmental Pillar Score

ESG – Environmental, Social and Governance

ESRS – European Sustainability Reporting Standards

EU – European Union

FE – Fixed Effects

GICS – Global Industry Classification Standard

GHG – Greenhouse Gases

GRI – Global Reporting Initiative

ISO – International Organization for Standardization

LSEG – London Stock Exchange Group

NFRD – Non-Financial Reporting Directive

NGO – Non-Governmental Organisations

RBV – Resource-Based View

RIC – Reuters Instrument Code

ROE – Return on Equity

SASB – Sustainability Accounting Standards Board

SME – Small and Medium-Sized Enterprises

TRESGCCS – Total ESG Combined Controversies Score

TRESGCS – Total ESG Combined Score

TRESGS – Total ESG Score

VIF – Variance Inflation Factor

1 Introduction

In recent years, the role of environmental, social and governance (ESG) factors in corporate activity has changed significantly (Eccles & Klimenko, 2019; Krueger et al., 2024). Previously treated as separate sustainability reporting practices or voluntary disclosures have increasingly become integrated into companies' core operations, stakeholder communication and external evaluation (Krueger et al., 2024). This reflects a broader shift in stakeholder expectations, where financial performance alone is no longer considered sufficient and companies are increasingly evaluated based on how effectively they manage ESG-related activities (Eccles & Klimenko, 2019).

In parallel, the volume and complexity of ESG-related reporting have expanded considerably. Listed companies now provide extensive sustainability disclosures, often structured in accordance with established frameworks such as the Global Reporting Initiative (GRI) and more recently, the European Union's Corporate Sustainability Reporting Directive (CSRD). These frameworks are intended to enhance the comparability and transparency of non-financial information (European Commission, 2023; LSEG, 2024). However, increased disclosure has not fully resolved concerns about its informational value, as research suggests that more extensive reporting does not necessarily correspond to improved environmental performance (Clarkson et al., 2008; Doan & Sassen, 2020). In some cases, companies may selectively emphasize favourable aspects of their activities, while downplaying less favourable outcomes, which raises concerns that ESG disclosure may, at least in part, function as a reputational tool rather than a faithful representation of underlying performance, which it is intended to capture. These dynamics are commonly discussed in terms of symbolic disclosure or greenwashing (Lyon & Montgomery, 2015; Marquis & Toffel, 2016), complicating the interpretation of ESG information for investors and stakeholders.

Within this context, this study focuses on whether ESG reporting is systematically related to environmental performance among companies listed on the Helsinki Stock Exchange. Finland provides a relevant empirical setting due to its high levels of corporate

transparency and well-established governance practices (Jutila et al., 2024), as well as the ongoing implementation of EU-level sustainability regulation. Nevertheless, it remains an open empirical question whether higher levels of ESG disclosure in this context reflect stronger environmental performance or are primarily driven by differences in reporting practices. To address this, the study adopts a quantitative approach based on panel data obtained from the LSEG Workspace database. ESG disclosure is measured using ESG scores, while environmental performance is proxied by the Environmental Pillar Score. The empirical analysis employs fixed-effects panel regression models to assess whether variations in ESG disclosure are associated with changes in environmental performance over time.

This study provides empirical evidence on the relationship between ESG disclosure and environmental performance in a Finnish context. Theoretically, the study draws on multiple frameworks, including legitimacy, signaling, institutional, stakeholder and agency theories, to interpret whether observed disclosure–performance alignment may reflect substantive performance, reporting structures, or broader institutional pressures. From a practical perspective, the findings offer relevant insights for investors, regulators and corporate decision-makers by informing the extent to which ESG disclosures align with measured environmental performance in studied area.

1.1 Purpose of the Study

The purpose of this thesis is to empirically examine the relationship between ESG disclosure and environmental performance among Finnish listed companies. ESG disclosure is measured using standardized ESG scores, while environmental performance is proxied by the Environmental Pillar Score. The analysis evaluates whether sustainability disclosures are associated with measured environmental performance and whether this association may reflect substantive alignment or reporting-related factors.

In addition, the study examines whether this relationship varies across contexts, specifically the study investigates whether industry characteristics and corporate governance

structures influence the strength of the association between ESG disclosure and environmental performance. By incorporating these moderating factors, the study aims to provide nuanced understanding of the conditions under which ESG disclosure aligns more closely with underlying performance. The findings provide insights for stakeholders by assessing whether ESG disclosures may serve as informative, but not standalone, indicators of measured environmental performance.

1.2 Structure of the Thesis

This thesis is structured into ten chapters, progressing from theoretical foundations to empirical analysis and concluding implications. Chapter 1 introduces the research topic and outlines the purpose, scope and research questions of the study. Chapter 2 develops the theoretical framework by presenting key perspectives that explain why companies disclose sustainability information and how potential discrepancies between disclosure and actual performance may arise. Chapter 3 reviews existing literature, with a particular focus on empirical studies examining the relationship between ESG disclosure and environmental performance and identifies the research gaps that motivate this study.

Chapter 4 develops research hypotheses based on the theoretical framework and prior empirical evidence, outlining expectations regarding the relationship between ESG disclosure and environmental performance, as well as potential moderating effects. Chapter 5 describes the research design, including the methodological approach, sample selection and econometric framework. Chapter 6 presents the data and variable construction, detailing the ESG measures, environmental performance indicators, governance variables and financial controls used in the analysis, along with the data preparation procedures applied to ensure consistency and reliability.

Chapter 7 reports the empirical results of the study. It begins with descriptive and diagnostic analyses, followed by baseline regression results and extended models examining industry and governance moderation effects, as well as robustness tests. Chapter 8

discusses the findings in relation to the theoretical framework and prior literature and evaluates their implications for investors, regulators and corporate decision-makers. Chapter 9 concludes the thesis by summarizing the main findings, acknowledging limitations and proposing directions for future research. Finally, Chapter 10 provides a declaration of the use of AI-assisted technologies in the writing process, ensuring transparency in accordance with academic integrity guidelines.

1.3 Research questions, scope and key definitions

This study is guided by one primary research question and two subordinate questions derived from the theoretical considerations presented in Chapters 2 and 3. The primary research question examines whether higher levels of ESG disclosure are associated with stronger environmental performance among companies listed on the Helsinki Stock Exchange. Environmental performance is measured using the LSEG Environment Pillar Score, which reflects company-level environmental outcomes based on standardized ESG assessment criteria (LSEG, 2024).

In addition, two supplementary questions address potential sources of heterogeneity in this relationship. The first examines whether the association between ESG disclosure and environmental performance differs across industries, specifically whether companies operating in environmentally sensitive sectors (such as energy, utilities, basic materials and industrials) exhibit a stronger relationship between disclosure and performance. The second research question investigates whether corporate governance characteristics moderate this relationship, focusing on board independence as a proxy for governance quality. These questions are tested using interaction terms and sub-sample analyses in the empirical section.

The empirical scope of the thesis is limited to active companies listed on Nasdaq Helsinki and covers the period from 2014 to 2023. The analysis includes companies from multiple industries to capture variation in environmental exposure and reporting practices. The

dataset is constructed using LSEG Workspace data and consists of an unbalanced panel due to differences in ESG data availability across companies and years. The empirical analysis is conducted using panel regression models with company and year fixed effects, allowing the study to exploit within-company variation over time, while controlling for unobserved heterogeneity. The analysis includes standard company-level control variables. Company size is measured as the natural logarithm of total assets, profitability is proxied by return on equity and financial structure is captured using capital gearing. These variables account for differences in company characteristics that may influence both ESG disclosure and environmental performance.

For clarity, the study adopts the following working definitions. ESG disclosure refers to company-level ESG scores provided by LSEG, which capture the extent and quality of publicly available information on environmental, social and governance practices. Environmental performance is measured using the Environment Pillar Score, which reflects a company's performance across a range of environmental indicators, including resource use, emissions and environmental innovation. Disclosure–performance alignment refers to the extent to which higher ESG disclosure is associated with stronger measured environmental performance within the empirical models. These definitions are operationalized in Chapter 6, where the data sources, variable constructions and model specifications are described in better detail. A methodological limitation should be noted at the outset, as both the ESG disclosure measure and the environmental performance measure are derived from the same LSEG data source, which introduces potential measurement overlap and limits construct independence. This may result in mechanical correlation, whereby part of the observed association reflects similarities in underlying data rather than a substantive relationship between disclosure and actual environmental performance. Consequently, the baseline results should be interpreted primarily as evidence of disclosure–performance alignment within the LSEG framework rather than as an independent validation of real-world environmental outcomes, limiting causal interpretation (LSEG, 2024; Berg et al., 2022).

2 Theoretical Framework

The theoretical framework of this thesis integrates several complementary perspectives to explain why companies disclose sustainability information and how gaps between reported commitments and actual outcomes may arise. ESG reporting is viewed not as a purely technical process, but as a strategic activity shaped by institutional pressures, stakeholder expectations, and managerial incentives, drawing on legitimacy, signaling, institutional, stakeholder and agency theory. In addition, measurement-related considerations are incorporated to account for empirical limitations, providing the basis for the study's hypotheses on the relationship between ESG disclosure and environmental performance and the factors influencing this relationship.

2.1 Institutional and Stakeholder Perspectives

According to institutional and stakeholder perspectives, ESG reporting is influenced not only by internal corporate decision-making, but also by institutional pressures and broader societal expectations (Benvenuto et al., 2023; DiMaggio & Powell, 1983; Freeman, 1984; Suchman, 1995). These perspectives explain how companies pursue legitimacy, respond to normative and regulatory pressures and address the demands of diverse stakeholder groups. The following subsections discuss stakeholder theory, institutional theory and legitimacy theory to provide a theoretical basis for understanding these dynamics.

2.1.1 Legitimacy Theory

Legitimacy theory provides a widely applied framework for understanding corporate reporting behaviour (Deegan, 2002). This theory is also central to this thesis, as it helps explain why companies may disclose extensively without corresponding performance, highlighting the distinction between symbolic and substantive behaviour and its link to

greenwashing. The theory's core assumption is that companies rely on society's continuous acceptance and therefore attempt to guarantee that their operations, strategies and disclosures are viewed to be consistent with major societal norms and values (Suchman, 1995). In this sense, legitimacy functions as a resource: when a corporation is perceived as legitimate, it receives access to finance labor and other vital resources (Dowling & Pfeffer, 1975; Suchman, 1995). Conversely, when legitimacy is brought into question, the company's legitimate operating license can be affected (Dowling & Pfeffer, 1975; Deegan, 2002). While legitimacy theory focuses on societal acceptance and perception management, it provides a useful foundation for understanding how companies use disclosure to maintain alignment with broader social expectations.

The concept of legitimacy has been viewed from multiple dimensions; each dimension will influence how a company communicates regarding sustainability (Suchman, 1995; Deegan, 2002). Suchman (1995), identified pragmatic, moral and cognitive legitimacy. A company may gain pragmatic legitimacy if its actions meet the needs of its stakeholders. In other words, the company's actions are providing some form of benefit to its stakeholders (i.e. jobs, quality products etc.). A company may gain moral legitimacy when its stakeholders believe that the actions of the company are ethical and align with social norms and values (e.g., renewable energy investments). Finally, a company may gain cognitive legitimacy when its stakeholders perceive the company's behaviour as normal or accepted by those around them. For example, there may exist expectations in certain industries to report on sustainability activities (DiMaggio & Powell, 1983; Clarkson et al., 2008). Thus, the dimensions suggest that a company's legitimacy does not constitute a permanent state of being (Suchman, 1995; Dowling & Pfeffer, 1975). Rather, it constitutes a dynamic perception that a company must continue to foster through ongoing communications related to its sustainability practices (Deegan, 2002).

Legitimacy theory also explains the strategic responses companies adopt to maintain, repair or extend legitimacy. Dowling and Pfeffer (1975) suggest that organizations can address legitimacy gaps by aligning actual practices with social values, by shaping

stakeholder perceptions through communication or by attempting to influence those values directly. In the context of ESG reporting, disclosure is a central means of managing stakeholder perceptions, especially where environmental performance can be difficult to observe. Sustainability communication thus serves both as a means of managing stakeholder perceptions and as a tool for shaping external reputation (O'Donovan, 2002).

The dispute between symbolic and substantive actions is a common theme in reporting that is motivated by legitimacy, since companies may highlight positive initiatives, such as emissions-reduction projects or sustainability awards, while selectively disclosing or omitting negative developments, including regulatory breaches or rising absolute emissions (Lyon & Montgomery, 2015). This dynamic reflects Meyer and Rowan's (1977) concept of *decoupling*, where formal structures are maintained largely for symbolic conformity rather than functional change. In this sense, corporate reports can become organizational façades that project alignment with societal expectations, while operational practices remain largely unchanged. According to Hahn and Lülfs (2014), businesses frequently use rhetorical techniques like rationalization, abstraction or moral repositioning to portray unfavourable outcomes in a way that is socially acceptable, maintaining legitimacy even in cases where performance gaps continue.

Cho, Laine, Roberts and Rodrigue (2015) demonstrate that businesses encountering environmental disputes or unfavourable media coverage typically increase their sustainability disclosures, often emphasizing positive narratives. In comparison, Aragón-Correa, Marcus and Vogel (2020) show that companies adjust their environmental strategies and reporting practices in response to both mandatory and voluntary regulatory pressures. These responses, however, do not always result in corresponding improvements in environmental outcomes, indicating that reporting may serve a legitimacy-securing role in addition to, or instead of, reflecting substantive change. Beyond routine disclosure, legitimacy theory is particularly relevant in the aftermath of crises or controversies. When companies experience environmental accidents, litigation or reputational shocks, they often resort to "repair" strategies that emphasize disclosure expansion rather than

substantive reform (Ashforth & Gibbs, 1990). These strategies illustrate how legitimacy is not only maintained, but actively reconstructed through selective communication, making sustainability reports important instruments in post-crisis impression management.

Scandinavian countries are often characterized by relatively high societal expectations regarding corporate sustainability and listed companies operate under close investigation from stakeholders, regulators and the media (Romberg, 2020). In Finland, Jutila, Ruman and Sahlström (2024) note that asset managers and listed companies have significantly expanded their ESG disclosures in response to the EU's CSRD and related frameworks. Yet more disclosure does not necessarily equate to better environmental performance (Doan & Sassen, 2020; Berg et al., 2022). Raising questions about the extent to which reporting practices reflect legitimacy management rather than genuine progress. This tension between symbolic and substantive disclosure is especially noticeable in environmentally sensitive industries such as energy, utilities, basic materials and industrials, where both the risks of environmental impact and the demands for transparency are high (Clarkson et al., 2008).

Although legitimacy theory supports company reporting behaviour, it still has certain limitations. One critique is that the theory assumes companies are primarily reactive in aligning with external expectations, as disclosures are often viewed as responses to societal and environmental pressures rather than proactive strategic choices (Deegan, 2002). This perspective may understate the role of managerial discretion and strategic signalling. Another limitation is that legitimacy can be difficult to test empirically, since legitimacy itself is a perception rather than a directly observable condition (Ashforth & Gibbs, 1990). Nevertheless, the strength of legitimacy theory lies in explaining why companies may engage in extensive disclosure even when substantive environmental improvements are limited, as companies can use reporting to maintain or repair legitimacy in response to external pressures (Deegan, 2002).

In summary, legitimacy theory highlights the dual role of sustainability reporting: it is both a mechanism for accountability and a tool for perception management. By emphasizing the importance of societal approval, the theory explains why companies invest considerable resources in disclosure practices that may not always align with verifiable performance outcomes. In the Finnish context, where regulatory requirements and stakeholder expectations are high, legitimacy theory provides view for understanding the potential divergence between ESG disclosures and actual environmental outcomes.

2.1.2 Institutional Theory

Companies' business practices are shaped by a broader set of rules, norms and expectations regarding how companies should function, according to Meyer & Rowan (1977). Whereas legitimacy theory examines whether companies align their practices with social expectations, institutional theory considers the structural pressures that arise from legal requirements, professional standards and sectoral norms. For example, ESG reporting is based on the idea that reporting is not only driven by managers' willingness to disclose information on companies' ESG issues, but also by institutional pressures that influence how companies act and communicate (DiMaggio & Powell, 1983; Bromley & Powell, 2012). As a result, companies may adopt reporting practices that are considered appropriate within their institutional environment, even when they do not reflect underlying performance (Meyer & Rowan, 1977; Bromley & Powell, 2012). In contrast to legitimacy theory, institutional theory emphasizes structural pressures and systemic convergence that shape corporate behaviour across organizations operating in similar environments.

According to Bromley & Powell (2012), companies may adopt reporting systems that are tailored for their institutional environment simply because such systems are expected to exist. One of the main mechanisms in institutional theory is *isomorphism*. Isomorphism refers to the tendency of organizations within the same sector to become increasingly similar over time. DiMaggio & Powell (1983) identified three types of institutional pressures that explain this phenomenon. Coercive pressures arise from legally binding rules

and regulations, such as the EU's CSRD, which obliges large public interest entities and certain groups to prepare annual reports containing sustainability-related information (European Commission, 2023). Normative pressures result from professionalization: sectoral associations, accounting businesses and reporting frameworks such as GRI promote established standards of practice (GRI, n.d.; KPMG, 2020). In addition to coercive and normative pressures, there are mimetic pressures. Mimetic pressures arise under conditions of uncertainty, where companies imitate the practices of peers or leading companies in order to maintain legitimacy. Together, these pressures lead to similarities in companies' reporting structures, regardless of differences in their environmental performance (DiMaggio & Powell, 1983).

Institutional theory also highlights that conformity to external pressures does not necessarily lead to substantive organizational change. The concept of decoupling describes situations in which companies adopt formal structures or reporting practices to signal compliance, while underlying operations remain largely unchanged (Meyer & Rowan, 1977; Bromley & Powell, 2012). In the ESG context, this may manifest as detailed sustainability disclosures that adhere to established frameworks without corresponding improvements in environmental performance. Organizations may prioritize compliance with reporting standards over the achievement of substantive sustainability outcomes, particularly in complex areas where performance is difficult to measure (Wijen, 2014). These dynamics highlight the dual role of institutional pressures: while they enhance transparency and comparability, they may also incentivize standardized reporting practices that are only loosely connected to underlying outcomes (European Commission, 2023; Bromley & Powell, 2012).

The institutional setting additionally influences both how much ESG disclosure takes place, and what it looks like. As an example, in a country with high levels of regulation and transparency (such as those in the Nordic region), companies are likely to face strong incentives to adopt standardized disclosure practices (DiMaggio & Powell, 1983; Jonsdottir et al., 2022). A key point of interest for Finland is that while Finnish companies

are subject to EU wide regulatory standards they are also embedded in the Nordic institutional framework; this creates strong pressure on these companies to provide ESG disclosures due to the coercive, normative and mimetic forces at work and therefore contributes to the converging forms of ESG disclosures by companies (DiMaggio & Powell, 1983).

Overall, institutional theory provides a framework for understanding ESG disclosure as a response to systemic pressures that shape both the form and content of corporate reporting. It explains why companies operating in similar environments exhibit similar disclosure practices and why such practices may not fully reflect underlying performance. This perspective is directly relevant to the present study, as it suggests that the observed relationship between ESG disclosure and environmental performance may be influenced by institutional forces that promote reporting convergence without guaranteeing substantive environmental improvements.

2.1.3 Stakeholder Theory

Stakeholder theory views sustainability reporting as an approach to create value by responding to interrelated stakeholder relationships rather than solely creating value for shareholders. Freeman (1984) emphasizes that a company's long-term viability is dependent upon its ability to manage and balance the expectations of many different stakeholder groups with various interests and needs. Therefore, from this perspective, sustainability reporting may be viewed as a method through which companies demonstrate accountability for their actions to those who have an interest in the company's operations. However, the level of influence of the stakeholders differs among groups. Mitchell et al. (1997), state that the salience of a group of stakeholders will depend on the extent of power, legitimacy and urgency associated with the group. For example, investors and regulators typically have an influence over companies using capital allocations and regulatory oversight, whereas consumers and activist groups typically use reputation risk and media attention to affect changes in companies. Consequently,

companies that operate within heavily regulated or environmental issues are typically subject to higher levels of scrutiny from outside parties and thus are subject to greater external scrutiny and are therefore more likely to provide more extensive environmental disclosures (Clarkson et al., 2008; Marquis & Toffel, 2016). Unlike institutional theory, stakeholder theory focuses on the role of specific stakeholder groups and their direct influence on corporate behaviour and disclosure practices.

Stakeholders influence corporate behaviour through both direct and indirect channels. In some cases, this pressure is quite explicit—for example, activist investors may demand more detailed disclosures on climate-related risks (Eccles & Klimenko, 2019). In other cases, it is more indirect, as NGOs influence corporate behaviour and public perception of environmental issues (Crapa et al., 2024). Stakeholder pressure can vary in its intensity and form (Ullmann, 1985), which in turn affects the nature of corporate disclosure. When stakeholders actively demand specific and verifiable information, companies are more likely to provide substantive disclosures. In contrast, when pressure is more diffuse or primarily reputational, disclosures may take a more symbolic form (Ullmann, 1985; Marquis & Toffel, 2016).

Stakeholder influence has strengthened in recent years, particularly through institutional investors and regulatory developments. Investors increasingly incorporate ESG criteria into decision-making and demand transparent and comparable disclosures (Eccles & Klimenko, 2019). At the same time, regulatory frameworks such as the EU's CSRD have formalised these expectations through requirements such as double materiality (European Commission, 2023). In the Finnish context, this result is associated with relatively high stakeholder scrutiny, particularly in environmentally sensitive industries (Khatri & Kjærland, 2023). However, the extent to which disclosures reflect actual performance depends on the effectiveness of stakeholder monitoring (Marquis & Toffel, 2016). Stakeholder theory provides a useful supporting perspective by explaining how external stakeholder pressures influence ESG disclosure, while its explanatory power overlaps somewhat with legitimacy and institutional theories, it still contributes to this study, by

helping to explain when ESG disclosures are more likely to reflect substantive performance rather than symbolic communication.

2.2 Economic and Governance Perspectives

The economic and governance perspectives focus on how ESG reporting may reduce information asymmetry between companies and external stakeholders. From this viewpoint, disclosure functions as a mechanism for conveying credible information about a company's environmental and governance practices, thereby influencing stakeholder perceptions and capital allocation decisions. ESG communication is shaped by both market incentives and internal governance structures that affect the credibility of the information disclosed. The following subsections examine signaling theory and agency theory as key frameworks for interpreting ESG disclosure behaviour.

2.2.1 Signaling Theory

Signaling theory provides an alternative perspective on why companies disclose sustainability information and how discrepancies can arise between what they report and their actual outcomes. Signaling theory originates in information economics and explains how organizations reduce information asymmetries by communicating privately held information to external parties (Spence, 1973), building on the broader problem of information asymmetry identified by Akerlof (1970). In the context of ESG reporting, from a signaling perspective, sustainability reports, publicly stated commitments and environmental initiatives function not only as mechanisms for transparency, but also as strategic signals aimed at influencing stakeholder perceptions and reducing information asymmetry. Organizations utilize these signals of social and environmental responsibility to attract socially conscious investors, build confidence and credibility among all stakeholders and provide greater access to capital markets (Dhaliwal et al., 2011; Connelly et al., 2011). As a result, they aim to reduce uncertainty and distinguish themselves from

competitors. Connelly, Certo, Ireland and Reutzel (2011) emphasize that the credibility of such signals depends heavily on their cost. Signals that require significant resource commitments, such as substantial environmental investments or externally verified commitments are difficult for companies with weak sustainability practices to imitate and are therefore more likely to be interpreted as credible indications of substantive commitment (Connelly et al., 2011; Simnett et al., 2009).

