

# Master Thesis U.S.E

## The Heterogenous Impact of ESG Ratings on Firm Performance across different EU Sectors

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**Abstract:** This study analyses the relationship between ESG (Environmental, Social and Governance) scores and firm profitability and value. By decomposing the sample at the sector level, the paper hopes to answer the following question: To what extent does the relationship between ESG and firm performance differ across sectors? The paper carries out fixed-effects analysis on a panel dataset of 4500 firm-year observations in Europe from the year 2011-2022 in order to answer this question. Two additional explanatory mechanism are also provided to explain this difference: The degree of privatization and innovation within a sector. Significant associations are found between ESG and firm profitability for the Social pillar, and ESG and firm value for multiple pillars. Distinct heterogeneity is seen in this relationship for firms in the Consumer Goods sector.

**JEL Classification:** C01, G31, G56

**Keywords:** Firm Performance, Return on Assets, Firm Value, ESG Scores, Sectors, Privatization, Innovation, R&D Intensity, Panel Data Fixed Effects

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## 1. Introduction

Stakeholder theory (Freeman, 1984) proposes that firms should conduct business in a manner which maximizes value for all parties affected by their activities, rather than simply prioritizing shareholder value (Friedman, 1970). According to these theorists, this would not only benefit society, but also the firm itself, through an increase in its ability to generate sustainable wealth (Freeman and McVea, 2001). Closely aligned with this theory is the concept of Corporate Social Responsibility (CSR), whereby “companies integrate social and environmental concerns into their business operations and interactions with their stakeholders” (UNIDO, 2024).

The most recent manifestation of CSR can be seen through the growing prevalence of Environmental, Social and Governance (ESG) activities among listed firms. These three ‘pillars’ of ESG are composed of various metrics and intend to capture all “non-financial risks and opportunities inherent to a company’s day-to-day activities” (Deloitte, 2024). Due to burgeoning global issues such as increasing climate risk and growing inequality, institutions such as the European Union have begun to enforce mandatory ESG reporting as of 2023<sup>1</sup>. Regardless firms may be self-motivated to pursue ESG practices and disclosures in order to increase their reputations and decrease business risk, in turn improving their financial performance (Tampakoudis & Anagnostopoulou, 2019; Zhao et al., 2018). Furthermore, ESG disclosure has been shown to decrease information asymmetry and risk on financial markets, creating a positive feedback loop between companies and investors (Khuo et al., 2021). As a result, more and more firms are beginning to integrate ESG practices into their everyday activities in order to pursue sustainable development and long-term value (Eccles et al., 2014; Fu & Li, 2023).

Despite this, evidence on the relationship between ESG ratings and firm performance is largely inconclusive, with studies showing mixed results. While some meta-analyses, such as those by Friede et al. (2015) and Alshehhi et al. (2018) have shown that a positive relationship exists between ESG and firm performance for 90% and 78% of reviewed studies, respectively, others, such as Whelan et al. (2021), portrayed results as low as 58%. As Ionescu et al. (2019) explain, this may be in large part caused by differing empirical approaches across the literature. Furthermore, results have been shown to vary depending on the region of analysis, type of firm, and sector (Jung & Yoo, 2023).

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<sup>1</sup> [DIRECTIVE \(EU\) 2022/2464 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2022](#)

Many studies have been conducted with focus on a particular sector, with similarly divergent results. For example, while sectors such as banking, manufacturing, mining, and oil & gas only display a positive and significant relationship between ESG and firm performance when considering environmental criteria (Azmi et al., 2021; Garcia et al., 2017; Chen et al., 2022), others, such as transportation, demonstrate a significant relationship between ESG and performance for all three pillars (positive for Environmental and Social pillars, and negative for Governance) (Kuo et al., 2021; Pham et al., 2022).

Despite these disparate results, there exists little research concerning cross-sector comparative analyses when considering the relationship between ESG and firm performance. ISS (2023), for example, investigate the relationship between ESG and firm valuation for each of the eleven ISIC Broad Sector Classifications, finding a positive and significant relationship for seven of them, with the most prominent results in Communication Services and Energy. Similarly, Buallay (2019) investigates the heterogeneity between ESG and firm financial performance in the manufacturing and banking sectors, finding a positive relationship for the former and a negative relationship for the latter.

Many studies investigate the heterogenous effect that sector classification may have on the relationship between ESG and firm financial performance and provide possible theories as to why these differences may exist. However, none of them provide a comprehensive outlook into the different relationships that may exist within each of the three ESG pillars. Furthermore, no studies have empirically investigated possible institutional or organizational reasons as to why this relationship may differ across sectors. A more comprehensive investigation into this heterogeneity may yield useful evidence which could help firms to tailor their ESG strategy to maximize their performance based on their sector of operation. Conversely, a knowledge of which ESG pillars improve firm performance and why may help regulators to target firms' ESG disclosures and practices more efficiently.

In order to address this issue, this paper aims to answer the following research question: *To what extent does the relationship between Environmental, Social, and Governance scores and Firm Performance differ across sectors, and why?*

The aim of this thesis is to provide a robust comparison of the relationship between ESG and firm performance across major economic sectors and investigate possible reasons as to why these differences exist. In this thesis, I propose two mechanisms for why these cross-sector differences exist: the differences in the *degree of privatization* and *degree of innovation* across different sectors.

The research question is answered through an empirical analysis of publicly listed firms based in the European Union (EU) from the years 2011-2022. An unbalanced panel dataset containing 4500 firm-year observations from the Stoxx Europe 600 Index is constructed using data from Refinitiv Eikon, where information on ESG ratings and firm financial characteristics can be found. Sectors are grouped based on the MSCI and S&P Dow Jones Global Industry Classification Standard.

A positive and significant relationship is found between firm profitability and ESG ratings for the Social pillar only. The relationship between ESG scores and firm value is positive with regards to Environmental and Social scores, but negative with regards to Governance. When decomposed at the sector level, a positive and significant association is found between total ESG scores and firm value for firms in the Consumer Goods sector. Further investigation shows that this relationship comes from the effect of Environmental and Social pillars on firm value. There is also a negative and highly significant association found between Governance score and firm value for firms in the Consumer Goods sector. A positive and significant association is found between firm value and Environmental score for firms in the Health sector. However, not all results are robust to a change in the time horizon of ESG scores or panel composition. Partial evidence is found to support the fact that the degree of privatization and innovation within a given industry may positively influence the relationship between ESG and firm performance.

This research contributes to the existing literature by (1) providing a thorough analysis of the heterogenous effect that different sector classifications have on the relationship between ESG and firm performance, (2) providing possible explanations as to why these differences exist. By restricting analysis to the EU, the results of the study should also provide useful evidence for both EU firms and policymakers.

The paper is structured as follows. Section 2 outlines the theoretical framework behind ESG and its logical relationship with firm performance, as well as formulates the hypotheses. Section 3 reviews the existing literature on ESG and firm performance, both at the sector and general levels. Section 4 explains the data and empirical approach. Section 5 describes the results for each proposed hypothesis and provides two robustness tests. Section 6 discusses the findings and possible implications and limitations of the research. Section 7 concludes.

## 2. Conceptual Framework & Hypotheses

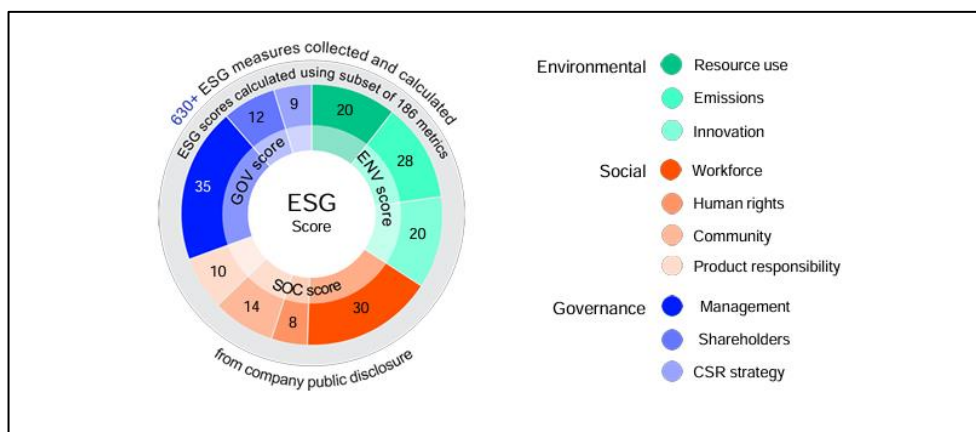
In this section, I begin by outlining the current ESG framework as put forth by LSEG, one of the world’s most prevalent ESG reporting firms. Following this, I will delineate the theoretical relationship between ESG and firm financial performance, based on two opposing theories: stakeholder theory and shareholder theory. I will then discuss theoretical explanations for why this relationship may differ across sectors, before proposing two additional mechanisms. I conclude the section by formulating several hypotheses for the paper.