However, signaling theory also draws attention to the possibility of symbolic or low-cost signals. Companies may highlight minor initiatives, emphasize selected achievements, or produce extensive sustainability reports without making meaningful changes to their environmental practices (Lyon & Montgomery, 2015; Cho et al., 2015). Lyon and Montgomery (2015) describe this as greenwashing, where communication is used to create a favourable image without substantive behavioural change. Empirical evidence supports this view. Marquis and Toffel (2016) show that companies often disclose positive environmental information while omitting less favourable outcomes, thereby signaling responsibility even when performance does not fully align with the narrative. Signaling theory further suggests that credibility depends on the possibility of third-party verification. Disclosures linked to certified standards, such as ISO 14001 or science-based targets, are consider more generally reliable than voluntary narrative claims, as external validation makes them more costly and difficult to imitate (Simnett, Vanstraelen, & Chua, 2009; Kolk & Perego, 2010; ISO, 2015).

Empirical research has shown that ESG signaling can create value for organizations through increased reputation and credibility; however, it also creates potential risk to an organization's reputation. While Dhaliwal et al. (2011) have found that voluntary sustainability disclosure is associated with a lower cost of equity capital, suggesting that such disclosures may function as credible signals of environmental responsibility on behalf of capital markets. Lyon & Montgomery (2015), and Marquis & Toffel (2016) highlight that the effectiveness of such disclosures may be weakened when there are no independent verification or measurable outcomes. The issue with this is the fundamental problem

with ESG reporting, as stated above: Credible signals increase trust among investors and other stakeholders at lower financing costs; however, if the communications are merely symbolic or exaggerated, then investor and stakeholder scepticism will be created and could potentially damage an organization's reputation.

In the Nordic region and particularly in Finland, signaling theory helps to explain current ESG disclosure practices (Jutila et al., 2024; Eccles & Klimenko, 2019; Khatri & Kjærland, 2023). Companies operate in an environment where expectations around sustainability are relatively high and regulatory requirements are becoming more demanding. For example, the EU's CSRD requires listed companies to expand their ESG disclosures, while at this stage only limited assurance of the reported information is required (European Commission, 2023). This means that disclosures are not subject to the same level of verification, which may create differences in their perceived credibility. As a result, stakeholders must assess whether reported information reflects substantive commitments or more superficial efforts. This is particularly relevant in the Finnish context, where transparency norms are generally strong and investor interest in sustainability has increased in recent years (Eccles & Klimenko, 2019). In addition, the market includes several environmentally intensive industries, where both the visibility and credibility of sustainability signals become especially important.

Overall, signaling theory explains the role of ESG disclosures in reducing information asymmetries between companies and their stakeholders. It explains why companies invest in sustainability communication and how signal credibility depends on the extent to which disclosures reflect real, hard-to-imitate commitments. Credible signals can enhance trust and lower capital costs, whereas symbolic signals risk misleading stakeholders and undermining the integrity of ESG reporting. Signaling theory is relevant for the present study, as it provides a framework for interpreting whether ESG disclosure is associated with actual environmental performance or whether it reflects symbolic signaling. It therefore directly informs the analysis of the relationship between ESG scores, and environmental outcomes examined in this study.

2.2.2 Agency Theory

While signaling theory focuses on how companies communicate information to reduce asymmetry, agency theory emphasizes how managerial incentives may distort such communication. Agency theory explains ESG reporting through the relationship between shareholders as principals and managers as agents. Jensen & Meckling (1976) wrote that due to potential conflicts of interest and divergent incentives, managers do not necessarily act in the best interest of shareholders. Since ESG reporting has traditionally been voluntary and depend entirely upon the manager's decisions (KPMG, 2020), this represents another potential ground for agency conflict (Jensen & Meckling, 1976; Marquis & Toffel, 2016). The manager might make symbolic commitments to sustainability while exaggerating the company's commitment to sustainability (Barnea & Rubin, 2010; Marquis & Toffel, 2016); particularly if they perceive a financial advantage of doing so.

One of the primary challenges faced by stakeholders within an agency framework is determining whether or not they are receiving a full representation of the Company's Environmental Performance. Managers, as agents who control access to information, retain considerable latitude in how they prepare and disseminate their company's ESG Report(s) (Jensen & Meckling, 1976; Barnea & Rubin, 2010). Therefore, managers have ample opportunity to present a false picture of their company's ESG Performance through "impression management" or so called "greenwashing" (Lyon & Montgomery, 2015; Marquis & Toffel, 2016). Studies suggest that managers may utilize sustainability reporting to gather public support or avoid negative external evaluation, regardless of any changes made to internal practices (Barnea & Rubin, 2010; Marquis & Toffel, 2016). When this occurs, the disclosure becomes nothing more than a tool for perception management rather than an accountability mechanism for the company. As such, the gap between communication and performance grows.

Although agency theory assumes no need for opportunistic disclosure, it also highlights the impact of governance and monitoring mechanisms on managerial discretion. For example, an independent board of directors and an active audit committee can increase

oversight of corporate sustainability communications and evaluate those communications. By tying executive compensation to sustainable targets, companies can discourage symbolic disclosures (Jiraporn & Chintrakarn, 2013). If reported ESG Performance fails to match actual results (i.e., the CEO/COO has tied his/her compensation to specific sustainable goals/targets), the CEO/COO would incur a personal cost. Moreover, having third party assurance review or evaluation performed on ESG reports can prevent opportunistic reporting. External assurance can enhance the credibility of reported ESG performance, managers are restricted in their ability to overstate environmental achievements (Kolk & Perego, 2010). Likewise, strong institutional ownership exerts additional pressure on managers to provide accurate information. Long-term investors see value in credible disclosures enabling them to properly assess risk and assign fair valuations (Khan et al. , 2016).

Empirical evidence supports these dynamics. Barnea and Rubin (2010) find that managers may overinvest in CSR activities for personal benefit, effectively using ESG initiatives to enhance their own social status rather than to increase company value. Prior, Surroca and Tribó (2008) find that managers with lower ownership stakes are more prone to use CSR engagement as a means of managerial entrenchment, signaling responsibility without necessarily improving financial or environmental outcomes. By contrast, companies with stronger governance mechanisms and higher institutional ownership tend to produce more credible, reliable sustainability reports. Khan et al. (2016) show that well-governed companies with effective monitoring achieve closer alignment between ESG communication and measurable outcomes, suggesting that strong oversight may help reduce agency-related disclosure distortions. These findings align with the broader agency perspective that disclosure practices are contingent on monitoring intensity and incentive alignment. When governance structures are weak, ESG communication can easily drift into managerial self-promotion. Conversely, when independent boards, activist shareholders and assurance providers are active, the scope for opportunistic disclosure narrows and reported information becomes more likely to reflect actual outcomes

rather than symbolic communication (Jensen & Meckling, 1976; Khan et al., 2016; Kolk & Perego, 2010).

Finland's corporate sector is characterized by relatively concentrated ownership and strong traditions of corporate governance (World Bank, 2020). Large institutional investors, particularly pension funds, often engage directly with company management on sustainability issues, reflecting the growing role of active ownership in ESG oversight (Jonsdottir et al., 2022). Their involvement enhances monitoring and reduces the scope for opportunistic ESG disclosure (Khan et al., 2016). Nevertheless, differences continue across companies: those with weaker governance or less intensive monitoring may still issue sustainability reports that overstate achievements or underreport material environmental challenges (Marquis & Toffel, 2016). Agency theory therefore helps explain why disclosure–performance gaps may persist even in a governance environment that is generally well developed. It underlines the importance of examining how incentive structures, monitoring mechanisms and ownership patterns affect the credibility of ESG communication in the Finnish context.

2.3 Organizational Capabilities and Measurement limitations

The organizational capabilities and measurement views will provide a different view by highlighting the organization's internal capabilities and the data-based restrictions associated with the relationship between ESG disclosure and environmental performance. Measurement perspectives highlight how environmental performance is measured and the limitations associated with these measurement approaches (Clarkson et al., 2008). Differences in the quality of data, methods for measuring, and standardized reporting requirements can all impact how effectively an organization can capture its environmental performance (Jonsdottir et al., 2022). As a result, even when disclosure appears extensive, it may not fully reflect underlying performance, either due to capability constraints or measurement challenges.

Differences in disclosure–performance alignment may also reflect variation in companies' internal capabilities (Barney, 1991; Hart, 1995; Russo & Fouts, 1997). The resource-based view of the company (RBV) by Barney (1991) theorizes that companies which have greater environmental competence (i.e., those which can produce at a lower cost, have established EMSs, and/or have greater access to financial resources) will be more likely to make significant improvements to their sustainability and document these through quantifiable results (Russo & Fouts, 1997; Hart, 1995). In addition to the RBV, the dynamic capabilities perspective (DCP) also notes that there is variability in how well companies are able to react to changing regulatory and market demands (Teece et al., 1997). As such, companies with strong adaptive capabilities are better positioned to convert ESG commitments into actionable change, while companies with weak adaptive capabilities tend to focus on communicating ESG commitment versus actual substantive improvement. Therefore, reported differences in ESG disclosures may be partially due to underlying capability limitations rather than differences in intention for reporting.

The relationship between ESG reporting and environmental outcomes is closely linked to how these constructs are measured. Although various methodologies exist for assessing ESG information and environmental performance, many ESG metrics rely, at least partially, on company-reported data. As a result, higher levels of ESG disclosure may lead to higher ESG scores simply because more information is reported, regardless of whether underlying environmental performance has improved (Chatterji et al., 2016; Berg et al., 2022; Christensen et al., 2021). As an example, a mechanical correlation may arise when the method used to assess ESG disclosure and the method used to measure environmental performance rely on similar underlying data. When disclosure-based metrics and performance indicators overlap, empirical results may indicate a positive relationship between disclosure and environmental performance that is partly driven by this shared data rather than by substantive improvements in underlying outcomes (Berg et al., 2022; Christensen et al., 2021). Consequently, ESG scores should be interpreted with caution. They can be understood as reflecting both the extent of sustainability-related reporting

and the degree to which these disclosures correspond to actual environmental actions undertaken by companies (Christensen et al., 2021).

Environmental performance itself can also be operationalised in different ways, such as absolute emissions, emissions intensity, or composite scores. These measures capture distinct dimensions of environmental impact and may lead to different empirical conclusions. The use of standardised ESG datasets, such as LSEG scores in this study, improves comparability across companies, but does not fully eliminate underlying measurement limitations (Berg et al., 2022).

2.4 Synthesis of Theoretical Perspectives

The theoretical frameworks discussed in this chapter provide explanations for why organizations disclose ESG information and why discrepancies can arise between reported disclosures and actual environmental performance. Legitimacy theory suggests that organizations respond to societal expectations to maintain or restore legitimacy (Suchman, 1995), while institutional theory highlights how regulatory and normative pressures shape reporting practices (DiMaggio & Powell, 1983). Stakeholder theory further emphasizes that disclosure is influenced by the expectations and influence of different stakeholder groups (Freeman, 1984). Collectively, all three theories suggest that organizations exist in a larger environment which influences both the amount and type of ESG reporting. In such environments, the report serves not only as a representation of performance, but also as a mechanism of maintaining legitimacy and responding to public scrutiny.

Signaling and agency theory shift the focus toward information asymmetries and managerial incentives. ESG disclosure can function as a signal intended to reduce uncertainty and communicate quality to stakeholders (Spence, 1973; Connelly et al., 2011). However, the credibility of such signals depends on their cost and verifiability. When monitoring is weak, managers may have incentives to engage in selective or symbolic disclosure, which

can weaken the link between reported information and actual performance (Jensen & Meckling, 1976; Lyon & Montgomery, 2015). Governance mechanisms, such as board oversight and external assurance, play an important role in constraining these tendencies and improving the reliability of reported information (Kolk & Perego, 2010; Simnett et al., 2009).

The resource-based perspective complements these views by highlighting differences in companies' internal capabilities. Companies vary in their ability to translate sustainability commitments into measurable outcomes, which may contribute to variation in the alignment between disclosure and performance (Barney, 1991; Hart, 1995). At the same time, measurement-related limitations further complicate this relationship. ESG scores and environmental indicators are constructed using different methodologies and data sources, meaning that observed relationships may partly reflect how disclosure is measured rather than underlying performance (Berg et al., 2022; Kathan et al., 2024). Table 1 summarises the key theoretical perspectives and their implications for the relationship between ESG disclosure and environmental performance. While each theory offers a distinct explanation, they collectively suggest that disclosure does not necessarily correspond to actual performance, but is shaped by external pressures, incentives and internal capabilities.

Table 1. Theoretical perspectives on ESG disclosure.

Perspective	Theoretical focus	Key mechanism influencing disclosure	Implication for disclosure–performance relationship
Legitimacy theory	Alignment with societal expectations	Companies disclose to maintain or restore legitimacy in the eyes of stakeholders	Disclosure may reflect symbolic actions when used to manage perceptions rather than represent actual performance
Institutional theory	Conformity to external rules and norms	Coercive, normative and mimetic pressures shape reporting practices	Standardized reporting may emerge independently of actual performance, allowing for decoupling
Stakeholder theory	Responsiveness to stakeholder expectations	Disclosure reflects the expectations and influence of different stakeholder groups	Alignment depends on the strength and nature of stakeholder pressure

Perspective	Theoretical focus	Key mechanism influencing disclosure	Implication for disclosure–performance relationship
Signaling theory	Reduction of information asymmetry	Companies use disclosure as a signal of quality, with credibility depending on signal cost and verifiability	Disclosure is more likely to reflect actual performance when signals are costly and credible, but may be symbolic otherwise
Agency theory	Conflicts between managers and owners	Managerial incentives and monitoring mechanisms shape disclosure behaviour	Weak governance may enable opportunistic or symbolic disclosure, while strong monitoring improves alignment
Capability & measurement perspectives	Internal resources and data limitations	Companies' capabilities and measurement systems affect both performance and how it is reported	Disclosure may not fully capture performance due to capability constraints or measurement limitations

Overall, these perspectives indicate that ESG disclosure is shaped by a combination of external pressures, managerial incentives and internal capabilities, while also being influenced by how performance is measured. As a result, disclosure should not be interpreted as a direct proxy for environmental performance. These insights provide the basis for the empirical analysis. While not all theoretical perspectives are directly tested empirically, they provide a conceptual framework for interpreting the observed relationships. While these theoretical perspectives provide an important interpretive framework, the empirical analysis of this thesis focuses specifically on the baseline disclosure–performance association and on moderation by industry sensitivity and board independence.

3 Literature review

This chapter reviews prior research on the relationship between ESG disclosure and actual environmental performance, with a particular focus on European and Nordic settings. Sustainability reporting has grown over the last decade or so. However, there remains some uncertainty regarding how accurately these disclosures reflect companies' true environmental practices. Prior research suggests that ESG disclosures may perform a dual function. While they do promote greater transparency and accountability and make companies' environmental actions more visible, they are also used as a means of symbolic communication through which companies attempt to gain credibility with stakeholders rather than providing an accurate reflection of their environmental practices (Cho et al. 2015; Lyon & Montgomery 2015).

Recently, there has been growing controversy related to the use of ESG disclosures as a proxy measure of companies' environmental practices. This has occurred primarily due to increased regulations requiring companies to disclose non-financial information and heightened expectations from investors concerning their own sustainability practices. In Europe, the Non-Financial Reporting Directive (NFRD) and its successor, the Corporate Sustainability Reporting Directive (CSRD), have strengthened and standardised sustainability reporting requirements for companies operating within the region (European Commission, 2023; Jutila et al., 2024). At the same time, international reporting frameworks such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) have wanted to improve the consistency and comparability of sustainability disclosures across companies (GRI, n.d.; IFRS Foundation, n.d.). Despite these developments, researchers continue to identify inconsistencies between companies' disclosed sustainability information, ESG ratings and measurable environmental outcomes, raising concerns about the reliability and comparability of ESG-related indicators (Berg et al., 2022; Sklavos et al., 2025). These issues have raised questions about the reliability of ESG scores, which are widely used by investors and other users of sustainability information to evaluate corporate sustainability (Kathan et al., 2024; Berg et al., 2022).

Research findings examining relationships between environmental performance and ESG disclosure are inconsistent. A portion of the variability associated with inconsistent findings appear to be related to variations in methodologies employed by authors along with the complexities associated with consistently measuring sustainable practices. Some studies report a positive association between sustainability disclosure and environmental performance, suggesting that disclosure may serve as a credible indicator of underlying environmental practices (Clarkson et al., 2008; Khatri & Kjærland, 2023). Other studies, however, point in the opposite direction, showing that companies may selectively emphasize positive aspects of their performance while downplaying less favourable outcomes, particularly when facing reputational pressures (Aragón-Correa et al., 2020; Cho et al., 2015). Overall, these findings suggest that the relationship between ESG disclosure and environmental performance is context-dependent and sensitive to how both disclosure and performance are measured (Doan & Sassen, 2020; Berg et al., 2022).

3.1 ESG Disclosure and Environmental Performance

A substantial body of empirical research examines whether corporate ESG disclosures correspond to verifiable environmental performance (Doan & Sassen, 2020). Overall, studies present contradictory findings: some find positive associations between structured sustainability disclosure and improved environmental outcomes, whereas others find weak, null or even negative relationships consistent with symbolic reporting or greenwashing (Doan & Sassen, 2020; Berg et al., 2022). Disclosure-performance gaps have been documented in many settings using various measures and this issue remains a central concern for researchers and practitioners because it raises questions about the informational value of ESG reports and ratings for investors, regulators and civil society (Doan & Sassen, 2020; Berg et al., 2022; Kathan et al., 2024).

Part of the reason for these differing findings could be that both the “disclosure” and the “performance” sides of the equation are complex to quantify (Berg et al., 2022;

Christensen et al., 2021). On the disclosure side, studies have variously measured ESG communication using binary indicators (whether a sustainability report is published), adoption of standards (e.g. GRI), content analysis scores, third-party ESG ratings or even report length and tone (Dhaliwal et al., 2011; Christensen et al., 2021; Berg et al., 2022). On the performance side, studies have used metrics such as reported greenhouse gas (GHG) emissions (Scopes 1 and 2, sometimes Scope 3), emissions intensity (emissions per revenue or value added), records of environmental fines or sanctions, incident/controversy databases and third-party environmental pillar scores (Berg et al., 2022; Delmas et al., 2013). For example, a company may publish extensive narrative disclosures that publishes a lengthy narrative report and it may score well on disclosure indices, but this does not necessarily mean it has lower emissions, especially if its operations are growing or it fails to address Scope 3 emissions (Greenhouse Gas Protocol, 2011; Delmas et al., 2013). Such measurement heterogeneity contributes substantially to variations in empirical conclusions (Kathan et al., 2024; Berg et al., 2022).

Prior meta-analyses and reviews indicate that these mixed findings and offered cautionary insights (Doan & Sassen, 2020). Notably, Doan and Sassen (2020) conclude that on average the link between environmental reporting and environmental performance is weak and that in many cases more reporting reflects attempts to manage stakeholder perceptions rather than actual improvements in outcomes. Likewise, recent research finds that ESG ratings often capture the apparent narrative strength of a company's sustainability programme (its policies, targets and disclosures) more than they capture independently verifiable impact metrics (Berg et al., 2022; Christensen et al., 2021). Divergence among major rating providers is itself a significant source of inconsistent results (Berg et al., 2022; Kathan et al., 2024). These findings suggest that both researchers and practitioners should be cautious in interpreting high levels of disclosure or high ESG scores as prima facie evidence of strong environmental performance.

However, contextual factors play an important role, studies focusing on the Nordic region have produced more optimistic evidence that formalised disclosure practices can

coincide with substantive outcomes (Khatri & Kjærland, 2023). For example, Khatri and Kjærland (2023) find that among Scandinavian listed companies, the adoption of formal sustainability reporting and recognised standards (such as GRI) is associated with better environmental performance scores, even after controlling for company size and capital intensity. This suggests that in institutional environments with strong regulatory standards, professional reporting cultures and active stakeholder monitoring, disclosure and performance are more likely to move in tandem (Khatri & Kjærland, 2023; DiMaggio & Powell, 1983). Even so, the relationship remains imperfect: in Khatri and Kjærland's analysis, the presence of external assurance did not consistently predict superior environmental outcomes, implying that assurance practices vary in rigour and that not all verification is equally informative about genuine improvements.

Causal interpretation remains challenging due to methodological issues such as endogeneity and reverse causality. Companies with stronger environmental performance may be more likely to disclose, adopt reporting standards, or receive higher ESG scores, making it difficult to determine whether disclosure leads to improved performance or vice versa. In addition, omitted variables, such as management quality or access to capital, may influence both disclosure practices and environmental outcomes. (Wooldridge, 2010; Doan & Sassen, 2020; Khatri & Kjærland, 2023).

A further source of mixed findings is the construction and scope of ESG ratings themselves. Different rating agencies use different indicators, weighting methods and mixes of self-reported versus externally verified data; these differences result in low correlations among ratings and make it hard to compare studies (Berg et al., 2022). Many ESG ratings rely primarily on companies self-disclosed information (Berg et al., 2022), so companies with more extensive reporting often receive higher scores even without better actual performance. In response, recent research advocates using multiple indicators together: triangulating narrative disclosures, third-party ratings and hard outcome data (emissions, sanctions, controversies) (Berg et al., 2022; Christensen et al., 2021). Some

studies have even developed explicit misalignment or greenwashing indices to flag companies with high disclosure levels but poor outcome records (Sklavos et al., 2025).

Industry differences can also change the outcome of the results, prior theoretical discussion and empirical evidence both suggest that industry context shapes disclosure credibility (Clarkson et al., 2008; Hahn & Kühnen, 2013). In high-impact sectors, where environmental metrics and external examination are stronger, symbolic reporting is more easily detected and therefore riskier. (Clarkson et al., 2008; Hahn & Kühnen, 2013). By contrast, companies in lower-impact sectors may manage to publish expansive sustainability narratives with little risk of immediate contradiction. This sectoral heterogeneity is one motivation for the present study's focus on environmentally sensitive industries in Finland: in those sectors, the potential for measurable environmental signals is greater and any gaps between communication and performance should be more detectable (Clarkson et al., 2008; Khatri & Kjærland, 2023).

3.2 Empirical Approaches to Disclosure–Performance Alignment

Researchers have employed a diverse and continually developing set of methodological approaches to assess whether corporate sustainability communication corresponds to verifiable environmental outcomes (Doan & Sassen, 2020; Khatri & Kjærland, 2023). The majority of research has focused on two common methodologies, which are cross-sectional and panel regression design (Doan & Sassen, 2020; Khatri & Kjærland, 2023). A very common example of the type of environmental performance indicator that is often used in those studies includes, but is limited is greenhouse gas emission intensity, overall environmental performance scores, how frequently a corporation is fined by government agencies or subject to other forms of legal sanction; and/or an aggregate score of all reported negative environmental events experienced by the company (Berg et al., 2022; Delmas et al., 2013). That data is then analysed alongside one or more disclosure metrics. Those disclosure metrics represent the quantity and quality of information disclosed in a company's ESG reports (Christensen et al., 2021; Berg et al., 2022). Regularly

disclosed metrics include ESG ratings, adoption of reporting standards, and/or the inclusion of specific environmental objectives within their disclosure (Christensen et al., 2021; Khatri & Kjærland, 2023). To measure the impact of disclosing environmental information, most models will control for company-specific attributes including company size, leverage, profitability, and industry classification (Khatri & Kjærland, 2023). Panel data models often incorporate year and industry fixed effects to control for unobserved trends and sector differences, generating better identification than simple cross-sectional analysis. Analyses typically report robust standard errors clustered by company or industry to account for within-company correlation over time. (Wooldridge, 2010; Khatri & Kjærland, 2023).

Because the decision to disclose is an endogenous for most businesses; those that have greater environmental performance will typically have better incentives to provide disclosures, adopt standards and obtain assurance from outside parties; therefore researchers need to apply a variety of methods when attempting to measure causal relationships related to disclosure (Doan & Sassen, 2020; Khatri & Kjærland, 2023; Wooldridge, 2010). To address these challenges, prior research has applied a range of empirical strategies. For example, studies use propensity-score matching to construct comparable groups of companies based on disclosure practices, while others employ difference-in-differences designs to exploit regulatory changes in disclosure requirements over time (Khatri & Kjærland, 2023; Krueger et al., 2024). Instrumental variable approaches have also been used when suitable instruments are available, although such applications rely on strong assumptions. Panel data models, particularly those incorporating fixed effects, are commonly used to control for unobserved heterogeneity (Wooldridge, 2010). For example, Khatri and Kjærland (2023) apply matching methods to address selection bias, while Krueger et al. (2024) exploit regulatory changes in sustainability reporting frameworks. Although these approaches improve identification, they do not fully eliminate endogeneity concerns and typically require extensive robustness testing (Wooldridge, 2010; Doan & Sassen, 2020).

Some studies construct composite measures to capture the gap between disclosure and performance, for example by combining disclosure scores with environmental indicators into a single index (Sklavos et al., 2025). These approaches require careful weighting and robustness checks, as results can be sensitive to how the indices are constructed (Sklavos et al., 2025). Accordingly, researchers usually test alternative index specifications and conduct robustness checks to ensure that key patterns are robust (Sklavos et al., 2025).

Measurement choices on both the disclosure and performance dimensions are crucial and can introduce systematic bias into empirical results (Berg et al., 2022; Christensen et al., 2021). Disclosure indicators often exhibit significant variability across data providers: commercial ESG ratings differ in their scope, indicator selection and weighting methods and many rely heavily on company-reported information (Berg et al., 2022). This dependence can artificially inflate the observed correlation between disclosure and performance metrics (Berg et al., 2022; Christensen et al., 2021). On the performance side, researchers face complex decisions regarding whether to use absolute or intensity-based emissions measures, how to incorporate different emission scopes (Scopes 1, 2, and the more difficult-to-measure Scope 3), and how to treat missing or estimated values (Greenhouse Gas Protocol, 2011; Berg et al., 2022). Emissions intensity, such as emissions per unit of revenue, is frequently used to normalise for company size but may conceal increases in absolute emissions when business activity expands (Greenhouse Gas Protocol, 2011). Alternative indicators, including regulatory sanctions, counts of environmental controversies and third-party performance assessments, offer complementary perspectives but vary in coverage and interpretability (Delmas et al., 2013; Berg et al., 2022). Addressing potential measurement error is therefore essential. Common methodological remedies include winsorisation to limit the influence of outliers, logarithmic transformations to correct for skewness and careful treatment of missing observations (Wooldridge, 2010).

Robustness and sensitivity tests are essential for credible disclosure–performance studies, researchers routinely re-estimate models using alternative definitions of disclosure

and performance, include lagged variables to allow time for disclosures to affect outcomes and conduct additional tests to assess the stability of results (Doan & Sassen, 2020; Wooldridge, 2010). Heterogeneity analyses dividing the sample by industry, company size, ownership concentration, or governance strength are particularly useful, since the disclosure–performance relationship often varies by sector and context (Doan & Sassen, 2020; Krueger et al., 2024). Sub-sample analyses and interaction effects involving governance-related factors, such as board independence or ownership structure, can reveal whether the credibility of reporting is moderated by a company's internal controls (Khan et al., 2016).

Taken together, the methodological literature suggests that no single technique is optimal in all cases. A thorough assessment of disclosure–performance alignment requires careful measurement, appropriate identification strategies and extensive sensitivity analyses. In this study, these insights inform the empirical design (Doan & Sassen, 2020; Berg et al., 2022; Wooldridge, 2010). The analysis employs panel regression models with company and year fixed effects to examine the relationship between ESG disclosure and environmental performance. In addition, the study explores heterogeneity across environmentally sensitive industries and evaluates the moderating role of governance characteristics through interaction terms. Robustness is assessed using alternative model specifications and performance measures. This approach aims to ensure that the observed relationships reflect substantive patterns rather than artefacts of measurement or sample composition. These considerations are particularly important in this study, as both ESG disclosure and environmental performance are derived from the same data source, which may influence the observed relationship (Berg et al., 2022; Christensen et al., 2021).

3.3 Company and Industry Factors Affecting Credibility

Environmental impacts are unevenly distributed across the economy and companies in high-impact sectors, such as energy, utilities, basic materials and heavy manufacturing

are subject to more intense regulatory oversight, stakeholder monitoring and media attention than companies in lower-impact sectors (Clarkson et al., 2008; Hahn & Kühnen, 2013). The credibility of ESG disclosures thus varies systematically across industries and according to company-specific characteristics. Empirical evidence suggests industry membership is often one of the strongest external determinants of disclosure patterns and credibility (Clarkson et al., 2008; Khatri & Kjærland, 2023). For instance, in sectors such as financial services, companies may rely more heavily on narrative commitments and policy-oriented disclosures than on direct operational environmental metrics (Sklavos et al., 2025). In contrast, companies in industrial sectors typically report hard data on emissions, resource use and waste, which facilitates third-party verification and increases the reputational and legal risks of misrepresentation (Clarkson et al., 2008; Khatri & Kjærland, 2023). Therefore, purely symbolic reporting is more difficult to sustain in those contexts.

Within a given industry, a company's size, resources and capabilities significantly influence both its disclosure intensity and its actual environmental performance (Barney, 1991; Hart, 1995; Khatri & Kjærland, 2023). Larger companies typically have greater managerial capacity, dedicated sustainability teams and more capital to invest in emissions-reducing technology and reporting systems (Waddock & Graves, 1997; Khatri & Kjærland, 2023). Empirical evidence from Nordic markets shows that large, capital-intensive companies tend to score higher on both disclosure metrics and objective environmental performance measures (Khatri & Kjærland, 2023). Size offers advantages in data gathering, obtaining assurance and engaging with external stakeholders, but it also creates high visibility, which can motivate more elaborate communications to protect corporate reputation (Waddock & Graves, 1997; O'Donovan, 2002). Governance characteristics further moderate these effects. Companies with strong governance mechanisms such as independent boards, significant institutional ownership or formal ESG oversight structures are more likely to align their disclosures with substantive actions, whereas weak governance is associated with wider disclosure-performance gaps (Khan et al., 2016; Kolk & Perego, 2010; Barnea & Rubin, 2010). Similarly, certifications and external

commitments (e.g. ISO 14001 or adoption of major reporting standards) often signal an organisational investment in environmental management and are empirically linked to higher reporting credibility, although the rigour and enforcement of such credentials vary by context (ISO, 2015; Khatri & Kjærland, 2023).

Meta-analytic evidence indicates that companies with weaker environmental performance sometimes disclose more extensively, consistent with impression management dynamics and the risk of selective disclosure or greenwashing (Doan & Sassen, 2020). In contrast, companies that treat sustainability as a strategic priority – integrating it into operations and capital planning – usually produce disclosures that more closely mirror measurable outcomes (Hart, 1995; Russo & Fouts, 1997). Ownership structure is another important determinant. Concentrated ownership, active institutional investors and long-term shareholders generally strengthen oversight and constrain managerial opportunism, thereby improving the alignment between communicated commitments and actual performance (Khan et al., 2016; Jensen & Meckling, 1976). On the contrary, dispersed ownership or managerial entrenchment can widen disclosure–performance gaps (Khatri & Kjærland, 2023; Khan et al., 2016). Broader cultural and market dynamics—such as customer preferences, supplier expectations and prevailing national norms—further shape whether companies direct their efforts toward substantive environmental improvements or rely primarily on reputational signalling (Freeman, 1984; Suchman, 1995; DiMaggio & Powell, 1983).

These company- and industry-level factors carry important implications for how we design empirical tests. Sectoral heterogeneity implies that studies should stratify the sample by industry or include explicit industry controls, because combining very different sectors could obscure systematic differences in the disclosure-outcome relationship (Clarkson et al., 2008; Khatri & Kjærland, 2023). Company size, governance and ownership attributes should be accounted for (either as controls or via subgroup analysis), since they influence disclosure decisions and are linked to environmental capacity (Khan et al., 2016; Khatri & Kjærland, 2023). The varying prevalence of certification and

assurance across industries also means researchers should, when possible, recognise self-reported metrics from externally verified indicators (Kolk & Perego, 2010; Simnett et al., 2009). In this thesis, such considerations motivate focusing on environmentally sensitive industries (where substantive environmental metrics are most noticeable and disclosure-performance gaps are likely to be most consequential and detectable) and including key company attributes such as size, governance proxies and ownership variables as controls in the analysis (Khatri & Kjærland, 2023; Kolk & Perego, 2010).

3.4 Regulatory and Contextual Landscape

The regulatory and broader context in which companies operate has dramatically changed in the last few years, which is why an understanding of this changing context is critical for explaining the connection between the disclosures made by companies and the demonstrable environmental outcomes. At the EU level, the new CSRD represents a significant change from voluntary to obligatory reporting on sustainability for numerous companies within the EU (European Commission, 2023). The CSRD requires in-scope companies to report using the European Sustainability Reporting Standards (ESRS) and there is a staggered application based upon company size and whether they are publicly listed (European Commission, 2023). Companies previously required to report under the non-financial reporting Directive (NFRD) will report on sustainability matters for the first time using CSRD standards for the 2024 financial year (with published reports available in 2025) (European Commission, 2023). Later waves of public companies and eventually smaller publicly traded SMEs will follow. The directive also introduces the principle of double materiality to reporting. Companies must report on two different aspects of sustainability issues: how those sustainability issues will impact their financial position and how the operations of those companies will negatively or positively affect the environment and society. Also, according to the directive, third-party assurances of the accuracy of the sustainability information will be required (the initial type of assurance being "limited assurance" with plans to increase it over time). (European commission, 2023; Grant Thornton, 2024; Ecobiomanager, n.d.)

There is also some degree of variability in how each EU country implements the CSRD. Accounting laws, auditing laws and laws regarding companies have already been modified in several countries in order to comply with the directives' mandates. Transposition and enforcement timelines have had various revisions with transposition deadlines, proposed simplifications packages (known as omnibus legislation) and other implementation adjustments occurring during 2024–2025 and into 2025–2026 creating near-term uncertainty concerning what constitutes scope, when it is due and the practical burden that reporting will place on companies. There were recently additional proposed simplifications to the overall framework that could potentially delay when certain reporting requirements go into effect (Reuters, 2025).

Concurrently, European regulators have become more aggressive in addressing inaccurate environmental statements and greenwashing. the European Union amended its consumer protection framework via Directive (EU) 2024/825 in 2024, extending coverage of unsubstantiated environmental claims within the unfair commercial practice's directive. That means every environmental statement made in marketing or corporate communications can no longer be unsubstantiated and must be backed up by factual evidence (Directive (EU) 2024/825, 2024) the European Commission has also proposed a sustainability directive along with supporting measures intended to establish consistency in verifying product-level environmental claims and enhance enforcement against deceptive sustainability marketing (European commission, 2023; Reuters, 2025). These three sets of initiatives, along with the CSRD reflect a broader trend toward increased accountability and transparency. As a result, these initiatives increase both the potential liability associated with making false or unsubstantial environmental statements and the authority of government agencies to deter and penalize those who make false or unsubstantial environmental statements (European Commission, 2023; Directive (EU) 2024/825, 2024).

These regulatory developments have broad consequences for the relationship between disclosure and actual performance. Mandatory reporting standards, common metrics

such as ESRS and external assurance requirements are anticipated to improve the quality and comparability of sustainability data (European Commission, 2023; Krueger et al., 2024). Improving the quality and comparability of sustainability data may strengthen the conditions for a closer alignment between reported information and measurable environmental outcomes (Christensen et al., 2021; Berg et al., 2022). Through mandating companies to collect data on specific quantifiable indicators — including Scope 1 & 2 greenhouse gas emissions, key pollution metrics, etc. and provide disclosure on such data, regulatory bodies create incentives for companies to develop more robust internal tracking and measurement systems for measuring environmental performance (European Commission, 2023; Krueger et al., 2024). Regulatory bodies are also increasing the expected liability for providing misinformation (by requiring independent verification of reports - although it will begin as limited assurance) thereby reducing the likelihood that companies will merely engage in tokenistic disclosures (Grant Thornton, 2024; Ecobiomanager, n.d.). practitioners indicate that mandatory reporting regimes significantly improve the clarity and thoroughness of reporting. However, evidence that similar frameworks rapidly lead to tangible decreases in measured environmental impacts is mixed. While early benefits are frequently seen in terms of breadth and comparability of disclosed data, actual reductions in measured impacts are generally dependent on time, investment and effective enforcement. (Krueger et al., 2024; Jutila, Ruman & Sahlström, 2024).

National authorities and sector-based authorities' ability to enforce compliance at both levels will also be critical factors. In what manner effectively national authorities utilize resources and implement these regulatory structures — including assuring that assurance is rigorous and imposing penalties for violations — will largely determine how successful the CSRD and emerging anti-greenwashing regulations are in closing the gap between disclosed information and performance information (Directive (EU) 2024/825, 2024; European Commission, 2023; Jutila et al., 2024). If national authorities do not aggressively pursue these regulatory programs, then companies may focus on disclosing information accurately rather than taking operational actions that would enable them to

reduce environmental impacts. On the contrary, if national authorities actively monitor companies' compliance with reporting requirements, particularly where established reporting practices exist as is often found in Nordic markets, then mandatory reporting is more likely to lead to meaningful environmental improvements over time (Jutila, Ruman & Sahlström, 2024; Khatri & Kjærland, 2023). Nevertheless, research indicates that differences among companies and industries still exist despite existing regulatory frameworks (Jutila, Ruman & Sahlström, 2024; Khatri & Kjærland, 2023) as such, the evolving nature of this regulatory context underscores that external oversight alone cannot ensure the authenticity of ESG communications. Even under mandatory frameworks, ESG communications' alignment with performance ultimately depends on characteristics unique to individual companies and institutional conditions that define how reporting obligations translate into action. Therefore, the next section evaluates the variables that moderate whether ESG communications represent a valid proxy for environmental performance.

3.5 Factors Moderating Disclosure–Performance Alignment

While existing research has examined the direct relationship between ESG disclosure and environmental performance, more recent studies emphasise the importance of contextual and organisational moderators (Doan & Sassen, 2020; Khatri & Kjærland, 2023). The credibility of sustainability communication is shaped not only by reporting practices themselves but also by the institutional, methodological and governance environments in which reporting occurs (Berg et al., 2022; Jensen & Meckling, 1976; DiMaggio & Powell, 1983). External verification, data comparability and internal oversight mechanisms influence whether disclosures are perceived as credible indicators of performance or as symbolic communication (Berg et al., 2022). Prior research points to three recurring factors that shape disclosure–performance alignment: external assurance, differences across ESG rating systems and corporate governance (Berg et al., 2022; Khatri & Kjærland, 2023; Khan et al., 2016) and together, these factors help explain why disclosure–performance relationships vary across companies, industries and institutional contexts.

3.5.1 Assurance and Verification

One factor that directly influences the credibility of ESG disclosure is the presence and quality of external assurance (Simnett et al., 2009; Kolk & Perego, 2010). External assurance, discussed in Chapter 2 as a mechanism for improving disclosure reliability, remains a key moderating factor in empirical research. Assurance aims to increase stakeholder confidence in reported information, though its effectiveness depends on scope and quality. Empirical studies, however, indicate that the effect of assurance on the alignment between disclosure and performance is mixed. Some research finds that assured reports are associated with higher-quality disclosures and greater stakeholder trust (Simnett et al., 2009; Casey & Grenier, 2015). Other studies, however, highlight that most sustainability reports receive only limited assurance, which is narrower in scope and less demanding than financial audits (Kolk & Perego, 2010; Martínez-Ferrero & García-Sánchez, 2017).

In the Nordic context, where professional reporting traditions are relatively strong, assurance is often viewed as a mechanism that constrains symbolic reporting and increases the likelihood that disclosures correspond with actual outcomes (Khatri & Kjærland, 2023). Nevertheless, evidence remains inconclusive, for example, assurance does not always cover environmental indicators specifically and the extent to which assurance providers challenge companies on contested or negative information is unclear (Khatri & Kjærland, 2023; Martínez-Ferrero & García-Sánchez, 2017). For this reason, assurance should be seen as a potentially important but not uniformly effective moderator of disclosure–performance alignment.

3.5.2 Divergence Among ESG Ratings

Another methodological issue concerns the divergence of ESG ratings across data providers. as outlined in Chapter 2, ESG ratings often diverge because data providers apply different indicators, weighting methods and levels of verification (Berg et al., 2022). Such

variation reduces the comparability of scores and complicates empirical assessment. This divergence has important implications for research and practice. From an academic perspective, it means that conclusions about disclosure–performance alignment may depend on which ESG dataset is used, thereby introducing an additional layer of uncertainty (Berg et al., 2022; Kathan et al., 2024). For investors and policymakers, rating divergence complicates the task of identifying sustainability leaders, particularly in smaller markets such as Finland, where coverage may be uneven and smaller companies are often rated by fewer providers. Studies increasingly recommend triangulating across multiple data sources, combining ESG ratings with hard performance indicators such as emissions or regulatory sanctions, to mitigate these concerns (Berg et al., 2022; Sklavos et al., 2025).

3.5.3 Corporate Governance

Strong governance structures can constrain managerial opportunism and increase the likelihood that reported sustainability efforts reflect substantive rather than symbolic action. Corporate governance mechanisms are increasingly recognised as critical determinants of the credibility of ESG disclosures (Jensen & Meckling, 1976; Khan et al., 2016). Consistent with the agency theory framework introduced in Chapter 2, weak governance and limited oversight can encourage opportunistic use of ESG disclosure (Jensen & Meckling, 1976; Barnea & Rubin, 2010). Empirical evidence supports this view: companies with independent boards, significant institutional ownership and sustainability-linked executive incentives are more likely to align their disclosures with measurable performance outcomes (Khan et al., 2016; Nofsinger, Sulaeman, & Varma, 2019).

Governance also interacts with external mechanisms such as assurance and stakeholder pressure. For example, Kolk and Perego (2010) find that companies with strong boards are more likely to seek external assurance for sustainability reporting, suggesting complementarity between internal and external accountability structures. Similarly, Gallego-Álvarez and Rodríguez-Domínguez (2023) show that boards whose members possess

longer tenure, greater experience and more cultural diversity are more proactive in implementing environmental practices, implying stronger monitoring and alignment between disclosures and outcomes. These findings highlight that governance quality not only moderates the disclosure–performance relationship but also shapes how companies respond to regulatory and market pressures for sustainability information.

Taken together, these factors indicate that the relationship between ESG disclosure and environmental performance is not uniform but depends on a range of contextual and organisational conditions (Doan & Sassen, 2020; Berg et al., 2022; Khatri & Kjærland, 2023). Assurance and verification practices influence the reliability of disclosed information, divergence among ESG ratings affects measurement consistency and governance structures shape the extent to which sustainability communication reflects underlying operational performance. Considered alongside the theoretical perspectives outlined in Chapter 2, these findings suggest that disclosure–performance alignment emerges from the interaction of external pressures, internal capabilities and methodological choices. This provides a foundation for the following section, which identifies the key gaps in the literature and positions the contribution of this study.

3.6 Research gaps and contribution of the study

Despite a substantial and growing body of research, the relationship between ESG disclosures and environmental performance is still not completely clear. Studies have produced inconsistent results regarding the relationship between ESG disclosure and environmental performance. Some studies found that higher amounts of disclosure were linked to better environmental outcomes (for example, Clarkson et al., 2008; Khatri & Kjærland, 2023), while other studies indicated weak or no relationships between the two, with many indicating that disclosure was primarily for symbolic or impression-management purposes (Cho et al., 2015; Doan & Sassen, 2020). This lack of consistency can be attributed to differences in measurement approaches, research design and contextual factors (Berg et al., 2022; Ioannou & Serafeim, 2015; Christensen et al., 2021). While ESG

indicators provide insight into organizational policies, disclosures and structure relative to realized environmental performance, they do not provide direct measures of environmental performance (Delmas et al., 2013; Berg et al., 2022). Therefore, the level of informational value provided by ESG disclosure remains context dependent and has not been clearly established.

One of the main limitations concerning the current body of research regarding the geography of the sample size is the fact that most studies utilize a broad international sample or a large cross-country dataset (Ioannou & Serafeim, 2015; Doan & Sassen, 2020). While studies utilizing only Nordic countries exist (Khatri & Kjærland, 2023), country-specific data is lacking, especially in Finland. This represents an important gap, as institutional settings characterised by highly developed governance systems, high transparency and strong regulatory environments may influence both ESG disclosure practices and the extent to which those practices align with measured environmental performance (Ioannou & Serafeim, 2015). Without additional empirical support, findings based on an aggregated international sample cannot be generalized to an environment with an institutional setting such as Finland's.

Another limitation of the existing literature concerns the inconclusive treatment of contextual and organisational influences on the disclosure-performance relationship (Doan & Sassen, 2020; Khatri & Kjærland, 2023). There is an increasing recognition in the literature that the relationship between ESG disclosure and environmental performance does not occur uniformly and is influenced by various aspects such as the industry type and governance structure (Clarkson et al., 2008; Khan et al., 2016; Eccles et al., 2014; Doan & Sassen, 2020). However, the majority of the empirical literature has failed to provide conclusive evidence supporting these moderation effects (Doan & Sassen, 2020). It is currently unclear if the relationship between ESG disclosure and environmental performance is significantly stronger in industries that are more environmentally sensitive due to their increased visibility and exposure to outside scrutiny (Clarkson et al., 2008; Doan & Sassen, 2020). Similarly, it is unclear whether governance mechanisms will act

to constrain symbolic reporting and increase the credibility of disclosed ESG metrics (Khan et al., 2016; Barnea & Rubin, 2010). Findings indicate that the moderation effects vary depending upon the institutional context. However, these moderation effects remain less explored within a single institution-based context (Ioannou & Serafeim, 2015).

The final limitation arising from methodological constraints is that ESG measures differ greatly in terms of scope and weight assigned to indicators selected for inclusion. Additionally, many ESG rating agencies rely largely on self-reported information (Berg et al., 2022; Christensen et al., 2021). As such, many studies may observe inflated positive correlations between ESG disclosure and performance without corresponding increases in actual environmental outcomes (Delmas et al., 2013; Berg et al., 2022; Christensen et al., 2021). Furthermore, issues surrounding endogeneity and reverse causality complicate interpretation of causation. For instance, organizations with improved environmental performance are more likely to engage in extensive disclosure activities or receive higher ESG scores (Krueger et al., 2024; Christensen et al., 2021). The limitations outlined above demonstrate that empirical designs should employ standardized measurement frameworks and include longitudinal components as well as controls for company-specific heterogeneity.

This study addresses the limitations mentioned previously via a structured empirical design. By analysing Finnish listed companies, this study contributes to a country-specific dataset from an institutional context that remains underrepresented in prior research. Panel data from LSEG Workspace during the period of 2014 – 2023 is analysed to examine whether ESG disclosure is associated with measured environmental performance. Additionally, this study will test for systematic variation in this relationship as a function of contextual moderators. Specifically, this study will investigate how the relationship between ESG disclosure and environmental performance varies across environmentally sensitive industries and governance characteristics. Empirically speaking, panel regressions with fixed-effects for both company and year allow researchers to account for

company-level unobserved heterogeneity as well as mitigate concerns about endogeneity (Wooldridge, 2010).

In summary, this thesis extends prior research by conducting an in-depth examination of the relationship between ESG disclosure and environmental performance in a Finnish institutional context using data collected over the period of 2014 – 2023. During this time frame, sustainability reporting practices evolved from voluntary disclosure frameworks towards more standardized and regulated ESG reporting in Europe (European Commission, 2023; Jutila et al., 2024). This thesis also advances our knowledge regarding the conditions under which disclosure-performance alignment varies by incorporating industry and governance characteristics into its empirical model. Finally, this thesis addresses methodological concerns present in prior research by employing a longitudinal design with consistent measurement and robustness considerations. Ultimately, this thesis provides a more context-specific and empirically grounded evaluation of the extent to which ESG disclosure aligns with measured environmental performance in the Finnish listed-company context.

4 Hypothesis development

The theoretical frameworks discussed in Chapter 2 and the empirical results from studies reported in Chapter 3 provide evidence that ESG disclosures do not necessarily mirror actual environmental performance. While companies can and do make extensive disclosure because it is perceived as being important to their stakeholders, to their legitimacy, and to conform with institutional norms; there are also instances where such disclosure may be a genuine indicator of superior environmental practices (Suchman, 1995; DiMaggio & Powell, 1983; Freeman, 1984; Spence, 1973). Based on the theoretical and empirical discussion, the following hypotheses examine whether ESG disclosure is associated with verified environmental performance among Finnish listed companies and whether this relationship varies across industry context and governance quality. The aim is to translate the conceptual arguments into testable propositions that guide the empirical analysis. Figure 1 outlines the idea of the conceptual framework, illustrating the expected relationship between ESG disclosure and environmental performance, with industry characteristics and governance quality acting as moderating factors.

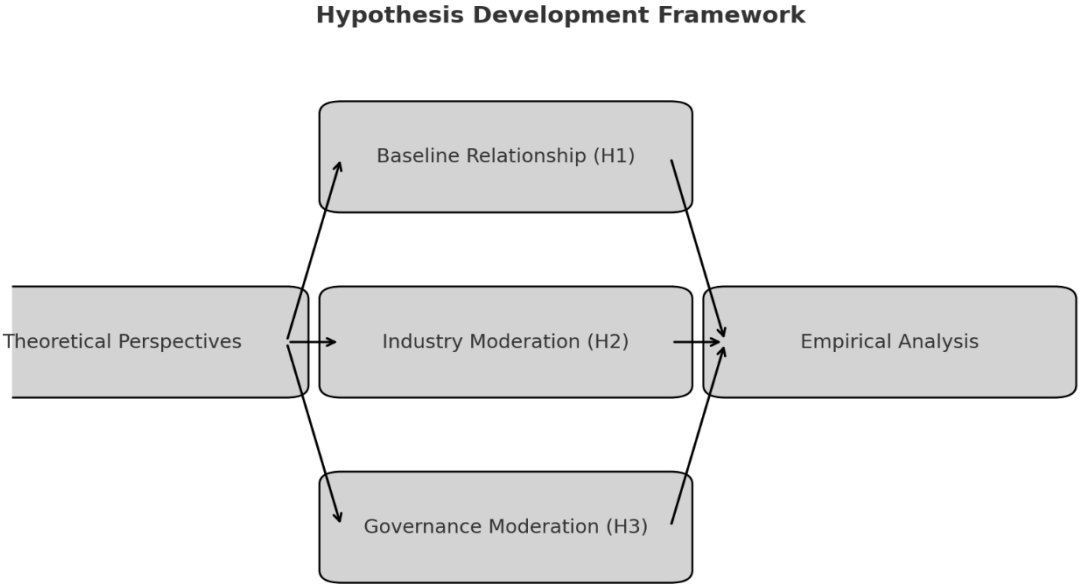

Figure 1. ESG Disclosure–Performance Framework.

ESG disclosure is operationalised using Refinitiv ESG-based measures, which are constructed from publicly available sustainability-related information (LSEG, 2024). Environmental performance is measured using both composite ESG-based indicators and emissions-based metrics to reflect both reported and observable environmental outcomes (Berg et al., 2022; Delmas et al., 2013). This dual measurement approach is used to improve construct validity and to better capture the alignment between disclosure and environmental performance as measured through both score-based and emissions-based indicators (Berg et al., 2022; Christensen et al., 2021).

4.1 Baseline Association Between Disclosure and Performance

A central question is whether ESG disclosure is associated with measured environmental performance and how that association should be interpreted in light of symbolic and substantive disclosure theories. Legitimacy theory suggests that disclosure can be used strategically to secure societal approval even when substantive improvements are limited (Suchman, 1995; Cho et al., 2015). In contrast, signaling theory predicts that companies with genuine stronger performance will disclose more because credible transparency distinguishes them in product and capital markets (Spence, 1973; Connelly et al., 2011; Dhaliwal et al., 2011).

These competing perspectives highlight the ambiguity of disclosure–performance relationships. If disclosure is primarily symbolic, the association between reporting and outcomes will be weak (Cho et al., 2015; Lyon & Montgomery, 2015). If disclosure functions as a credible signal, then higher reporting levels should coincide with verifiable performance improvements (Spence, 1973; Clarkson et al., 2008). Testing this baseline association provides the foundation for subsequent, more nuanced hypotheses.

H1: ESG disclosure levels are positively associated with measured environmental performance among Finnish listed companies.

Empirically, H1 will be tested using regression models that relate environmental performance indicators, including score-based and emissions-based measures, to disclosure measures obtained from established ESG databases. Controls will include company size, profitability, leverage and industry affiliation, with company and year fixed effects to account for unobserved heterogeneity. Concerns about measurement validity will be addressed through triangulation across alternative environmental performance measures and robustness checks, as described in Chapter 6.

4.2 Industry Heterogeneity

Institutional and stakeholder theories emphasize that disclosure practices are shaped by industry-specific pressures. Companies in environmentally sensitive industries, such as energy, utilities, basic materials and industrials, face more intense stakeholder monitoring, regulatory oversight and reputational risk (DiMaggio & Powell, 1983; Clarkson et al., 2008). In such industries, disclosure is more likely to be subject to verification and consequently, more closely aligned with substantive environmental performance (Clarkson et al., 2008; Khatri & Kjærland, 2023). By contrast, companies in lower-impact industries may face weaker monitoring and fewer coercive pressures, leaving greater scope for symbolic reporting (DiMaggio & Powell, 1983; Hahn & Kühnen, 2013). Testing for industry heterogeneity thus allows us to assess whether disclosure–performance alignment is conditional on sectoral context, which is especially relevant in Finland given the dominance of energy-intensive and export-oriented industries in its economy.

H2: The positive association between ESG disclosure and measured environmental performance is stronger for companies in environmentally sensitive industries (energy, utilities, basic materials and industrials) than for companies in lower-impact sectors.

Interaction terms are used to test moderation effects, as they allow the estimation of whether the relationship between ESG disclosure and environmental performance differs systematically across industry groups (Aiken & West, 1991). The hypothesis will be

tested using interaction terms between disclosure measures and industry classifications, as well as sector-specific sub-sample analyses. Industry classification and coding rules are presented in Chapter 6.

4.3 Board Independence as a Governance Proxy

Agency theory highlights the importance of governance structures in aligning managerial incentives with shareholder and stakeholder interests (Jensen & Meckling, 1976). Without effective monitoring, managers may use ESG disclosure opportunistically to enhance personal reputation or weaken accountability (Jensen & Meckling, 1976; Barnea & Rubin, 2010). Board independence is used here as a practical proxy for governance quality, as agency theory highlights the role of monitoring in constraining managerial opportunism, and prior research links stronger governance and monitoring to more credible ESG-related disclosure practices (Jensen & Meckling, 1976; Khan et al., 2016). In Finland, ownership is often concentrated and institutional investors play an important role in corporate governance, which makes governance-related monitoring a relevant contextual factor in this setting (World Bank, 2020; Jonsdottir et al., 2022). Examining board independence as a proxy for governance quality allows us to evaluate whether companies with stronger monitoring structures achieve closer alignment between disclosure and measurable environmental outcomes than those with weaker governance systems.

H3: The positive association between ESG disclosure and measured environmental performance is stronger for companies with higher board independence, used here as a proxy for governance quality. Empirically, this is examined using board independence as a moderating variable, interaction terms with disclosure scores, and robustness checks across governance terciles.

4.4 Scope of Hypotheses

Together, these hypotheses focus on the main mechanisms identified in the literature: signaling credibility, industry context and governance quality. These hypotheses provide a conceptually coherent and comprehensive basis. Other potentially relevant factors such as company size, ownership type (state versus private), environmental certification (e.g., ISO 14001, Science Based Targets, and regulatory change (e.g., CSRD implementation) will be incorporated as control variables or explored in supplementary heterogeneity tests rather than as primary hypotheses. This approach ensures that the hypothesis set remains focused and empirically tractable while still allowing for robust checks and secondary insights. By structuring the analysis around H1–H3, this thesis examines the conditions under which ESG disclosure is associated with measured environmental performance and how this association varies across industry context and board independence. The hypotheses are tested using panel regression models, where ESG disclosure is included as the main explanatory variable and environmental performance as the dependent variable. Moderation effects are examined through interaction terms between ESG disclosure and industry classification (Hypothesis 2) and governance characteristics (Hypothesis 3). This empirical approach allows the analysis to assess both the baseline relationship and the conditions under which the strength of this relationship varies across companies (Wooldridge, 2010).

5 Methodology

This chapter outlines the methodological framework used to investigate the relationship between ESG disclosure and measured environmental performance among Finnish listed companies. The purpose of this chapter is to provide an explanation of how the empirical part of the study was done, so the results can be easily replicated. This section aims to explain the study's design, scope, the way the sample was chosen, the definition of variables used in the study and their measurement, what the primary source of information used was for the empirical part of the study and how the analysis of those data was performed. Thus, the study creates a solid foundation for testing hypotheses that have been formed based on previous Chapter 4.

5.1 Research Design and Scope

This study adopts a quantitative explanatory research design (Creswell, 2014). Quantitative methods are particularly suitable for examining the relationship between ESG disclosure and environmental performance because they allow systematic comparison across companies and enable the application of regression analysis to evaluate statistical relationships between variables (Wooldridge, 2010). As the aim of this study is to find out if there is evidence of higher levels of ESG disclosure being associated with measurable environmental outcomes and to explore how company level characteristics affect this relationship (Saunders et al., 2019), the explanatory approach has proven useful within the ESG literature. In many cases when researching ESG literature, the relationship between disclosure and environmental performance is unclear due to the presence of company specific and institutional factors (Berg et al., 2022; Christensen et al., 2021; Friede et al., 2015).

Panel data is used for empirical analysis. Panel data combines cross-section variability between companies with time series variability over years. A major advantage of using panel data is that it enables researchers to account for omitted variable bias related to

company specific characteristics (Wooldridge, 2010). Compared to pure cross-sectional analyses, panel data provides a stronger basis for controlling for unobserved heterogeneity; however, it does not fully address endogeneity concerns such as reverse causality (Wooldridge, 2010). Since both ESG disclosure and environmental performance are affected by company-specific characteristics (such as organizational culture or management practices), which cannot be observed directly, panel data provides a better tool for analysing the relationship of interest compared to other cross-sectional approaches (Wooldridge, 2010; Baltagi, 2021). For example, during the examined time frame there were several changes made to regulation regarding sustainability reporting in the European Union such as the growing implementation of the EU Taxonomy for Sustainable Activities and the CSRD (European Commission, 2018; Directive (EU) 2022/2464, 2022). Therefore, using this time span allows us to analyse current trends in corporate sustainability reporting while providing enough time series variations for statistical analysis. Therefore, this time span provides strong methodological relevance as it represents a transition from largely voluntarily disclosed ESG information to more standardized ESG reporting standards. These developments can potentially influence either the quantity or quality of disclosed ESG information (Christensen et al., 2021).

5.2 Sample Selection

The empirical sample consists of companies listed on the Helsinki Stock Exchange (Nasdaq Helsinki). The analysis includes companies from multiple industries to capture variation in environmental exposure across sectors. Including companies from different sectors makes it possible to examine whether the relationship between ESG disclosure and environmental performance varies depending on the environmental intensity of the industry in which a company operates.

To investigate potential sectoral differences, the study distinguishes between environmentally sensitive and less environmentally intensive industries. Following prior research in environmental and sustainability accounting, environmentally sensitive

industries include sectors in which business activities are typically associated with higher environmental impacts and stricter regulatory scrutiny (Clarkson et al., 2008). In this study, these industries include energy, utilities, basic materials and industrials sectors. Companies operating in these sectors are generally subject to stronger environmental regulation and stakeholder pressure regarding sustainability practices and environmental disclosure (Clarkson et al., 2008; Kolk & Perego, 2010).

The classification of companies into environmentally sensitive industries is implemented using industry information provided by Refinitiv and based on the Global Industry Classification Standard (GICS) (MSCI & S&P Dow Jones Indices, 2023). A dummy variable is constructed to indicate whether a company belongs to one of the environmentally sensitive industries. This variable allows the empirical analysis to examine whether the relationship between ESG disclosure and environmental performance differs between companies operating in environmentally sensitive industries and those operating in less environmentally intensive sectors (Clarkson et al., 2008).

Including both environmentally sensitive and non-sensitive industries broadens the analytical scope of the study (Ioannou & Serafeim, 2015). While focusing exclusively on environmentally intensive industries could increase the materiality of environmental performance indicators, including companies from multiple sectors allows the study to assess whether disclosure–performance alignment varies across different industry contexts (Clarkson et al., 2008; Khatri & Kjærland, 2023). At the same time, restricting the analysis to companies listed on Nasdaq Helsinki ensures that the companies operate within a consistent institutional and regulatory environment. This improves comparability across observations while maintaining a sufficiently diverse sample for empirical analysis (Ioannou & Serafeim, 2015; La Porta et al., 1998). In addition, focusing on a single-country setting improves internal validity by reducing variation arising from cross-country institutional differences, which have been shown to influence ESG disclosure practices and their economic implications (Ioannou & Serafeim, 2015).

The initial population of companies was identified using the Refinitiv (LSEG Workspace) Navigator report for companies listed on Nasdaq Helsinki. This dataset included 176 companies classified as active at the time of data extraction. The sample was subsequently reduced due to data availability constraints, which is common in ESG research due to incomplete reporting and coverage limitations (Berg et al., 2022). First, only companies with available environmental performance data (Environment Pillar Score, ENSCORE) were retained, resulting in a subset of approximately 76 companies. As ENSCORE serves as the dependent variable, companies without this information could not be included in the analysis. In a second step, companies with missing observations in other key variables, such as ESG disclosure scores, financial control variables or governance indicators were excluded. As a result, the final estimation sample consists of 74 companies and 454 company-year observations. The reduction in sample size is primarily driven by incomplete ESG ratings, emissions data and governance variables, as well as challenges in matching data consistently across sources.

5.3 Variables and Measures

The empirical analysis relies on a set of variables obtained from the LSEG Workspace (Refinitiv) database. The dataset includes ESG indicators, environmental performance measures, corporate governance indicators and financial control variables for companies listed on the Helsinki Stock Exchange. These variables allow the study to examine the relationship between ESG disclosure and observable environmental outcomes while controlling for relevant company characteristics identified in prior literature (Clarkson et al., 2008; Khatri & Kjærland, 2023).

The primary dependent variable in the analysis is environmental performance, which is measured using the Environment Pillar Score (ENSCORE) provided by Refinitiv (LSEG, 2024). This score reflects a company's performance in managing environmental risks and impacts and is constructed from multiple indicators, including emissions management, environmental innovation and environmental policies (LSEG, 2024). The use of ENSCORE

provides a standardised and comparable measure of environmental performance across companies. However, as composite ESG-based indicators may partly reflect disclosed policies rather than realised environmental outcomes, the analysis also incorporates emissions-based measures to better capture observable environmental performance (Berg et al., 2022). These include direct emissions (Scope 1), indirect emissions (Scope 2) and emissions intensity relative to revenue (Greenhouse Gas Protocol, 2011). Using multiple environmental indicators allows the study to assess the robustness of the relationship between ESG disclosure and environmental performance (Berg et al., 2022; Christensen et al., 2021). In this thesis, environmental performance is measured using LSEG-based and emissions-based indicators and the main score-based dependent variable should be interpreted as a proxy for environmental performance rather than as an independently verified physical outcome measure.

The key independent variable is ESG disclosure, which is measured using the Refinitiv ESG Score (TRESGS) and the ESG Combined Score (TRESGCS) (LSEG, 2024). The ESG Score reflects the extent and quality of a company's sustainability reporting based on publicly available information, including sustainability reports, annual reports and regulatory filings (LSEG, 2024). The ESG Combined Score adjusts the ESG score by incorporating information about ESG-related controversies, providing a more comprehensive measure of disclosure credibility (LSEG, 2024). These measures are appropriate for capturing ESG disclosure, as they are based on publicly available reporting and reflect the extent and quality of information disclosed by companies, which is central to assessing whether disclosure aligns with actual environmental performance (LSEG, 2024; Christensen et al., 2021). In addition, the ESG Controversies Score (TRESGCCS) is included to capture the extent to which companies have been associated with ESG-related controversies reported in the media or regulatory sources (LSEG, 2024; Berg et al., 2022).

Corporate governance characteristics are incorporated into the analysis to examine whether governance quality moderates the relationship between ESG disclosure and environmental performance. Governance quality is proxied by board independence,

measured as the proportion of independent directors on the board. Board independence is widely used in corporate governance research as an indicator of monitoring effectiveness and is expected to improve monitoring and reduce the scope for opportunistic ESG disclosure by reducing managerial opportunism and symbolic reporting (Jensen & Meckling, 1976; Khan et al., 2016).

To reduce omitted-variable bias, the study includes several financial control variables that have been widely used in previous research examining ESG performance and corporate sustainability (Waddock & Graves, 1997; Clarkson et al., 2008). Company size is measured using total assets and market capitalization, as larger companies typically have more resources available for sustainability initiatives and are subject to greater stakeholder scrutiny (Waddock & Graves, 1997). Financial performance is captured through return on equity (ROE) and operating profit margin, which measure a company's profitability and its capacity to invest in environmental improvements (Clarkson et al., 2008). Leverage is measured using capital gearing and total debt, reflecting the company's financial structure and potential constraints on sustainability investments (Friede et al., 2015). Finally, the number of employees and asset growth are included as additional indicators of company scale and development (Ioannou & Serafeim, 2015). Table 2 presents a summary of the variables used in the empirical analysis, together with their definitions and data sources.

Table 2. Variables, definitions and sources.

Variable Type	Variable	Code	Definition / Measure	Source
Dependent	Environment Pillar Score	ENSCORE	Composite score measuring company environmental performance based on environmental management, policies, and environmental impact indicators	Refinitiv (LSEG Workspace)
Dependent (alternative)	Scope 1 CO_2 emissions	ENERDP024	Direct greenhouse gas emissions produced by company operations	Refinitiv
Dependent	Scope 2 CO_2 emissions	ENERDP025	Indirect emissions associated with purchased electricity and energy consumption	Refinitiv

Variable Type	Variable	Code	Definition / Measure	Source
(alternative)				
Dependent (robustness)	GHG emissions intensity	ENERO52V	Scope 1 emissions relative to company revenue	Refinitiv
Dependent (robustness)	Total emissions intensity	ENERO03V	Total CO_2 emissions relative to company revenue	Refinitiv
Independent	ESG Score	TRESGS	Overall ESG disclosure score reflecting the extent and quality of ESG reporting	Refinitiv
Independent	ESG Combined Score	TRESGCS	ESG score adjusted for ESG controversies	Refinitiv
Independent	ESG Controversies Score	TRESGCCS	Measure capturing the presence and severity of ESG controversies	Refinitiv
Moderator	Board Independence	CGBSO07V	Percentage of independent directors on the board	Refinitiv
Control	Total Assets	02999	Total company assets used as a measure of company size	Refinitiv
Control	Market Capitalization	08001	Market value of the company's equity	Refinitiv
Control	Return on Equity (ROE)	08301	Net income relative to shareholders' equity	Refinitiv
Control	Operating Profit Margin	08316	Operating income relative to revenue	Refinitiv
Control	Capital Gearing	08221	Ratio measuring financial leverage	Refinitiv
Control	Total Debt	03255	Total debt obligations of the company	Refinitiv
Control	Number of Employees	07011	Total number of employees in the company	Refinitiv
Control	Asset Growth	08621	One-year growth rate of total assets	Refinitiv

5.4 Data Sources and Ethical Considerations

The primary method for conducting an empirical analysis in this study is through using secondary data. Secondary data were drawn from well-established and widely

recognized sources of both financial and sustainability-related data. Utilizing secondary data with standardization supports increased transparency and replicability for research as it allows for the use of verifiable, consistent data across all researched companies (Saunders et al., 2019). The data set which was utilized in this study were collected from LSEG Workspace. The sample includes Finnish corporations listed on the Nasdaq Helsinki stock exchange. The time span of the data set is from 2014 to 2023. A ten-year window of time allows for enough variance in ESG disclosure, as well as environmental performance metrics, while simultaneously allowing the researcher to assess recent trends in corporate sustainability reporting throughout the EU regulatory framework. The data include ESG indicators, environmental performance metrics, governance characteristics and financial information for the companies included in the sample.

Information on ESG disclosure and environmental performance is obtained from the Refinitiv ESG database within LSEG Workspace. The Database collects data from company annual reports, sustainability reports, regulatory filings and other publicly available disclosures (LSEG, 2024). This data source has been systematically analysed and converted to standardized ESG metrics, to accordingly comparison of companies across time periods. In addition to the ESG Scores, the ESG combined scores, the ESG controversies scores and the environment pillar scores will also be utilized as key indicators for measuring environmental performance. Furthermore, greenhouse gas emissions are measured by direct emissions (Scope 1), emissions caused by purchased energy (Scope 2) and revenue intensity of emissions (Greenhouse Gas Protocol, 2011).

Corporate governance characteristics are also obtained from the Refinitiv dataset. In this study, governance quality is proxied by board independence, measured as the percentage of independent directors on the company's board. This indicator reflects the extent to which the board can exercise independent oversight over management and sustainability-related decisions (Jensen & Meckling, 1976; Khan et al., 2016).

Financial and company-level control variables are drawn from the same LSEG Workspace database to ensure consistency across data sources. These variables include total assets, market capitalization, return on equity, operating profit margin, capital gearing, total debt, number of employees and annual asset growth. Using financial variables from the same database as the ESG indicators reduces the risk of inconsistencies that may arise when combining multiple external datasets (Berg et al., 2022).

The study is based on publicly disclosed company-level data from commercially available financial databases. Therefore, the study does not include human participants, personal data or confidential information. As a result, there are no ethical concerns regarding privacy or data protection directly arising from the study. However, methodological considerations exist regarding the validity and reliability of the measures. The ESG indicators are, to a large extent, derived from company disclosures. Reporting biases as well as differences in disclosure practices among companies may therefore be introduced (Christensen et al., 2021; Berg et al., 2022). To mitigate these concerns, the analysis includes multiple environmental performance indicators. Both composite ESG scores and objective emissions measures are used. Using several complementary indicators strengthens the robustness of the empirical analysis and helps ensure that the results reflect observable environmental performance rather than disclosure practices alone (Berg et al., 2022; Christensen et al., 2021).

5.5 Analytical Techniques

The empirical analysis is conducted using quantitative panel data methods. Panel data analysis is particularly appropriate for this study because it allows the examination of variation across both companies and time. By combining cross-sectional and time-series dimensions, panel data models improve estimation efficiency and help control for unobserved heterogeneity that may affect environmental performance across companies (Wooldridge, 2010). The analysis proceeds in several stages. First, descriptive statistics are calculated for all variables included in the dataset. These statistics provide an

overview of the distribution of ESG disclosure scores, environmental performance indicators, governance characteristics and financial variables within the sample. In addition, correlation matrices are reported to examine the pairwise relationships between variables and to assess the potential presence of multicollinearity before conducting regression analysis.

The main empirical strategy relies on panel regression models that examine the relationship between ESG disclosure and environmental performance (Wooldridge, 2010). This approach is suitable for the present study, as it allows the analysis to focus on within-company variation over time, thereby reducing bias arising from time-invariant unobserved company characteristics; however, time-varying confounding factors and reverse causality may still be present (Wooldridge, 2010; Baltagi, 2021). The baseline specification follows the framework proposed by Khatri and Kjærland (2023), who analyse sustainability reporting and environmental performance among Nordic listed companies. Their model provides a suitable starting point for the present study, as it examines whether sustainability disclosures correspond with observable environmental outcomes. However, the model is extended in this thesis by incorporating corporate governance as a moderating factor and by applying the model specifically to Finnish listed companies. The baseline regression model used to test the relationship between ESG disclosure and environmental performance is specified as follows:

$$EnvironmentalPerformancei,t = \beta 0 + \beta 1 ESGDisclosurei,t + \beta 2 ln(Assetsi,t) + \beta 3 Profitabilityi,t + \beta 4 Leveragei,t + \beta 5 IndustryDummyi + \beta 6 YearDummyt + \varepsilon i,t \quad (1)$$

where i denotes the company and t denotes the year. The dependent variable $EnvironmentalPerformance$is measured primarily using the Environment Pillar Score (ENSCORE). Alternative environmental indicators, such as emissions intensity measures, are used in robustness tests. ESG disclosure is measured using the Refinitiv ESG Score (TRESGS). Company size is measured as the natural logarithm of total assets, profitability

is measured using return on equity and leverage is captured using capital gearing. Industry dummy variables control sector-specific environmental risk differences, while year dummy variables capture time-specific shocks affecting all companies. The inclusion of company and year fixed effects further strengthens the empirical design by controlling for unobserved heterogeneity across companies and common time-specific shocks (Wooldridge, 2010). This is important in ESG research, where unobservable factors such as corporate culture or regulatory changes may influence both disclosure and environmental outcomes (Berg et al., 2022; Christensen et al., 2021). Hypothesis 1 examines whether higher levels of ESG disclosure are associated with better environmental performance. This hypothesis is tested using the baseline regression model described above. A positive and statistically significant coefficient for the ESG disclosure variable would indicate that companies with higher ESG disclosure levels also demonstrate stronger environmental performance. However, as ESG scores partly incorporate environmental components, the relationship should be interpreted with caution and additional robustness tests using alternative environmental measures are conducted to mitigate potential mechanical correlation (Berg et al., 2022).

To test Hypothesis 2, which proposes that the relationship between ESG disclosure and environmental performance is stronger in environmentally sensitive industries, an interaction term between ESG disclosure and the environmentally sensitive industry indicator is introduced. The model is therefore extended as follows:

$$EnvironmentalPerformancei,t = \beta 0 + \beta 1 ESGDisclosurei,t + \beta 2 SensitiveIndustryi + \beta 3(ESGDisclosurei,t \times SensitiveIndustryi) + \beta 4 ln(Assetsi,t) + \beta 5 Profitabilityi,t + \beta 6 Leveragei,t + \beta 7 YearD \quad (2)$$

The interaction term captures whether the association between ESG disclosure and environmental performance differs between environmentally sensitive industries and other sectors. Interaction terms are used to test moderation effects, as they allow the estimation of whether the relationship between ESG disclosure and environmental

performance differs systematically across groups, such as environmentally sensitive industries (Aiken & West, 1991). A positive coefficient for the interaction term would indicate that ESG disclosure is more strongly associated with environmental performance in industries with higher environmental impact.

Hypothesis 3 examines whether corporate governance strengthens the relationship between ESG disclosure and environmental performance. Following the supervisor's recommendation, governance is incorporated as a moderating variable. In this study, governance quality is proxied by board independence, measured as the percentage of independent directors on the company's board. The moderating effect is tested by including an interaction term between ESG disclosure and board independence:

$$EnvironmentalPerformancei, t = \beta 0 + \beta 1 ESGDisclosurei, t + \beta 2 Governancei, t + \beta 3 (ESGDisclosurei, t \times Governancei, t) + \beta 4 ln(Assetsi, t) + \beta 5 Profitabilityi, t + \beta 6 Leveragei, t + \beta 7 IndustryDummyi \quad (3)$$

The interaction coefficient captures whether the relationship between ESG disclosure and environmental performance varies depending on governance quality. A positive coefficient would indicate that stronger governance structures enhance the credibility of ESG disclosures and are associated with better environmental outcomes (Khan et al., 2016). Similarly, the interaction between ESG disclosure and governance quality enables the analysis to assess whether governance structures influence the strength of the disclosure–performance relationship.

To strengthen the reliability of the empirical findings, robustness checks are performed. These robustness checks are necessary given known limitations in ESG measurement and potential model sensitivity and they help assess whether the observed relationships depend on specific variable definitions or model specifications (Berg et al., 2022). Alternative environmental performance indicators are also used, including greenhouse gas emissions intensity measures such as Scope 1 emissions relative to revenue. Additional

ESG indicators, such as the ESG Combined Score, are also used to verify that the results are not driven by the specific disclosure metric selected in the baseline model. Extreme values are treated using winsorization to reduce the influence of outliers and variance inflation factors (VIF) are calculated to assess the presence of multicollinearity among explanatory variables (Wooldridge, 2010). In addition, a tercile-based robustness test is conducted by dividing the sample according to governance quality (board independence) and re-estimating the baseline model across these subgroups to assess whether the main relationship differs across governance levels. Furthermore, robust standard errors are applied in all regression models to account for potential heteroskedasticity (Wooldridge, 2010). Overall, the use of panel regression models allows the study to systematically evaluate the relationship between ESG disclosure and environmental performance across companies and over time. By incorporating industry characteristics, governance factors and financial controls, the empirical approach provides a comprehensive framework for testing the hypotheses developed in the theoretical section of the thesis. All statistical analyses and regression models were estimated using the R statistical software.

6 Data

Following chapter describes the dataset used in the empirical analysis and explains how the final research sample was constructed. While the previous chapter outlined the methodological framework and analytical techniques applied in the study, the present chapter focuses on the data that underlies the empirical analysis. Specifically, the chapter introduces the sources of the dataset, explains the process through which the sample companies were identified and describes the procedures used to prepare the data for econometric analysis. The dataset consists of company-level ESG indicators, environmental performance measures, governance characteristics and financial variables for companies listed on the Helsinki Stock Exchange. The data were obtained from the LSEG Workspace (Refinitiv) database and cover the period from 2014 to 2023. This time frame provides a sufficiently long observation window to analyse variation in ESG disclosure practices and environmental performance across companies and over time.

The chapter proceeds as follows. Section 6.1 describes the data collection process and the primary data sources used in the study. Section 6.2 explains the construction of the research sample and the classification of companies by industry. Section 6.3 outlines the procedures used to clean and prepare the dataset for analysis. Finally, Section 6.4 presents descriptive statistics for the main variables used in the empirical models.

6.1 Data Collection and Sources

The empirical data used in this study were obtained from LSEG Workspace (Refinitiv), which provides standardized ESG, governance and financial data for publicly listed companies (LSEG, 2024). The database was selected because it offers a consistent and widely used source for company-level sustainability and financial indicators, thereby enabling the construction of a longitudinal dataset suitable for panel regression analysis.

The raw data were exported from LSEG Workspace into an Excel file consisting of two worksheets. The first worksheet contains the company list (Navigator Report), which defines the initial sample universe. This sheet includes identifying and descriptive information for each company, such as company name, ticker symbol, RIC code, listing date, exchange, market, currency, sector classification and activity status (LSEG, n.d.). In this study, the Navigator Report is used to identify the companies listed on the Helsinki Stock Exchange and to verify that only companies classified as active are included in the sample.

The second worksheet contains the actual variable-level data used in empirical analysis. This sheet includes yearly observations for the ESG, environmental, governance and financial variables requested from LSEG Workspace. The dataset therefore combines company identifiers from the Navigator Report with time-varying company-level observations from the data sheet. As the raw export format is not immediately suitable for econometric analysis, the second worksheet is cleaned and restructured into a panel-data format in which each row corresponds to a company-year observation and each column represents a variable used in the empirical models.

The data cover the period from 2014 to 2023, which provides a ten-year observation window for the analysis of ESG disclosure and environmental performance among Finnish listed companies. This period is sufficiently long to capture variation across both companies and years, while also reflecting the recent development of sustainability reporting practices in the European regulatory context (European Commission, 2018; Directive (EU) 2022/2464, 2022). The variables collected from LSEG Workspace include ESG scores, environmental performance indicators, governance characteristics and financial control variables, which together form the empirical basis of the study.

6.2 Sample Construction and Industry Classification

The construction of the research sample followed process that began with identifying the population of companies listed on the Helsinki Stock Exchange (Nasdaq Helsinki). The initial company universe was obtained through the Navigator export from LSEG Workspace, which provides standardized company identifiers and sector classifications for all listed securities. The navigator report includes company names, ticker symbols, Reuters Instrument Codes (RIC), listing dates, sector information and activity status. Because the focus of this study is on currently operating listed companies, only companies classified as active in the database were retained in the sample. Companies with inactive status were excluded to avoid distortions related to delistings, mergers, or incomplete reporting histories.

After establishing the universe of active listed companies, ESG, governance, environmental and financial variables were retrieved from the same database for the observation period 2014–2023. These variables were then matched with the companies identified in the navigator report using company identifiers such as ticker symbols and RIC codes. The matching process ensured that all variables correspond to the correct company-year observations. Because the availability of ESG and environmental indicators varies across companies and years, the final analytical dataset is determined by the availability of observations for the key variables used in the empirical models.

Industry classification plays an important role in empirical analysis, as the study investigates whether the relationship between ESG disclosure and environmental performance differs across sectors with varying environmental impacts. Sector information is obtained directly from the LSEG Workspace database, which assigns each company to a standardized industry category. These classifications are used to distinguish between environmentally sensitive industries and other sectors of the economy. Industries such as oil and gas, electricity and utilities, chemicals, industrial materials, metals and mining, and construction and materials are typically treated as environmentally sensitive in the environmental-disclosure literature (Clarkson et al., 2008).

Using the sector classifications available in the dataset, companies belonging to environmentally intensive sectors were identified and grouped into a category labelled environmentally sensitive industries. Companies operating in other sectors, such as financial services, software, media, or retail, were categorized as lower environmental impact industries. This classification enables the creation of an industry indicator variable that is later used in the regression analysis to test whether the association between ESG disclosure and environmental performance differs across industry types. Table 3 summarizes the stages of the sample construction process.

Table 3. Sample Construction Process.

Stage	Description	Outcome
Initial population	All companies listed on Nasdaq Helsinki identified through LSEG Workspace Navigator export	Universe of Helsinki-listed companies
Activity filter	Companies classified as inactive removed from the sample	Active listed companies retained
Data matching	ESG, environmental, governance and financial variables matched using company identifiers	Company-year observations constructed
Data availability filter	Observations retained only where key variables are available for the analysis period	Final panel dataset (2014–2023)

The resulting dataset forms an unbalanced panel of Finnish listed companies observed over multiple years. The panel structure enables the study to examine both cross-sectional differences between companies and temporal variation within companies over time. By combining sector classifications with ESG and financial variables, the dataset provides a suitable empirical foundation for analysing whether ESG disclosure corresponds with verifiable environmental performance and whether this relationship differs across industry contexts.

6.3 Dataset and Variable Preparation

The raw dataset obtained from LSEG Workspace required several preparation steps before it could be used for econometric analysis. The original export consisted of a wide-format Excel dataset containing company-level ESG, environmental, governance and financial indicators across multiple years. As is common with large database exports, the raw data included observations outside the intended study period, empty rows and formatting inconsistencies that needed to be addressed before constructing the final analytical dataset. The first step in the data preparation process involved adjusting the structure of the dataset to ensure that variables and years were consistently organized. The columns were reviewed and rearranged where necessary to align company identifiers with their corresponding ESG and financial variables. This step ensured that each variable could be correctly linked to the relevant company and year during the subsequent stages of analysis. Next, the dataset was restricted to the observation period used in the empirical analysis. The original LSEG export contained observations for the years 2009–2025, but the scope of this study focuses on the ten-year period 2014–2023. Observations outside this timeframe were therefore removed from the dataset. Limiting the dataset to a consistent time window improves comparability across companies and ensures that the empirical analysis reflects a stable period of ESG reporting practices.

The dataset was then cleaned to remove incomplete or non-informative rows. Empty rows, error values and rows containing missing identifiers were removed to prevent distortions in the statistical analysis. Removing such observations is a standard procedure in empirical research using large secondary datasets, as database exports often include structural rows or incomplete entries that are not suitable for quantitative analysis (Wooldridge, 2010). After this, the dataset was structured into a format suitable for panel-data analysis. Each observation corresponds to a company-year combination, while columns represent the variables used in the empirical models, including ESG indicators, environmental performance measures, governance characteristics and financial control variables. This panel structure enables the analysis to capture both cross-sectional variation between companies and temporal variation across years.

In addition to structural cleaning, certain variables were prepared for econometric estimation. Company size variables such as total assets were transformed using the natural logarithm in order to reduce skewness and improve the statistical properties of the regression models (Wooldridge, 2010). Environmental performance variables based on emissions were expressed as intensity measures relative to revenue where applicable, allowing comparisons between companies of different sizes (Greenhouse Gas Protocol, 2011). These transformations are consistent with established practices in empirical ESG research and help reduce the influence of scale differences and skewed distributions in the regression analysis (Wooldridge, 2010; Berg et al., 2022).

Finally, the cleaned and structured dataset forms an unbalanced panel of Finnish listed companies observed between 2014 and 2023. Because ESG and environmental reporting are not available for all companies every year, some company-year observations contain missing values for specific variables. Rather than imputing missing values, the analysis relies on the available observations for each regression specification. This approach preserves the integrity of the original data while allowing the empirical models to utilize the maximum number of valid observations, which is a common consideration in empirical analyses using incomplete panel data (Wooldridge, 2010). The resulting dataset provides the foundation for the descriptive statistics and regression analyses presented in the following chapter.

6.4 Descriptive Statistics

This subsection presents the descriptive statistics and sample distribution of the LSEG Workspace dataset used in the empirical analysis. The data were obtained from an Excel export downloaded from LSEG Workspace (Refinitiv/LSEG). The first worksheet contains the Navigator report for actively listed companies on Nasdaq Helsinki, while the second worksheet includes the annual ESG, environmental, governance and financial variables used in this study. In accordance with the research design, the sample is restricted to the period 2014–2023.

The final dataset forms an unbalanced panel consisting of 175 unique companies and 1,691 company-year observations. According to the Navigator report, there are 177 active Nasdaq Helsinki companies in total, but two of these are excluded from the panel because they do not have any observations during the review period, as their listings occur after the sample window. The unbalanced structure of the panel reflects differences in listing histories and data availability across companies, as some companies entered the market only during the latter part of the study period and therefore do not have observations for the earlier years.

The descriptive statistics reported in this subsection are calculated on an available-case basis, meaning that the number of observations varies across variables depending on the extent of missing data. In the regression analyses presented in Chapter 7, the effective number of observations is determined model by model using listwise deletion. Consequently, a company-year observation is included in each regression only if all dependent and explanatory variables required for that specification are available simultaneously.

6.4.1 Descriptive Statistics of the Main Variables

Table 4 reports the descriptive statistics for the main variables used in the study. For each variable, the table presents the mean, standard deviation, minimum value, maximum value and the number of non-missing observations for the period 2014–2023. As expected in an unbalanced panel setting, the number of observations varies substantially across variables.

Table 4. Descriptive statistics of the main variables (2014–2023).

Variable	Mean	Standard Deviation	Min	Max	N
Environment Pillar Score (ENSCORE)	56.80	24.78	0.00	96.01	459
ESG Score (TRESGS)	56.18	19.22	10.21	92.00	459
ESG Combined Score (TRESGCS)	54.68	18.24	10.21	91.40	459
ESG Controversies Score (TRESGCCS)	94.32	17.19	3.13	100.00	459
Board Independence % (CGBSO07V)	82.76	19.01	10.00	100.00	459
ln(Total Assets) (02999 / WC02999)	12.24	2.31	0.69	22.62	1458
Return on Equity, ROE (08301 / WC08301)	-0.88	116.64	-2470.41	468.70	1359
Operating Profit Margin (08316 / WC08316)	-1517.21	34000.09	-957705.22	3503.59	1437
Capital Gearing (08221 / WC08221)	37.35	51.84	-1079.14	1179.77	1440
CO2e Emissions Scope 1 (ENERDP024)	856,622	3,776,029	0	49,043,800	370
CO2e Emissions Scope 2 (ENERDP025)	200,054	478,222	0	3,120,000	376
Scope 1 emissions / revenue (ENERO52V)	141.23	568.30	0.00	5137.80	354
Total CO2e emissions / revenue (ENERO03V)	166.71	550.30	0.00	5160.54	383
Market Capitalization (08001 / WC08001)	4,497,650	32,946,911	1,298	438,982,951	1304
Number of Employees (07011 / WC07011)	4,539	10,920	0	103,083	1159

The ESG-related variables consist of the Environment Pillar Score (ENSCORE), ESG Score (TRESGS), ESG Combined Score (TRESGCS), ESG Controversies Score (TRESGCCS) and Board Independence percentage (CGBSO07V) (LSEG, 2024). These are standardized LSEG indicators in which higher values generally indicate stronger ESG, environmental, or governance performance (LSEG, 2024). In particular, the ESG Combined Score requires careful interpretation. According to LSEG's methodology, the combined score reflects both the company's ESG Score and the effect of material ESG controversies (LSEG, 2024). In the absence of significant controversies, the ESG Combined Score is equal to the ESG Score, whereas the occurrence of material controversies lowers the combined score

(LSEG, 2024). The board independence variable is measured as a percentage and is used in this study as a proxy for governance quality in the moderation analysis.

Environmental performance is measured not only through the environmental pillar score but also through both absolute and relative emissions indicators. Scope 1 and Scope 2 emissions follow the established greenhouse gas reporting framework, where Scope 1 refers to direct emissions from the company's own operations and Scope 2 refers to indirect emissions arising from purchased energy (Greenhouse Gas Protocol, 2011). In addition, emissions intensity variables scale emissions by revenue, thereby improving comparability across companies of different sizes (Greenhouse Gas Protocol, 2011). This is relevant in a sample that includes both large established corporations and considerably smaller listed companies.

The financial variables include company size, profitability, leverage, market capitalization, and the number of employees. Company size is proxied by the natural logarithm of total assets, while profitability is captured through return on equity and operating profit margin. Capital structure is measured by gearing. These variables are used as controls in regression analyses and provide a broader picture of company characteristics within the sample. A notable feature of Table 4 is the clear difference in data coverage between ESG and emissions variables, on the one hand and conventional financial variables, on the other. The ESG score variables and board independence each have 459 non-missing observations, while the Scope 1 emissions intensity variable (ENERO52V) is available for only 354 observations. By contrast, the logarithm of total assets is available for 1,458 observations and market capitalization for 1,304 observations. This indicates that ESG and emissions data are substantially less comprehensive than financial reporting data, which is a common feature of ESG databases, especially when smaller companies and companies with shorter listing histories are included in the sample (Berg et al., 2022).

The distributions of several financial variables also reveal substantial dispersion and the presence of extreme values. Return on equity, operating profit margin and gearing

exhibit very large minimum and maximum values, which is typical in panel data containing small companies, loss-making years and cases where the denominator of a ratio is close to zero (Wooldridge, 2010). The emissions variables likewise display considerable variation. These features are important for the later empirical analysis, as they imply that the robustness of the regression results should be assessed with particular attention to outliers and influential observations.

6.4.2 Industry Distribution and Environmentally Sensitive Sectors

Table 5 presents the distribution of the sample by industry group. The classification of environmentally sensitive industries is based on the sector information reported in the Navigator worksheet and follows the logic of the research design. In this study, environmentally sensitive industries include companies operating in sectors related to energy, utilities, materials and industrials. This includes, for example, sectors such as Oil, Gas and Coal, Electricity, Chemicals, Industrial Materials, Industrial Metals and Mining, Precious Metals and Mining, Construction and Materials, Industrial Engineering, Industrial Transportation, Industrial Support Services, General Industrials, Electronic and Electrical Equipment, Technology Hardware and Equipment and Automobiles and Parts.

Table 5. Sample and industry distribution.

Group	Companies (unique)	Company-year observations
Total	175	1691
Environmentally sensitive industries	73	748
Other industries	102	943

Based on this classification, 73 companies, representing 748 company-year observations, are categorized as environmentally sensitive. The remaining 102 companies, corresponding to 943 company-year observations, belong to other sectors. This division is analytically important because it enables empirical testing of whether the relationship between ESG disclosure and environmental performance differs between environmentally sensitive industries and other sectors, as proposed in Hypothesis H2.

6.4.3 Missing Observations and Implications for the Empirical Analysis

An important limitation of the dataset concerns the extent of missing observations, particularly for ESG and emissions variables. Relative to the full panel structure of 1,691 company-year observations, the ESG variables and the governance measure contain substantial missingness. ENSCORE, TRESGS, TRESGCS, TRESGCCS and CGBSO07V each have 459 non-missing observations, implying that approximately 27 percent of the potential company-year observations are available for these variables. Missingness is even more pronounced in the emissions variables. For example, the Scope 1 emissions intensity variable (ENERO52V) has 354 non-missing observations, while Scope 1 absolute emissions (ENERDP024) have 370 observations.

This pattern is consistent with a common limitation of ESG databases, namely that ESG and emissions data are less systematically available than financial data (Berg et al., 2022). In practice, this often means that the effective estimation sample is biased toward larger companies and companies with more established disclosure practices (Berg et al., 2022). Such selectivity should be considered when interpreting the results, particularly with respect to generalizability across the full population of Nasdaq Helsinki companies.

No imputation has been applied to missing values in the descriptive analysis. Instead, the statistics reported in Table 4 are based on non-missing observations for each variable separately. In Chapter 7, the regression models are estimated using model-specific listwise deletion, which means that the number of observations varies across specifications depending on variable availability. For example, the baseline specification for Hypothesis 1, where ENSCORE is the dependent variable and TRESGS is the main explanatory variable together with the control variables, includes 454 company-year observations from 74 companies. The corresponding specification using Scope 1 emissions intensity as the dependent variable includes 271 company-year observations. Accordingly, comparisons across models must be made with caution, as different specifications may rely on partially different underlying samples.

6.4.4 Interpretation for the Regression Analysis

Overall, the descriptive statistics suggest that the dataset contains substantial cross-sectional and temporal variation in ESG disclosure, environmental performance and company characteristics. This variation provides a sufficient basis for testing the study's main hypotheses. At the same time, the descriptive evidence also highlights three important empirical challenges.

First, the relatively limited coverage of ESG and emissions variables means that the regression analyses are conducted on a considerably narrower subset of observations than the full panel structure would suggest. Second, the concentration of missing values in ESG-related variables raises the possibility that the effective regression sample overrepresents larger and better-reporting companies (Berg et al., 2022). Third, the strong skewness of emissions intensity measures and the presence of extreme values in profitability and leverage variables underscore the importance of robustness checks and potential outlier treatment in empirical analysis (Wooldridge, 2010). For these reasons, the results reported in Chapter 7 should be interpreted not only in terms of statistical significance and coefficient magnitude, but also considering sample selectivity, missing data and the distributional properties of the underlying variables. In summary, the descriptive analysis provides an foundation for understanding both the strengths and the limitations of the empirical tests that follow.

7 Results

This chapter presents the empirical results of the study. The analysis proceeds in several steps to examine the relationship between ESG disclosure and environmental performance among the sampled companies. The chapter begins with a correlation analysis that provides an overview of the relationships among the main variables and assesses potential multicollinearity issues. Next, the baseline panel regression model is estimated to test the primary relationship between ESG disclosure and environmental performance (H1). The analysis then explores whether this relationship varies across industries (H2) and whether corporate governance characteristics moderate the association (H3). Finally, a set of robustness tests is conducted to evaluate the stability and reliability of the empirical findings.

7.1 Correlation Analysis

Before estimating the regression models, it is necessary to examine the relationships among the main variables included in the empirical analysis. Correlation analysis provides a preliminary overview of how the variables are related and helps identify potential multicollinearity issues that could affect the reliability of regression estimates. This section first presents the Pearson correlation matrix for the key variables used in the study and then evaluates multicollinearity using variance inflation factors (VIFs). Together, these diagnostics provide an initial assessment of the data structure and support the specification of the regression models used to test the study's hypotheses.

7.1.1 Correlation Matrix

This section examines the correlation structure among the core variables used in the regression models and assesses the extent of multicollinearity among the baseline regressors. The purpose of this analysis is diagnostic rather than inferential: the correlation

matrix provides an overview of the degree to which the main variables move together, while the variance inflation factors indicate whether multicollinearity may undermine coefficient precision in the subsequent regression models. Table 6 presents the Pearson correlation matrix for the principal variables used in Chapter 7. The lower triangle reports Pearson correlation coefficients and the upper triangle reports the corresponding pairwise number of non-missing observations. Because the dataset forms an unbalanced panel and data availability differs substantially across variables, the number of observations used to compute each coefficient varies by variable pair.

Table 6. Pearson correlation matrix with pairwise sample sizes.

	1 ENSCORE	2 ESG	3 ESGCS	4 CONT	5 BOARD	6 lnAssets	7 ROE	8 OPM	9 Gear
1 ENSCORE	1.000	459	459	459	459	457	454	456	457
2 ESG	0.852	1.000	459	459	459	457	454	456	457
3 ESGCS	0.815	0.957	1.000	459	459	457	454	456	457
4 CONT	-0.299	-0.323	-0.058	1.000	459	457	454	456	457
5 BOARD	0.129	0.288	0.263	-0.114	1.000	457	454	456	457
6 lnAssets	0.680	0.612	0.550	-0.344	0.064	1.000	1359	1436	1440
7 ROE	-0.010	-0.012	-0.007	0.071	-0.023	0.099	1.000	1344	1346
8 OPM	0.009	0.029	0.031	-0.009	0.033	0.044	0.035	1.000	1419
9 Gear	-0.086	-0.144	-0.138	0.027	-0.053	0.058	-0.276	-0.001	1.000

The strongest positive correlations are observed between the environmental pillar score (ENSCORE) and the two headline ESG measures, namely ESG Score (TRESGS) and ESG Combined Score (TRESGCS). The correlation between ENSCORE and TRESGS is 0.852, while the correlation between ENSCORE and TRESGCS is 0.815. These results indicate

that companies with higher overall ESG scores also tend to exhibit higher environmental pillar scores in this sample. This pattern is consistent with the theoretical expectation underlying Hypothesis 1, although it should be interpreted with caution because the variables are not fully independent in construction (LSEG, 2024). ESG scores provided by Refinitiv/LSEG are calculated using related ESG indicators across environmental, social and governance pillars and the combined score additionally incorporate adjustments related to controversies and negative events (LSEG, 2024).

A particularly important result is the extremely high correlation between TRESGS and TRESGCS (r = 0.957). This indicates that the two measures capture highly overlapping information and should therefore not be included simultaneously in the same regression specification. Instead, they are more appropriately treated as alternative proxies for ESG disclosure and used in separate model specifications and robustness analyses. This interpretation is consistent with the LSEG ESG scoring framework, in which the combined score adjusts the overall ESG score for controversy-related information rather than representing an independent construct (LSEG, 2024).

The governance variable, measured by board independence, is positively correlated with both ESG Score (r = 0.288) and ESG Combined Score (r = 0.263), while its correlation with ENSCORE is weaker (r = 0.129). These correlations are directionally consistent with the idea that stronger governance structures may be associated with more developed sustainability-related disclosure and oversight. However, the moderation role of governance cannot be inferred from simple pairwise correlations and is examined more directly in the interaction models later in Chapter 7.

Company size, measured by the natural logarithm of total assets, is positively correlated with ENSCORE (r = 0.680), TRESGS (r = 0.612) and TRESGCS (r = 0.550). This suggests that larger companies tend to have higher ESG-related scores in this sample. One plausible interpretation is that larger companies face greater disclosure pressure, possess more reporting resources and are more likely to be covered comprehensively in ESG databases

(Berg et al., 2022). This pattern is also relevant when interpreting the regression results, as the effective estimation sample may be tilted toward larger companies.

The controversies score is negatively correlated with both ESG Score and company size. This is consistent with the logic of the LSEG framework, in which controversy information affects the combined score through a discounting mechanism (LSEG, 2024). For this reason, the controversies-adjusted combined score provides a useful robustness alternative to the standard ESG Score in the later regression analysis (LSEG, 2024).

Figure 2 presents a correlation heatmap for the key variables used in the regression analysis. The strongest relationship is observed between the ESG Score (TRESGS) and the Environment Pillar Score (ENSCORE), with a correlation of 0.83. Company size (lnAssets) is also moderately correlated with both ESG disclosure and environmental pillar performance, while board independence shows relatively weak correlations with the other variables.

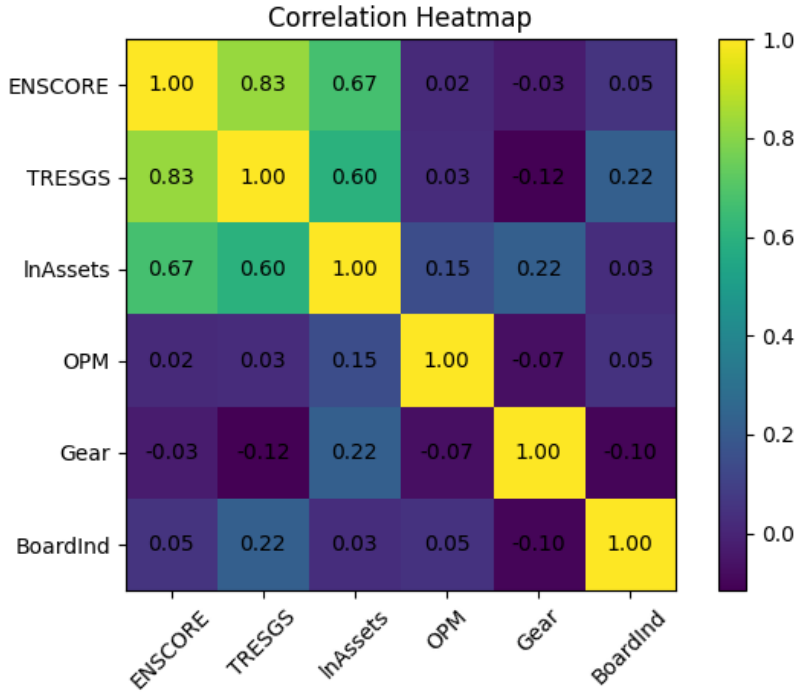

Figure 2. Correlation heatmap of key variables.
Note. The figure was created by the author based on the study dataset. Python code used for visualization was generated with the assistance of an AI tool (OpenAI ChatGPT). Prompt used:

"Generate Python code for a correlation heatmap using ESG variables (ENSCORE, TRESGS, lnAssets, OPM, Gear, BoardInd) with clear labels and colour scale."

7.1.2 Multicollinearity Diagnostics

To assess whether the baseline set of independent variables suffers from problematic multicollinearity, variance inflation factors (VIFs) were calculated for the main regressors used in the baseline models. The variables included in this diagnostic are ESG disclosure (TRESGS), board independence, company size, return on equity, operating profit margin and capital gearing. The VIF analysis is based on the complete-case estimation sample in which all regressors are jointly observed.

The VIF diagnostics for the baseline set of regressors (ESG disclosure, board independence, size, profitability and leverage proxies) indicate very low multicollinearity in the estimation sample (N = 454 complete cases). All the VIF values are well below commonly used thresholds that flag severe multicollinearity (Ntotsis et al., 2021). In econometric applications, VIF values above approximately 5–10 is typically interpreted as indicating potentially problematic levels of multicollinearity (Ntotsis et al., 2021).

Table 7. Variance inflation factors (VIF) for baseline regressors.

Variable	VIF	Tolerance (1/VIF)	N
ESG disclosure (TRESGS)	1.989	0.503	454
Board independence (CGBSO07V)	1.112	0.900	454
ln(Total Assets)	1.899	0.527	454
ROE	1.115	0.897	454
Operating Profit Margin	1.056	0.947	454
Capital Gearing	1.280	0.781	454

Table 7 shows that all VIF values are low and remain well below commonly applied rule-of-thumb thresholds for severe multicollinearity (Ntotsis et al., 2021). The highest VIF is 1.989 for ESG disclosure, followed by 1.899 for company size. The remaining variables have VIF values close to 1. These results indicate that the baseline regressor set does not exhibit multicollinearity at a level that would mechanically distort standard errors or undermine the interpretability of the regression coefficients. It should be noted, however, that this conclusion applies to the baseline regressor set only. The very high correlation between TRESGS and TRESGCS shown in Table 6 remains substantively important for model design. For this reason, these two ESG proxies are treated as alternatives across specifications rather than entered simultaneously into the same regression model.

7.1.3 Implications for Regression Analysis

Overall, the correlation analysis provides useful diagnostic support for the model design employed in the subsequent sections. First, the strong positive associations between ENSCORE and the ESG score variables suggest that the key variables move in the expected direction, which is consistent with the theoretical motivation for Hypothesis 1. Second, the very high correlation between TRESGS and TRESGCS confirms that these variables should be treated as alternative ESG disclosure measures rather than included simultaneously in the same specification. Third, the VIF diagnostics indicate that the baseline set of control variables does not suffer from problematic multicollinearity. Accordingly, the results of this section support the use of the baseline regression framework in Chapter 7, while also highlighting the need for careful specification design when alternative ESG score variants are employed. The correlation analysis is therefore best interpreted as a diagnostic and context-setting step that complements, but does not replace, the panel regression analysis that follows.

7.2 Baseline Regression (H1)

This section presents the baseline regression results used to test Hypothesis 1, which states that higher ESG disclosure is positively associated with verified environmental performance among Finnish listed companies. The analysis is based on the cleaned LSEG Workspace dataset covering companies listed on Nasdaq Helsinki during the period 2014–2023. Environmental performance is measured using the Environment Pillar Score (ENSCORE), while ESG disclosure is measured using the Refinitiv/LSEG ESG Score (TRESGS).

The baseline panel regression provides support for H1. In the estimation sample with complete observations for all baseline variables (454 company–year observations from 74 companies), the coefficient on ESG Score is positive and statistically significant across specifications. In the preferred two-way fixed-effects model, a one-point increase in the ESG Score is associated with a 0.683-point increase in ENSCORE (cluster-robust $p = 0.001$), implying that a 10-point increase in the ESG score corresponds to an approximately 6.83-point increase in environmental pillar performance, ceteris paribus.

7.2.1 Model Specification

Following the empirical framework presented in the methodology chapter, the baseline model relates environmental performance to ESG disclosure and a set of standard control variables capturing company characteristics. Environmental performance is proxied by the Environment Pillar Score (ENSCORE), while ESG disclosure is measured using the Refinitiv/LSEG ESG Score (TRESGS). LSEG's ESG scores are constructed from publicly reported company information across the environmental, social and governance dimensions and are designed to facilitate cross-company comparability (LSEG, 2024). The overall ESG score is derived from a structured evaluation of underlying indicators and thematic pillars as described in the LSEG ESG Scores Methodology (LSEG, 2024).

Baseline regression specification includes several control variables commonly used in the sustainability and corporate performance literature (Clarkson et al., 2008; Waddock & Graves, 1997). Company size is measured as the natural logarithm of total assets. Profitability is proxied by return on equity (ROE), while leverage is measured using capital gearing. These variables capture key financial characteristics that may influence environmental performance or disclosure behaviour (Clarkson et al., 2008; Waddock & Graves, 1997).

Year fixed effects are included in all specifications to control for macroeconomic conditions, regulatory changes and reporting-related trends that may affect all companies simultaneously (Wooldridge, 2010). To provide an interpretable baseline model comparable with previous sustainability reporting studies, the analysis first reports results for a specification including year fixed effects and an industry-group dummy variable distinguishing environmentally sensitive industries from other sectors. The main inference for Hypothesis 1 is then based on a more conservative specification that includes both company and year fixed effects. This two-way fixed-effects specification controls for unobserved time-invariant heterogeneity at the company level and therefore relies on within-company variation over time (Wooldridge, 2010).

Because the dataset forms an unbalanced panel and ESG coverage is incomplete for part of the sample period, the baseline regression is estimated using listwise deletion across the variables included in the model. This results in a complete-case estimation sample of 454 company–year observations from 74 companies. Consequently, the baseline results reflect the subset of listed companies for which ESG scores, and financial variables are jointly available. This is relevant for interpretation because the effective regression sample may be tilted toward larger companies and companies with more comprehensive ESG data coverage (Berg et al., 2022).

7.2.2 Baseline Regression Results

Table 8 presents the baseline regression results for Hypothesis 1. Model (1) reports results from the specification including year fixed effects and an industry dummy variable distinguishing environmentally sensitive industries. Model (2) reports results from the preferred two-way fixed-effects specification including both company and year fixed effects, with standard errors clustered at the company level.

Table 8. Baseline regression results for H1 (dependent variable: ENSCORE).

Variable	Model (1): Year FE + Industry dummy	Model (2): Company & Year FE
ESG disclosure (TRESGS)	0.879*** (0.107)	0.683*** (0.215)
ln(Total Assets)	2.654*** (1.017)	2.362 (2.678)
ROE	-0.001 (0.010)	-0.003 (0.005)
Capital Gearing	0.003 (0.070)	-0.011 (0.068)
Sensitive industry dummy	2.353 (2.493)	Not estimated (absorbed by company FE)
Observations	454	454
Companies	74	74
Year fixed effects	Yes	Yes
Company fixed effects	No	Yes
SEs clustered by company	Yes	Yes
R-squared	0.777	0.933

Standard errors are clustered at the company level. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

In Model (1), ESG disclosure is positively and statistically significantly associated with environmental performance. The coefficient on TRESGS is 0.879 and is statistically significant at the 1 percent level. This indicates that companies with higher ESG scores tend to exhibit higher Environment Pillar Scores within the sample.

In Model (2), which introduces company fixed effects in addition to year fixed effects, the coefficient on TRESGS remains positive and statistically significant. The estimated coefficient is 0.683 with a cluster-robust p-value of 0.001. This result indicates that increases in ESG disclosure within companies are associated with higher environmental performance. In practical terms, the coefficient implies that a one-point increase in the ESG Score is associated with a 0.683-point increase in ENSCORE. Correspondingly, a 10-point increase in the ESG score is associated with an expected increase of approximately 6.83 points in the Environment Pillar Score, holding other variables constant.

The control variables provide limited explanatory power in the baseline model. Company size is positive and statistically significant in Model (1), suggesting that larger companies tend to have higher environmental pillar scores. However, this relationship becomes statistically insignificant once company fixed effects are introduced in Model (2). This pattern suggests that the positive association between company size and environmental performance is largely driven by differences between companies rather than by changes within companies over time.

Profitability, measured by return on equity and capital gearing, are not statistically significant in either specification. This indicates that variation in these accounting measures is not systematically associated with environmental pillar performance once ESG disclosure and fixed effects are considered. Figure 3 illustrates the relationship between ESG disclosure (TRESGS) and environmental pillar performance (ENSCORE). The figure shows a clear positive relationship between the variables, indicating that companies with higher ESG scores tend to exhibit higher environmental pillar scores.

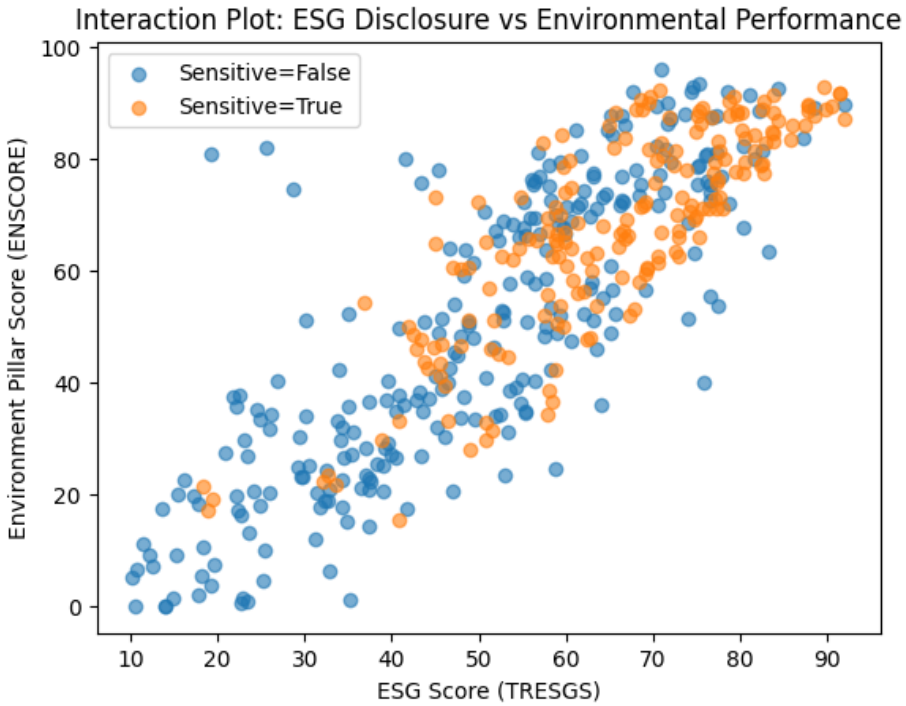

Figure 3. Scatter plot of ESG Score and Environment Pillar Score.
Note. The figure was created by the author based on the study dataset. Python code used for visualization was generated with the assistance of an AI tool (OpenAI ChatGPT). Prompt used: "Create a scatter plot showing ESG score vs environmental score, with colour distinction for sensitive industries and labelled axes."

7.2.3 Interpretation and Implications

Overall, the baseline regression results provide empirical support for Hypothesis 1. Across both specifications, higher ESG disclosure is associated with higher environmental pillar performance. Importantly, the relationship remains statistically significant even in the more demanding two-way fixed-effects model, which controls for both company-specific and year-specific unobserved factors (Wooldridge, 2010). This result is also consistent with the theoretical expectation that ESG disclosure can function as a signal of underlying environmental performance rather than merely symbolic communication (Connelly et al., 2011; Spence, 1973; Dhaliwal et al., 2011). At the same time, from a legitimacy perspective, the positive association does not necessarily imply a fully substantive relationship (Suchman, 1995; Cho et al., 2015). It may also reflect that companies align their disclosures with expected reporting standards in ways that enhance

perceived environmental performance, particularly when performance is measured using composite indicators rather than direct physical outcomes (Cho et al., 2015; Berg et al., 2022; Christensen et al., 2021).

The two-way fixed-effects specification is therefore treated as the preferred baseline model for the remainder of the analysis. By exploiting within-company variation over time, this specification reduces the influence of time-invariant company characteristics that might otherwise bias the estimated relationship between ESG disclosure and environmental performance (Wooldridge, 2010). These findings establish the empirical foundation for the subsequent analyses in Chapter 7. The following sections extend the baseline model by examining whether the relationship between ESG disclosure and environmental performance differs across industry contexts (Hypothesis 2) and whether governance quality strengthens this relationship (Hypothesis 3). In addition, robustness tests replace ENSCORE with emissions-based indicators to evaluate whether the observed association remains consistent when environmental performance is measured using more direct physical outcome measures.

7.3 Industry Moderation (H2)

This section tests Hypothesis 2, which proposes that the positive association between ESG disclosure and verified environmental performance is stronger for companies operating in environmentally sensitive industries than for companies in lower-impact sectors. The motivation for this hypothesis is that companies in environmentally intensive industries face greater regulatory pressure, stakeholder scrutiny and reputational exposure regarding environmental impacts (DiMaggio & Powell, 1983; Clarkson et al., 2008). As a result, ESG disclosure may be more closely aligned with environmental performance in such sectors (Clarkson et al., 2008; Khatri & Kjærland, 2023). Environmental performance continues to be measured using the Environment Pillar Score (ENSCORE), while ESG disclosure is measured using the Refinitiv/LSEG ESG Score (TRESGS). The control variables follow the baseline specification and include company size (measured as the

natural logarithm of total assets), profitability (return on equity), and leverage (capital gearing), together with year fixed effects.

7.3.1 Industry Classification and Model Specification

To operationalize environmentally sensitive industries, a company-level indicator variable (SensitiveIndustry) is constructed using the sector classification provided in the LSEG Navigator export. The indicator takes the value one for companies operating in sectors corresponding to environmentally intensive activities and zero otherwise. Companies are classified as environmentally sensitive if their sector falls within one of the following categories: Oil, Gas and Coal; Electricity; Chemicals; Industrial Materials; Industrial Metals and Mining; Precious Metals and Mining; Construction and Materials; General Industrials; Industrial Engineering; Industrial Support Services; Industrial Transportation; and Electronic and Electrical Equipment. These sectors broadly correspond to industries associated with energy production, heavy manufacturing, materials extraction and other environmentally intensive activities (Clarkson et al., 2008).

Hypothesis 2 is tested by extending the baseline regression model with an interaction term between ESG disclosure and the sensitive-industry indicator. The interaction coefficient captures whether the relationship between ESG disclosure and environmental performance differs between environmentally sensitive and less environmentally intensive sectors. Two model specifications are estimated. Model (1) includes year fixed effects and the sensitive-industry indicator, providing a specification comparable to the baseline model presented earlier. Model (2) introduces company fixed effects in addition to year fixed effects, forming a two-way fixed-effects specification. In this model, the main effect of SensitiveIndustry is absorbed by the company fixed effects because the variable does not vary over time for a given company (Wooldridge, 2010). However, the interaction term remains identifiable because it varies with ESG disclosure over time (Wooldridge, 2010).

7.3.2 Interaction Regression Results

The interaction regression results for Hypothesis 2 are presented in Table 9. The table reports the estimated coefficients for the baseline ESG disclosure variable, the environmentally sensitive industry indicator and their interaction term. Results allow an assessment of whether the disclosure–performance relationship differs systematically between environmentally sensitive and less environmentally intensive sectors.

Table 9. Industry moderation results (dependent variable: ENSCORE).

Variable	Model (1): Year FE + Sensitive dummy	Model (2): Company & Year FE
ESG disclosure (TRESGS)	0.815*** (0.132)	0.570* (0.308)
SensitiveIndustry	-5.836 (6.390)	— (absorbed)
TRESGS × SensitiveIndustry	0.138 (0.108)	0.343 (0.345)
ln(Total Assets)	2.614*** (0.950)	2.183 (2.475)
ROE	-0.003 (0.010)	-0.003 (0.005)
Capital Gearing	0.003 (0.068)	-0.009 (0.065)
Observations	454	454
Companies	74	74
Year fixed effects	Yes	Yes
Company fixed effects	No	Yes
R-squared	0.779	0.935

Cluster-robust standard errors at the company level in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

Across both specifications, the coefficient on ESG disclosure remains positive and statistically significant, indicating that higher ESG scores are associated with higher environmental pillar scores. This result is consistent with the baseline regression results presented in Section 7.2. The key moderation results concerns the interaction term between ESG disclosure and the sensitive-industry indicator. The interaction coefficient is positive in both specifications but is not statistically significant. In Model (1), the interaction

coefficient is 0.138 (p = 0.201) and in Model (2) it is 0.343 (p = 0.320). These estimates suggest that the disclosure–performance relationship is numerically stronger in environmentally sensitive industries, but the difference in slopes is not estimated with sufficient precision to reject the null hypothesis of equal slopes across industry groups.

The estimated coefficients can also be interpreted in economic terms. In Model (1), the estimated slope for ESG disclosure is 0.815 for companies in non-sensitive industries and 0.952 (0.815 + 0.138) for companies in sensitive industries. In Model (2), which relies on within-company variation over time, the estimated slope is 0.570 for non-sensitive industries and 0.913 (0.570 + 0.343) for sensitive industries. Although these point estimates are consistent with the expected direction of Hypothesis 2, the absence of statistical significance for the interaction term indicates that the data do not provide sufficient evidence that the relationship between ESG disclosure and environmental performance differs systematically across industry groups.

7.3.3 Sub-sample Comparison by Industry Group

To complement the interaction analysis, additional regressions are estimated separately for environmentally sensitive and non-sensitive companies. These sub-sample models provide a descriptive comparison of the disclosure–performance relationship across the two industry groups. The results of these sub-sample regressions are presented in Table 10.

Table 10. Sub-sample regressions by industry group (dependent variable: ENSCORE).

Variable	Non-sensitive industries	Environmentally sensitive industries
ESG disclosure (TRESGS)	0.802*** (0.141)	0.935*** (0.093)
ln(Total Assets)	2.759** (1.128)	3.379*** (1.021)
ROE	0.002 (0.008)	-0.083*** (0.030)
Capital Gearing	-0.049 (0.096)	0.067 (0.089)
Observations	245	209

Variable	Non-sensitive industries	Environmentally sensitive industries
Companies	44	30
Year fixed effects	Yes	Yes
R-squared	0.685	0.869

Both models include year fixed effects and cluster-robust standard errors at the company level. *** p < 0.01, ** p < 0.05, * p < 0.10.

The estimated coefficient on ESG disclosure is positive and statistically significant in both sub-samples. The coefficient is 0.802 for non-sensitive industries and 0.935 for environmentally sensitive industries, again suggesting a somewhat stronger association in environmentally intensive sectors. Nevertheless, this comparison is descriptive and does not constitute a formal statistical test of differences between groups. The formal interaction analysis presented in Table 9, which directly tests differences between industry groups, indicates that the difference in slopes is not statistically significant in this dataset.

7.3.4 Interpretation

Overall, the industry moderation analysis indicates that the positive association between ESG disclosure and environmental pillar performance documented in the baseline model is present in both industry groups. While the estimated coefficients are numerically larger for environmentally sensitive industries, the interaction analysis does not provide statistically significant evidence that the disclosure–performance relationship differs systematically across sectors. Accordingly, the result does not support the theoretical expectation that stronger stakeholder and institutional pressures in environmentally sensitive industries would produce a tighter disclosure–performance alignment (DiMaggio & Powell, 1983; Clarkson et al., 2008). These findings suggest that the alignment between ESG disclosure and environmental pillar performance in the sample is not primarily driven by sectoral environmental intensity. Instead, the relationship between ESG disclosure and environmental performance appears to operate broadly across industries among the companies included in the estimation sample. The next section examines

whether corporate governance characteristics strengthen the disclosure–performance relationship by introducing governance interaction effects.

7.4 Governance Moderation (H3)

This section tests Hypothesis 3, which proposes that the positive association between ESG disclosure and verified environmental performance is stronger for companies with higher governance quality. The underlying rationale is that stronger governance structures may enhance oversight of sustainability practices and improve the credibility of ESG disclosure, thereby strengthening the alignment between reported ESG performance and actual environmental outcomes (Jensen & Meckling, 1976; Khan et al., 2016).

Environmental performance continues to be measured using the Environment Pillar Score (ENSCORE), while ESG disclosure is measured using the Refinitiv/LSEG ESG Score (TRESGS). Governance quality is proxied by board independence (CGBSO07V), defined as the percentage of independent directors on a company's board (LSEG, 2024). This measure follows this thesis supervisor's recommendation and reflects data availability within the LSEG Workspace dataset. The control variables follow the baseline specifications used in earlier sections and include company size (measured as the natural logarithm of total assets), profitability (return on equity) and leverage (capital gearing). Year fixed effects are included in all specifications to control for macroeconomic conditions and reporting-related developments affecting all companies simultaneously. An industry-group dummy identifying environmentally sensitive sectors is included in the pooled specification but is absorbed by company fixed effects in the two-way fixed-effects model because it is time-invariant at the company level.

7.4.1 Model Specification

Hypothesis 3 is tested by extending the baseline regression model with an interaction term between ESG disclosure and board independence. The interaction coefficient captures whether the slope of ESG disclosure varies with governance quality. A positive and statistically significant interaction coefficient would indicate that stronger governance amplifies the association between ESG disclosure and environmental performance.

Two model specifications are estimated. Model (1) includes year fixed effects and the sensitive-industry indicator, providing a pooled specification comparable to earlier baseline models. Model (2) includes both company and year fixed effects, forming a two-way fixed-effects model that controls for time-invariant company characteristics. In both models, standard errors are clustered at the company level. The regression analysis uses the same complete-case sample employed in the baseline regressions, consisting of 454 company–year observations from 74 companies.

7.4.2 Interaction Regression Results

The governance moderation results for Hypothesis 3 are presented in Table 11. The table reports the estimated coefficients for ESG disclosure, board independence and their interaction term across two model specifications. Together, these results make it possible to assess whether the disclosure–performance relationship varies systematically with governance quality.

Table 11. Governance moderation results (dependent variable: ENSCORE).

Variable	Model (1): Year FE + Sensitive dummy	Model (2): Company & Year FE
ESG disclosure (TRESGS)	1.278*** (0.265)	0.400 (0.308)
Board independence (CGBSO07V)	0.057 (0.177)	−0.362* (0.192)
TRESGS × Board independence	−0.004 (0.003)	0.004 (0.003)

Variable	Model (1): Year FE + Sensitive dummy	Model (2): Company & Year FE
ln(Total Assets)	2.347* (1.217)	2.591 (2.530)
ROE	−0.004 (0.010)	−0.003 (0.005)
Capital Gearing	−0.002 (0.075)	−0.025 (0.063)
Sensitive industry dummy	3.393 (2.363)	— (absorbed)
Observations	454	454
Companies	74	74
Year fixed effects	Yes	Yes
Company fixed effects	No	Yes
R-squared	0.792	0.935

Cluster-robust standard errors at the company level in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

Across both specifications, the estimated association between ESG disclosure and environmental performance remains positive. In Model (1), the coefficient on TRESGS is positive and statistically significant (1.278, p < 0.01), indicating that companies with higher ESG scores tend to exhibit higher environmental pillar scores. However, the key moderation result does not support Hypothesis 3. The interaction term between ESG disclosure and board independence is not statistically significant in either specification. In the pooled model (Model 1), the interaction coefficient is slightly negative (−0.004, p = 0.164), indicating no evidence that higher board independence strengthens the disclosure–performance relationship. In Model (2), which controls for company-specific unobserved heterogeneity through fixed effects, the interaction term becomes positive but remains statistically insignificant (0.004, p = 0.185). These results indicate that even when identification relies on within-company variation over time, the data does not provide statistically reliable evidence that board independence amplifies the relationship between ESG disclosure and environmental pillar performance.

The main effect of board independence is negative and marginally significant in the two-way fixed-effects model (−0.362, p = 0.060). However, this coefficient should be interpreted cautiously because, in interaction models, main effects represent conditional relationships evaluated at zero values of the interacting variable. Consequently, the marginal effect of ESG disclosure across different governance levels provides a more informative interpretation.

Based on Model (2), the estimated marginal effect of ESG disclosure on environmental performance remains positive and statistically significant across typical levels of board independence. At the 25th percentile of board independence (71.43%), the marginal effect of TRESGS on ENSCORE is estimated at 0.690 (p = 0.001). At the median level of board independence (87.5%), the marginal effect is 0.756 (p < 0.001) and at the 75th percentile (100%) it increases to 0.807 (p < 0.001). Although these estimates indicate a consistently positive relationship between ESG disclosure and environmental performance across the governance distribution, the slope does not increase with governance to a statistically meaningful degree.

7.4.3 Governance Tercile Robustness Test

As an additional robustness check, the sample is divided into governance terciles based on the company-level average of board independence within the estimation sample. The baseline regression specification is then estimated separately for companies in each tercile. Table 12 reports the results of these tercile-based regressions.

Table 12. Robustness check across governance terciles (dependent variable: ENSCORE).

Variable	Low governance tercile	Mid governance tercile	High governance tercile
ESG disclosure (TRESGS)	1.109*** (0.197)	0.786*** (0.144)	0.918*** (0.137)
Observations	142	126	186
Companies	25	24	25

Variable	Low governance tercile	Mid governance tercile	High governance tercile
Year fixed effects	Yes	Yes	Yes
R-squared	0.785	0.824	0.790

Terciles based on company-level average board independence within the estimation sample. All models include year fixed effects and the sensitive-industry dummy. Cluster-robust standard errors at the company level in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

The coefficient on ESG disclosure remains positive and statistically significant in all governance terciles. However, the point estimates do not increase monotonically with governance quality. In fact, the largest estimated coefficient appears in the low-governance tercile (1.109), while the estimate for the high-governance tercile (0.918) is not consistently larger than the others. This pattern suggests that stronger board independence does not systematically strengthen the relationship between ESG disclosure and environmental pillar performance.

7.4.4 Interpretation

Overall, the governance moderation analysis does not provide statistical support for Hypothesis 3 in this dataset. Although ESG disclosure is consistently positively associated with environmental pillar performance, the interaction models and tercile-based robustness checks indicate that higher board independence does not significantly strengthen this relationship. In other words, the positive disclosure–performance association appears to persist across governance levels, but not in a way that would indicate a meaningful moderating effect of board independence.

These findings suggest that governance quality, as proxied by board independence, does not appear to play a decisive moderating role in linking ESG disclosure to environmental performance within the estimation sample. Instead, the disclosure–performance association appears broadly similar across companies with different governance structures. In theoretical terms, this finding does not support the expectation derived from agency

theory that stronger governance should constrain opportunistic disclosure and strengthen the credibility of ESG reporting (Jensen & Meckling, 1976; Khan et al., 2016). From a legitimacy perspective, this may indicate that ESG disclosure is driven more by external expectations and reporting norms than by internal governance structures, as companies seek to align with socially accepted practices to maintain legitimacy (Suchman, 1995; Cho et al., 2015). In such cases, even companies with weaker governance may adopt similar disclosure practices to maintain legitimacy, limiting the observable moderating effect of board independence (Suchman, 1995; Cho et al., 2015). The next section evaluates the robustness of the main disclosure–performance relationship using alternative environmental outcome measures and additional robustness specifications.

7.5 Robustness Test

This section evaluates the robustness of the main empirical findings by re-estimating the preferred two-way fixed-effects model using alternative variable definitions and data treatments. The purpose of these tests is to assess whether the positive baseline relationship between ESG disclosure and environmental performance depends on the specific disclosure proxy, environmental outcome measure, or the presence of extreme values in the estimation sample. In all robustness models, company and year fixed effects are included and standard errors are clustered at the company level.

The first robustness test replaces the baseline ESG disclosure measure, Refinitiv/LSEG ESG Score (TRESGS), with the ESG Combined Score (TRESGCS). This is a relevant alternative because the combined score adjusts the overall ESG score for controversy-related information and therefore provides a controversies-adjusted ESG measure (LSEG, 2024). The dependent variable remains the Environment Pillar Score (ENSCORE) and the control variables remain unchanged. The second and third robustness tests replace the baseline dependent variable with emissions-intensity measures derived from LSEG data. More specifically, the dependent variable is measured as the natural logarithm of direct Scope 1 emissions intensity (ENERO52V) and in an additional specification, the natural

logarithm of total CO_2 emissions intensity relative to revenues (ENERO03V). These physical emissions-based indicators differ conceptually from ENSCORE because higher values indicate weaker environmental performance rather than stronger environmental performance. Consequently, if the baseline findings reflect a broader alignment between ESG disclosure and verified environmental outcomes, one would expect the coefficient on ESG disclosure to become negative when emissions-intensity measures are used as the dependent variable. Finally, the baseline specification is re-estimated after winsorizing the continuous variables at the 1st and 99th percentiles within the complete-case estimation sample. This test assesses whether the baseline result is driven by a limited number of extreme observations.

Table 13. Robustness tests.

Variable	Model (1): Alternative ESG proxy	Model (2): Alternative DV ln(ENERO52V)	Model (3): Alternative DV ln(ENERO03V)	Model (4): Winsorized baseline
ESG Combined Score (TRESGCS)	0.384*** (0.147)			
ESG Score (TRESGS)		0.013 (0.012)	0.008 (0.007)	0.688*** (0.215)
ln(Total Assets)	2.119 (2.749)	-0.201 (0.290)	-0.100 (0.188)	3.054 (2.648)
ROE	-0.001 (0.005)	-0.000 (0.000)	-0.000 (0.000)	-0.047 (0.033)
Capital Gearing	-0.005 (0.075)	0.001 (0.004)	0.001 (0.003)	-0.053 (0.070)
Observations	454	348	380	454
Companies	74	60	64	74
Company fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Variable	Model (1): Alternative ESG proxy	Model (2): Alternative DV ln(ENERO52V)	Model (3): Alternative DV ln(ENERO03V)	Model (4): Winsorized baseline
R-squared	0.923	0.964	0.980	0.933

All models include company and year fixed effects. Standard errors are clustered at the company level. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Table 13 reports the results of these robustness checks. When ESG disclosure is measured using ESG Combined Score instead of ESG Score, the estimated coefficient remains positive and statistically significant. The coefficient on TRESGCS is 0.384 (p = 0.009), indicating that the main finding is not dependent on the use of TRESGS alone. This result supports the interpretation that the positive disclosure–performance relationship is not merely a feature of one specific LSEG disclosure metric.

The results are less consistent when environmental performance is measured using physical emissions-intensity indicators. In the specification using ln(ENERO52V) as the dependent variable, the coefficient on TRESGS is 0.013 and statistically insignificant (p = 0.273). Similarly, when ln(ENERO03V) is used as the dependent variable, the coefficient on TRESGS is 0.008 and statistically insignificant (p = 0.245). These results indicate that the positive association observed in the baseline ENSCORE model does not translate into a statistically significant relationship when environmental performance is measured through emissions intensity. Importantly, the coefficients are not negative, which means the data do not provide evidence that higher ESG disclosure is associated with lower emissions intensity in these robustness specifications. The winsorized baseline model yields results that are very close to the main baseline estimate. After winsorization, the coefficient on TRESGS is 0.688 (p = 0.001), compared with 0.683 in the original two-way fixed-effects baseline model. This close similarity indicates that the main result is not driven by a small number of outlying observations in the estimation sample.

Taken together, the robustness tests provide mixed but overall informative evidence. The positive relationship between ESG disclosure and environmental pillar performance

remains stable when the disclosure proxy is changed from TRESGS to TRESGCS and when the baseline variables are winsorized. At the same time, the relationship is not reproduced when emissions-intensity measures are used as alternative dependent variables. This suggests that the baseline finding is robust within the LSEG score-based framework, but weaker when environmental performance is defined using direct physical emissions outcomes. Accordingly, the results should be interpreted as supporting a robust association between ESG disclosure and score-based environmental performance, while offering more limited evidence for a comparable association with emissions-intensity indicators.

The main outcome of the robustness analyses confirm that the empirical findings of this study are not driven by a particular model specification or by extreme observations in the data. While the positive association remains consistent across specifications, it weakens when environmental performance is measured using emissions-based indicators. These findings provide additional context for interpreting the empirical results and underline the importance of measurement choices in ESG-related research. From a theoretical perspective, this suggests that the apparent alignment between disclosure and performance depends partly on how environmental performance is operationalised, which is consistent with prior concerns regarding ESG measurement and score construction (Berg et al., 2022; Christensen et al., 2021). This divergence between score-based and emissions-based measures can also be interpreted through legitimacy theory (Suchman, 1995). While ESG disclosure appears to align with composite performance indicators, the absence of a relationship with emissions-based measures suggests that reported performance may partly reflect how companies present their environmental activities rather than fully capture underlying physical outcomes (Suchman, 1995; Cho et al., 2015; Berg et al., 2022; Christensen et al., 2021). This is consistent with the view that companies seek to maintain legitimacy through structured disclosure, even when measurable environmental improvements are less visible (Suchman, 1995; Cho et al., 2015). The following chapter discusses the broader implications of these findings in relation to the theoretical framework and prior literature.

8 Discussions

The interpretation and context of the empirical results described in Chapter 7 follow in this chapter. The purpose of the discussion is not simply to run through the statistical outcomes, but rather to discuss what these outcomes mean in the context of the research questions, framework and prior literature on ESG disclosure and environmental performance. The previous chapter is dedicated to reporting the quantitative results of the regression analyses. The discussion comments on what those results mean regarding the link between ESG disclosure of Finnish listed companies and their measured environmental outcomes. The chapter goes on various stages. To begin, Section 8.1 outlines the study's principal empirical findings regarding the three hypotheses. Then we interpret the result in Section 8.2 and discuss why it may be. The findings are compared with previous results found in the academic literature on ESG disclosure and sustainability performance. The implications of the findings are explained in Section 8.4. The subsequent sections cover study limitations and future implications.

8.1 Summary of Findings

The empirical analysis provides mixed support for the hypotheses concerning ESG disclosure and environmental performance. For the primary hypothesis (H1), the data show a robust positive relationship: companies with higher Refinitiv/LSEG ESG Scores exhibit significantly higher environmental pillar scores. In the preferred two-way fixed-effects model, the ESG disclosure coefficient is positive and significant, with a one-point increase in the ESG Score associated with approximately a 0.68-point increase in the Environment Pillar Score (ENSCORE). This indicates that, on average, greater ESG disclosure corresponds to better environmental pillar performance within the sample of Finnish listed companies.

By contrast, the moderation hypotheses are not supported by the data. Hypothesis 2 posited that the disclosure–performance link would be stronger in environmentally

sensitive industries. The interaction regressions show a slight positive interaction term, but it is statistically insignificant. Both the pooled and fixed-effects models yield no significant difference in the slope of the ESG–environmental relationship between high-impact and low-impact sectors. Descriptive regressions by industry group likewise indicate a positive ESG effect in all sectors, with only modest differences in coefficients. Overall, the evidence suggests that the ESG–performance association is not systematically stronger in sensitive industries.

Similarly, Hypothesis 3 is not supported. Introducing board independence as a moderator yields no significant interaction effect. The interaction term between ESG Score and board independence is effectively zero in both the pooled and fixed-effects models. The disclosure–performance link remains positive at all governance levels, but higher governance does not significantly amplify it. Sub-sample regressions by governance tercile show positive ESG effects in each tercile, with the largest point estimate surprisingly in the low-governance group. Thus, stronger board independence does not appear to increase the disclosure–performance alignment.

In summary, the main result of the study is that higher ESG disclosure is associated with better environmental pillar performance among the sampled companies and this relationship holds under the baseline specification with both year and company fixed effects. In contrast, neither industry context nor corporate governance significantly alters this relationship in the expected way. These findings provide a nuanced picture: while the basic disclosure–performance link is robust, its strength does not vary systematically with industry environmental intensity or with board independence.

8.2 Interpretation

The positive baseline association between ESG disclosure and environmental performance appears consistent and robust. From a theoretical perspective, this finding is most consistent with signaling theory and stakeholder theory, as it suggests that ESG

disclosure reflects underlying environmental practices rather than purely symbolic communication (Spence, 1973; Freeman, 1984). Econometrically, a one-point increase in the ESG Score (TRESGS) is associated with approximately a 0.68-point increase in the Environment Pillar Score (ENSCORE) in the preferred two-way fixed-effects model ($p = 0.001$). This indicates that increases in ESG disclosure within companies are associated with improved environmental performance over time. There are multiple conceptual mechanisms which could provide an explanation for these relationships. Companies with high levels of ESG scores may implement more extensive environmental actions such as decreasing pollution and/or increasing investment into green technology, which would be reflected in an increased value of ENSCORE (Barney, 1991; Hart, 1995). Simultaneously, companies who face pressures from stakeholders or regulators may concurrently improve their disclosure and performance (Freeman, 1984; DiMaggio & Powell, 1983). Larger companies or those with significant resources may have the ability to invest in sustainability resulting in an increased level of disclosure and subsequent performance (Barney, 1991; Hart, 1995). The robustness of this finding across alternative specifications and ESG proxies suggests that it is not driven by a particular model choice.

While the baseline results indicate a positive association between ESG disclosure and environmental performance, this relationship is primarily observed in score-based measures. In contrast, robustness tests using emissions-based indicators do not provide consistent evidence of a similar association. This suggests that the observed alignment may reflect consistency within the LSEG scoring framework rather than a strong link to underlying environmental outcomes. At the same time, the finding does not fully rule out legitimacy-based motives for disclosure, but it suggests that, in this sample, ESG reporting is not purely decoupled from environmental performance (Suchman, 1995; Cho et al., 2015).

By contrast, Hypothesis 2 is not supported. The interaction between ESG disclosure and environmentally sensitive industries is positive but statistically insignificant. Although subsample analyses indicate slightly stronger coefficients in high-impact sectors, these

differences are not statistically meaningful. From a theoretical perspective, this weakens the expectation derived from institutional and stakeholder theories that stronger external scrutiny in environmentally sensitive industries should produce tighter disclosure–performance alignment (DiMaggio & Powell, 1983; Clarkson et al., 2008). In substantive terms, the results suggest that the alignment between ESG disclosure and environmental pillar performance in the Finnish sample is not primarily driven by sectoral environmental intensity.

Hypothesis 3 is likewise not supported. The interaction between ESG disclosure and board independence is effectively zero across all specifications, and governance-tercile analyses show positive ESG–performance relationships at all levels without a clear pattern. From a theoretical perspective, this contrasts with agency theory expectations, according to which stronger monitoring structures should reduce opportunistic disclosure and increase the credibility of reported ESG information (Jensen & Meckling, 1976; Kolk & Perego, 2010; Khan et al., 2016). These null results may reflect limitations in variation or measurement. Board independence is only a partial proxy for governance quality and may not reflect ESG-specific expertise, incentives or broader oversight structures (Simnett et al., 2009; Casey & Grenier, 2015). In addition, limited within-company variation over the relatively short period of time may reduce statistical power (Wooldridge, 2010). Measurement error in ENSCORE or in the moderating variables may further attenuate the estimated interaction effects (Wooldridge, 2010). These findings should therefore be interpreted with caution.

Alternative interpretations should also be considered. A key concern relates to measurement. ENSCORE is a composite rating constructed from disclosed information rather than a direct measure of emissions. When emissions-intensity measures (such as Scope 1 or total CO_2 emissions) are used as dependent variables, the ESG Score coefficients are small and statistically insignificant. This suggests that the positive ENSCORE results may partly reflect overlapping disclosure content rather than purely physical environmental outcomes. Data limitations likely contribute to this pattern, as emissions data are often

incomplete, self-reported and inconsistently defined across companies (Berg et al., 2022; Christensen et al., 2021). Although one-year lag specifications do not overturn the main results, which alleviates some simultaneity concerns, causal interpretation remains limited despite the use of panel data and fixed effects. Theoretically, this suggests that support for ESG disclosure as a signal is stronger when environmental performance is measured using broader composite indicators, while evidence based on narrower physical outcome measures remains limited (Berg et al., 2022; Christensen et al., 2021).

The robustness tests strengthen confidence in the core finding while also clarifying its scope. Using the ESG Combined Score (TRESGCS) produces similar results, indicating that the finding is not specific to a single disclosure metric. Winsorization and alternative standard error specifications do not materially affect the results, suggesting that they are not driven by outliers or heteroskedasticity. However, the absence of a significant relationship when using emissions-based measures highlights that the observed association is strongest for composite environmental indicators. This reinforces the view that ESG scores capture broader aspects of environmental performance rather than narrowly defined physical outcomes (Berg et al., 2022; Christensen et al., 2021).

These findings have both theoretical and practical implications. In addition to supporting signalling, stakeholder, resource-based theory views concerning how disclosure can represent real environmental action, the positive ESG-performance relationship has also shown that there is no consistent influence on the relationship based upon company type (i.e., industry) or company structure (governance). Therefore, while the study demonstrates a relative uniformity for all companies in the sample regarding their ESG – Performance relationship, it also shows that sectoral influences or higher levels of governance quality do not significantly explain why the relationship exists. Practically, the findings indicate that ESG score information may provide a useful but imperfect indication of company environmental performance; however, the findings should be viewed with a degree of scepticism due to the relatively weak relationship observed when comparing ESG score ratings with emission-based metrics (Berg et al., 2022; Christensen et

al., 2021). The study finds that in order to improve upon existing methodologies related to measuring environmental performance at the corporate level, high-quality, consistent and comprehensive environmental data is needed (Berg et al., 2022; Christensen et al., 2021). Methodologically, the findings demonstrate that use of more detailed or consistent data and improved methodology will likely generate additional insights in subsequent studies.

Overall, the study demonstrated that companies that make stronger environmental disclosures (ESG), have better environmental performances, however, the study was unable to determine specific ways in which companies that make stronger ESG disclosures experience improvements in their environmental performances. While the study provides some evidence of a link between making stronger environmental disclosures and having better environmental performances, it is necessary to consider the limitations of the study's empirical design. Specifically, the empirical design does not allow for complete elimination of endogeneity problems, nor does it address potential measurement errors (Wooldridge, 2010; Berg et al., 2022). Overall, the study suggests that environmental disclosures made by companies may serve as signals of environmental performance within score-based measures, while evidence based on emissions indicators remains limited. In addition, the role of industry context and governance structures appears less influential than initially suggested in prior literature (Spence, 1973; DiMaggio & Powell, 1983; Jensen & Meckling, 1976). The next chapter situates these findings within the broader literature and draws overall conclusions.

8.3 Comparison with literature

The positive association found between ESG disclosure (TRESGS) and environmental pillar performance (ENSCORE) is largely consistent with prior empirical studies and theoretical expectations. From a signaling theory perspective, this finding suggests that higher ESG scores suggests that higher ESG scores may convey credible information about underlying environmental practices. In other words, companies with better

environmental performance tend to receive higher ESG ratings, indicating that the disclosure is at least partially substantive rather than purely symbolic. This aligns with earlier studies reporting positive links between sustainability disclosure and environmental outcomes (e.g., Clarkson et al., 2008; Doan & Sassen, 2020). Clarkson et al. (2008) found that companies with stronger environmental performance tend to disclose more environmental information, whereas Doan and Sassen (2020) show in their meta-analysis that the overall relationship between environmental reporting and performance is weak and on average negative. The results therefore reinforce the view that ESG reporting can reduce information asymmetry (Connelly et al., 2011) by reflecting real environmental efforts.

Legitimacy theory would raise the possibility that companies use ESG disclosure mainly to secure social approval without real change (Suchman, 1995). In this study, however, the positive baseline relationship does not fully support a strict “decoupling” interpretation. Since if ESG ratings were purely symbolic, one might expect weak or no correlation with measured environmental performance, but instead we observe a significant alignment. That said, this does not imply the absence of any symbolic behavior, it only suggests that, on average, disclosure and performance move together in our sample. This nuance is important, it confirms conclusions by some scholars that while greenwashing can occur (Lyon & Montgomery, 2015), disclosure may in some contexts still reflect substantive environmental efforts. Results imply that Finnish companies, perhaps due to stakeholder pressures, generally align their ESG scores with their environmental outcomes.

The findings also resonate with resource-based and stakeholder theories. Larger companies showed both higher ESG scores and better environmental pillar ratings, which is consistent with the idea that companies with greater resources and capabilities can invest more in environmental management and in reporting those activities (Barney, 1991; Hart, 1995). Similarly, stakeholder theory suggests that companies facing more external examination (often larger, more visible companies) have stronger incentives to both

improve performance and disclose it (Freeman, 1984). The observed positive baseline relationship is thus broadly in line with expectations that both internal capabilities and external demands drive disclosure and performance.

In contrast, the non-significant moderation effects on industry and governance diverge from some expectations in the literature. Hypothesis 2 proposed that disclosure–performance links would be stronger in environmentally sensitive industries (Aragón-Correa et al., 2020), reflecting higher regulatory exposure and stakeholder demands in sectors like energy and materials. Although the estimated coefficients were directionally larger in sensitive industries, the differences were not statistically significant. This suggests that, in the Finnish context, companies across industries do not differ greatly in how ESG disclosure relates to performance. One possible reason is that reporting standards and stakeholder expectations are becoming more standardized across sectors, as seen with EU regulations like the CSRD (Directive (EU) 2022/2464, 2022). This understanding is consistent with institutional theory's idea of mimetic isomorphism (DiMaggio & Powell, 1983), where companies in different sectors may adopt similar reporting practices under common regulatory regimes. In any case, our result contrasts with studies that find marked industry differences and implies that industry type alone is not a reliable predictor of ESG–performance alignment in this sample.

Hypothesis 3, concerning governance moderation, was also unsupported: board independence did not significantly strengthen the ESG–performance relationship. Governance and agency theories predict that more independent boards improve monitoring and reduce opportunistic disclosure (Jensen & Meckling, 1976; Kolk & Perego, 2010). Yet we find no evidence of such an effect. This discrepancy may restrict from limitations in the proxy for governance: board independence captures only one aspect of governance quality. Prior research has noted that other governance factors (e.g., ESG-linked incentives, expert committees, external assurance) may be important (Simnett et al., 2009; Casey & Grenier, 2015). It may also reflect that Finnish listed companies generally have high governance standards, leaving little variation for an effect to emerge. Essentially,

findings suggest that, at least with the measures used, board independence does not noticeably amplify the informativeness of ESG scores about measured environmental performance. This suggests that agency theory may remain relevant, but that its empirical implications depend heavily on how governance quality is operationalised in the analysis (Jensen & Meckling, 1976; Khan et al., 2016).

The robustness checks provide further insights that tie back to methodological debates in the literature. Using the alternative ESG Combined Score (TRESGCS) did not change the result, reinforcing the finding with a slightly different disclosure metric in line with LSEG's scoring methodology. However, when environmental outcomes were measured by emissions-intensity indicators, the positive relationship disappeared. This divergence highlights a key point raised in Chapter 3: ESG ratings and emissions-based metrics may capture different facets of environmental performance (Berg et al., 2022; Christensen et al., 2021). LSEG's Environment Pillar Score aggregates a range of factors, including policies, management systems and emissions-related indicators, whereas emissions intensity based on Scope 1 and Scope 2 data is a narrower and more direct outcome measure (LSEG, 2024; Greenhouse Gas Protocol, 2011). The absence of a significant link with emissions suggests that ESG disclosure in our sample is more strongly related to composite performance measures than to raw emissions figures. This finding contributes to the ongoing debate on measurement, indicating that while ESG scores correlate with broad environmental performance, they may not predict specific outcome metrics one-to-one. From a theoretical standpoint, this reinforces the argument that disclosure credibility cannot be evaluated independently of the measurement system through which environmental performance is assessed (Berg et al., 2022; Christensen et al., 2021).

As summary, we can state that our results both confirm and nuance existing theoretical expectations and empirical findings. The positive baseline association is consistent with signaling, stakeholder and resource-based perspectives, suggesting that ESG disclosure may contain informational content about measured environmental performance within the LSEG-based framework. On the other hand, the lack of moderation by industry and

governance and the difference between composite and emissions-based measures highlight the limitations of a one-size-fits-all interpretation. These findings suggest that theoretical models must account for how disclosure–performance relationships depend on measurement choices and context (Berg et al., 2022; Christensen et al., 2021). They also point to the need for careful interpretation of ESG scores in future research, as emphasized in prior literature (e.g., Gallego-Álvarez & Rodríguez-Domínguez, 2023; Berg et al., 2022). Our study extends the literature by providing Nordic evidence that, in practice, companies with higher ESG ratings tend to have stronger measured environmental performance, although this alignment varies with how performance is quantified and is not simply a function of industry or board structure.

8.4 Implications and Limitations

The positive ESG–performance relationship is most directly consistent with signaling theory, while also suggesting that legitimacy-seeking disclosure in this setting is not purely symbolic. Companies appear to align their disclosures with score-based environmental performance measures, indicating that higher ESG scores can reflect a combination of underlying practices, reporting structures and measurement design rather than purely symbolic communication. The findings are also consistent with stakeholder theory and the resource-based view, as companies facing stronger stakeholder scrutiny and possessing greater internal capabilities appear better able to improve both their practices and their reporting.

From a practical perspective, the results indicate that ESG disclosures, as constructed by LSEG, can provide useful information for investors and regulators (LSEG, 2024). Mandatory reporting requirements and established reporting standards may contribute to more consistent and comparable environmental information (Directive (EU) 2022/2464, 2022; Greenhouse Gas Protocol, 2011). For managers, the findings highlight the importance of aligning environmental investments with transparent reporting practices, as stronger reporting is associated with stronger score-based environmental performance

in this sample. At the same time, ESG scores should be interpreted with some caution, particularly with respect to how disclosure is measured. Overall, the results suggest that, in this setting, higher disclosure scores are associated with stronger score-based environmental performance, although this does not by itself establish that the relationship reflects only substantive environmental improvement.

More concretely, the findings suggest several implications for decision-making. First, for investors, ESG scores can serve as a useful preliminary screening tool, but they should be complemented with direct emissions-based and other outcome-based indicators. Second, for managers, the findings suggest that disclosure alone should not be relied upon as evidence of environmental progress and should be complemented by tangible environmental action and measurable outcomes. Third, for regulators and standard setters, this research highlights the critical nature of improving consistency, comparability and verification of ESG measures, especially through the development of connections between disclosed ESG ratings and demonstrable or quantifiable environmental results. Overall, the results support the view that well-designed reporting frameworks can contribute to better alignment between corporate disclosure and environmental performance, but only when supported by robust measurement standards and data quality.

Despite these practical implications, several limitations must be acknowledged when interpreting the results. Measurement represents one of the central concerns, as the dependent variable ENSCORE is a composite indicator derived from LSEG rather than a direct measure of emissions. A key limitation of the analysis is that both ESG disclosure and environmental performance are drawn from the same data provider. This raises the possibility that the observed relationship is partly influenced by how the indicators are constructed, rather than reflecting a purely substantive alignment. ESG scores and environmental pillar scores rely on overlapping data sources, including company-reported disclosures, which may mechanically increase the correlation between the two measures. As a result, companies with more extensive or structured reporting practices may receive

higher scores on both dimensions, even without proportional improvements in directly observable environmental outcomes.

This concern is consistent with prior research documenting divergence across ESG rating providers and methodological inconsistencies in score construction (Berg et al, 2022). It also suggests that ESG metrics may capture the extent and quality of disclosure as much as underlying outcomes. The results should therefore be interpreted with caution, as part of the observed relationship may reflect measurement design rather than a true causal link. This interpretation is further supported by the finding that GHG emissions intensity does not follow the same pattern, indicating a potential gap between reported performance and physical outcomes. This distinction is critical for interpretation, as it suggests that the observed positive relationship primarily reflects alignment in composite ESG-based measures rather than a consistently observable relationship with direct environmental outcomes.

Additional limitations relate to data and model specification. Data coverage is incomplete and the estimation sample is relatively small, which reduces statistical power, particularly for interaction effects. In addition, the sample includes only companies with available ESG and environmental performance data, which are typically larger and more transparent companies. As ESG data availability is not random, the estimation sample likely overrepresents larger companies with more developed reporting practices, introducing selection bias and limiting generalizability to the broader population of Nasdaq Helsinki companies. Unobserved confounding factors may still influence the results, for example if companies with unmeasured sustainability initiatives also report more extensively. Reverse causality cannot be fully excluded, as companies anticipating scrutiny may adjust their disclosures, or underlying policies may drive both reporting and performance. The governance proxy and industry classification may also suffer from measurement limitations or insufficient variation over time.

The cumulative effect of all the above-mentioned limitations suggests that the findings ought to be treated with caution, and they should be further validated in broader settings. The significance of validation is especially pronounced in ESG studies. In many cases, ESG measures based on disclosures and performance are built using similar databases; therefore, it can be very challenging to differentiate between the nature of disclosed information versus actual outcomes (Berg et al., 2022; Christensen et al., 2021). While the empirical method applied in this study appears to be an appropriate way for identifying statistical associations between ESG disclosure and environmental performance across companies, it cannot provide conclusive evidence for causality. (Wooldridge, 2010). Therefore, the results obtained within this study must be viewed as indicative of possible relations rather than as direct proof of causality.

8.5 Future research

The findings of this study point to several directions where further work could significantly deepen understanding of the relationship between ESG disclosure and environmental performance. A central issue concerns measurement. Relying on ESG scores alone makes it difficult to separate reporting practices from actual outcomes, particularly given inconsistencies in ESG measurement methodologies (Berg et al., 2022). Future research would benefit from combining disclosure-based measures with independently verifiable indicators, such as audited emissions data, regulatory records or environmental incident databases. This would make it easier to distinguish whether higher scores reflect genuine improvements or simply more extensive reporting.

At the same time, the issue of causality has been left to some extent unresolved. Although the results show a positive connection between better disclosure and better financial performance, there is no evidence for which factor causes which other. Therefore, to be able to find out if companies' better ESG disclosures lead to better performance or vice versa (i.e., if better performing companies have a greater willingness or ability to disclose), researchers need to use methodologies that extend beyond the common panel

data analysis. The potential for this lies with natural experimentation; regulatory changes; or staggered implementation of ESG-reporting frameworks.

In addition, the effect of corporate governance on ESG disclosure can be researched further. As mentioned previously, the limited impact found in the current study suggests that traditionally applied measures of corporate governance such as board independence do not necessarily reflect all the mechanisms by which governance affects ESG outcomes (Gallego-Álvarez & Rodríguez-Domínguez, 2023). Hence, using more specific indicators related to corporate governance, for example: ESG-related executive incentives; corporate ownership structures; and/or an assessment of the presence and quality of external auditing of disclosed information could provide a more accurate insight into how internal control systems and incentive schemes determine the level of both ESG reporting and actual ESG performance.

The institutional context in Finland, characterized by strong regulatory frameworks and high transparency norms, may influence both the extent and credibility of sustainability disclosure as well as companies' environmental practices, consistent with the role of institutional pressures in shaping organizational behaviour (DiMaggio & Powell, 1983). However, it remains an open question whether these findings can similarly occur in other countries with lower regulatory environments and higher stakeholder pressures. Additionally, this research question could be further explored by broadening the focus of this research to include additional countries or focusing on industry-specific areas that have the most risk of producing adverse environmental effects, in order to better understand how the institutional context influences the relationship between reported sustainable practices and actually engaging in sustainable practices. Furthermore, there exists much needed additional analysis regarding variation among companies. As size, resources available and industry exposure are all expected to influence both the ability to make changes to improve environmental conditions and the motivation to discuss said changes (communicate) through disclosure (reporting) (Barney, 1991; Hart, 1995; Freeman, 1984). Richer, company-level data, combined with alternative empirical modeling

techniques such as instrumental variable models or dynamic panel models would help increase confidence in causality and assist in providing a more complete understanding of the mechanisms driving the relationships examined.

In summary, advancing research in this area requires both improved measurement and stronger identification strategies. Without clearer separation between disclosure and actual environmental outcomes, there is a persistent risk of overstating the effectiveness of ESG reporting. Future research that integrates independent performance data with more rigorous empirical designs will be better positioned to distinguish substantive environmental improvements from symbolic compliance. Based on these observations, we can state that deeper understanding of this distinction is essential not only for academic research, but also for policymakers, investors and other stakeholders seeking to assess whether ESG disclosure frameworks are driving real environmental impact or merely shaping perceptions of sustainability.

9 Conclusion

This thesis examined whether ESG disclosure is associated with measured environmental performance among Finnish listed companies. A quantitative research design was employed to examine the relationship between ESG disclosure and measurable environmental outcomes. Both ESG scores, governance indicators and financial controls were integrated into a regression framework to assess both the presence of the relationship and the conditions under which it is present.

The findings indicate a statistically significant positive association between ESG disclosure and environmental pillar performance. Companies with higher ESG scores have higher composite ESG indicators of environmental performance. This suggests that ESG disclosure contains relevant informational content within the LSEG-based measurement framework. However, because the main disclosure and performance measures are drawn from the same data environment, the findings should be interpreted as evidence of disclosure–performance alignment rather than as direct proof that ESG reporting fully reflects underlying environmental practices. Accordingly, the results do not support a purely symbolic interpretation, but neither do they rule out the possibility that part of the observed relationship reflects reporting structure and measurement design.

The moderating analyses show that neither industry classification nor board independence significantly modify the relationship between ESG disclosure and environmental performance. Companies within environmentally sensitive industries were no more likely to demonstrate alignment than those outside such industries. Similarly, governance quality, as assessed by board independence did not strengthen the relationship. Thus, the industry and board-independence measures examined in this study did not produce clearly differentiated effects across the sample.

While there has been consistent empirical evidence linking ESG disclosure with environmental pillar scores, the relationship weakens when using emissions-based indicators. The results indicate that ESG ratings represent a broader construct, including reporting

practices, management systems and, to some extent, observable environmental outcomes. More broadly, the findings suggest that observed ESG disclosure–performance alignment reflects a combination of substantive practices, reporting frameworks and measurement structure, rather than permitting a simple classification as purely symbolic or purely substantive. From an academic perspective, the study provides evidence of ESG disclosure's informational value within score-based environmental assessments in a Nordic context characterized by strong governance and advanced regulation. Moreover, the results highlight the importance of sensitivity to measurement choices. From a practical perspective, ESG scores may serve as useful signals for investors; however, they should be interpreted alongside direct performance indicators. For regulators, the findings support continued efforts to enhance the consistency, comparability and reliability of sustainability reporting.

Overall, the results demonstrate a consistent positive association between ESG disclosure and measured environmental performance among Finnish listed companies, although this relationship depends on how performance is measured. The findings highlight that ESG metrics capture a broader construct that probable includes both underlying practices and reporting structures. Consequently, interpreting ESG disclosure requires careful consideration of both the information reported and the measurement systems through which performance is assessed.

10 Declaration of the Use of AI-assisted Technologies in the Writing Process

This thesis has been prepared in accordance with the University of Vaasa's guidelines on the responsible and transparent use of artificial intelligence in academic work.

AI tools used: OpenAI ChatGPT, Claude (Anthropic).

AI-assisted technologies were used as a supporting tools during parts of the writing and analytical process. AI was not used as an independent author, decision-maker, or source of academic judgement. All substantive decisions regarding research design, data selection, econometric modelling, interpretation of results and academic conclusions were made independently by the author.

The use of AI-assisted technologies was limited to the following purposes:

- Structural support in writing: AI was used to assist in organizing the structure of chapters and subsections and to improve the logical flow between sections of the thesis. The overall argumentation, interpretation of results and theoretical integration were developed independently by the author.
- Language refinement and clarity: AI was used to improve the clarity, readability and academic tone of the text. This included suggestions for sentence structure, transitions between sections and stylistic refinement. All wording decisions were reviewed and finalized by the author.
- Methodological and technical clarification: AI was occasionally used to clarify econometric concepts and assist in clarifying syntax and generating example code structures for statistical software. The regression models, variable definitions and empirical specifications were independently designed and implemented by the author using the LSEG Workspace dataset.

- Support in literature identification: AI was used as an exploratory tool to identify potentially relevant academic literature and regulatory materials related to ESG disclosure, environmental performance and sustainability reporting. All sources included in the thesis were independently verified, reviewed and selected by the author.
- Proofreading and consistency review: AI was used as a supplementary tool to identify potential inconsistencies in wording, unclear passages, or structural issues in the manuscript. AI did not serve as an authority on the validity of academic arguments or empirical findings.
- Data visualization support: AI was used to assist in generating and refining code for visualizations (such as correlation heatmaps and scatter plots). The underlying data, results and interpretations were produced independently by the author. Prompts used in the creation of figures are reported in the corresponding figure captions.
- Conceptual clarification support: AI was used to critically evaluate the alignment between the theoretical framing and the empirical design (e.g., refining the distinction between “credibility” and “disclosure–performance alignment”). All conceptual decisions, interpretations and final formulations were independently assessed and determined by the author.

All AI-assisted outputs were critically evaluated, edited and meaningfully incorporated by the author. The author assumes full responsibility for the accuracy, coherence, empirical analysis and final content of this thesis. AI-assisted technologies were used to complement, not replace, independent academic reasoning and analytical work. This declaration is provided to ensure transparency and compliance with academic integrity principles and the university’s requirements regarding the disclosure of AI-assisted technologies.

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Appendices

Appendix 1. Variable Definitions

Variable	Code	Definition	Unit	Source
Environmental Pillar Score	ENSCORE	Refinitiv/LSEG ESG Environment pillar score, 0–100 scale	Index (higher = better)	Refinitiv LSEG ESG
ESG Score	TRESGS	Refinitiv/LSEG Total ESG score (aggregated E, S, G dimensions)	Index (0–100)	Refinitiv LSEG ESG
ESG Combined Score	TRESGCS	Refinitiv/LSEG ESG Combined Score (ESG Score adjusted for controversies)	Index (0–100)	Refinitiv LSEG ESG
ESG Controversies Score	TRESGCCS	Refinitiv/LSEG ESG Controversies subscore	Index (0–100)	Refinitiv LSEG ESG
Board Independence (%)	CGBSO07V	Percentage of board members classified as independent	Percent (%)	Refinitiv LSEG
ln(Total Assets)	ln(WC02999)	Natural log of total assets (LSEG code 02999)	Log(M€)	Company financials, Refinitiv
Return on Equity (ROE)	WC08301	Return on shareholders' equity	Percent (%)	Company financials, Refinitiv
Operating Profit Margin	WC08316	Operating profit margin (Operating profit / Sales)	Percent (%)	Company financials, Refinitiv
Capital Gearing	WC08221	Debt-to-equity ratio (Total debt / Total equity)	Ratio	Company financials, Refinitiv
Scope 1 Emissions	ENERDP024	Direct CO_2 eq. emissions (Scope 1)	Tonnes	Refinitiv ESG database
Scope 2 Emissions	ENERDP025	Indirect CO_2 eq. emissions (Scope 2)	Tonnes	Refinitiv ESG database
Scope 1 Emissions / Revenue	ENERO52V	Scope 1 CO_2 emissions divided by revenue	Tonnes/M€	Derived (Refinitiv data)
Total Emissions / Revenue	ENERO03V	Total CO_2 (Scope1+2) emissions divided by revenue	Tonnes/M€	Derived (Refinitiv data)
Market Capitalization	MarketCap (08001)	Total market value of outstanding shares	M€	Refinitiv quotes
Number of Employees	07011	Total number of employees	Count	Company reports / Refinitiv

Sources: LSEG ESG methodology; Greenhouse Gas Protocol; and Refinitiv financial databases (codes from Navigator export).

Appendix 2. Industry Classification

SensitiveIndustry Dummy: Equals 1 if the company's sector is among those with high environmental impact, 0 otherwise. Sectors are classified according to the Global Industry Classification Standard (GICS) via Refinitiv. The following sectors were flagged as environmentally sensitive:

Sector	**SensitiveIndustry**
Oil, Gas and Coal	1
Electricity	1
Chemicals	1
Industrial Materials	1
Industrial Metals and Mining	1
Precious Metals and Mining	1
Construction and Materials	1
General Industrials	1
Industrial Engineering	1
Industrial Support Services	1
Industrial Transportation	1
Electronic and Electrical Equipment	1
All other sectors	0

These groupings are based on prior literature identifying high-impact industries. Companies outside these sectors (e.g. services, finance, technology) are coded 0. This dummy allows testing whether disclosure–performance links differ by sector intensity.