### 2.1. ESG Framework

ESG is a framework used to measure firms’ organizational and business practices on a wide variety of sustainability and ethical issues (Stedman, 2023). According to Deloitte (2024), they intend to capture “all the non-financial risks and opportunities inherent to a company’s day-to-day activities”.

ESG scores provided by LSEG are based upon 10 different categories, each of which are assigned to one of three relevant pillars – Environmental, Social, or Corporate Governance (LSEG, 2024). LSEG track over 630 firm-level ESG metrics, of which the 186 most relevant for each industry are used to calculate category and subsequent pillar scores. The title of each category, along with the assignment to its relevant pillar, can be seen in Figure 1 below. The score of each ESG pillar derives from the weighted sum of its relevant categories. These weights vary by industry for social and environmental categories, and by country for corporate governance categories. Pillar weights are normalized to percentages ranging from 0-100. Together, the sum of these pillar scores represent the total ESG score for a given firm.

Figure 1: LSEG ESG Framework



Source: [LSEG \(2024\)](#)

Overall and pillar scores for each firm are given in percentile (0-100) and letter grade (D- to A+, with D- as the worst) form, with both measures indicating the level of ESG performance and transparency for a given firm relative to its industry of operation.

## **2.2. Theoretical Link Between ESG & Firm Financial Performance**

The proposed link between ESG score and firm financial performance rests on two opposing theories, namely stakeholder and shareholder theory. I will outline each of these theories and discuss their potential relationship with ESG in turn.

### **2.2.1 ESG & Stakeholder Theory**

Stakeholder theory argues that firms have an ethical obligation to maximize value for all parties with whom they interact, such as customers, suppliers, and employees, rather than merely maximizing shareholder value (Freeman, 1984). According to the theory, firms who pursue amicable relationships with all of their stakeholders are more likely to achieve financial success.

Closely related to stakeholder theory is the concept of Corporate Social Responsibility (CSR), whereby “companies integrate social and environmental concerns into their business operations and interactions with their stakeholders” (UNIDO, 2024). ESG disclosure and activity from firms is a clear example of such CSR practice. As Buallay (2019) notes, firm sustainability reporting is an important issue for a broad range of stakeholders. As such, firms who engage in ESG activity may convey a “willingness to fulfil stakeholders’ demands”, as well as avoid any potential future costs of formal compliance through additional regulation (Azmi et al., 2021, p.2). Furthermore, through accurate ESG disclosure and reporting, firms can increase their transparency and legitimacy, as well as reduce informational asymmetries with the general public, leading to greater investor and stakeholder confidence (Garcia et al., 2017; Deegan, 2014). As Giese et al. (2024) note, companies with high ESG ratings have historically been shown to better manage idiosyncratic risk compared to their lower scored peers, have lower costs of capital, and are usually more resilient to changes in the market environment.

Closely related to the stakeholder theory of ESG is the resource-based view (RBV) of the firm. RBV states that four criteria: Value, Rareness, Imperfect Limitability and Non-Substitutability (VRIN) are key aspects of resources which are vital to a company’s competitive



advantage and their ability to ensure long-term success (Barney, 1991). According to Chen et al. (2022), ESG activities can be accurately classed as VRIN resources, given their unique contribution to the enhancement of corporate reputation, supply chain sustainability, and “improvements in relationships with stakeholders” (Chen et al., 2022, p.3).

According to stakeholder theory, ESG activity should therefore be viewed as a strategic investment which can lead to the improved financial performance of firms (Azmi et al., 2021). ESG can improve the market value of firms through an enhancement of investor confidence and corporate image and boost firm profitability through the development of strategic resources.

### **2.2.2 ESG & Shareholder Theory**

Contrary to stakeholder theory, shareholder theory instantiates that the sole purpose of firms is to increase value for their shareholders. According to this view, pursuits which improve stakeholder relations represent a significant trade-off to the firm, as they divert limited resources from activities which could have been aimed toward directly increasing firm value (Friedman, 1970). As Devinney (2009) notes, any act taken by a firm to improve their relationship with one group of stakeholders necessarily leads to a trade-off with another. As such, any attempt by a firm to increase its corporate social performance with their given resources presents an opportunity cost (in this case, projects with a positive net present value) and necessarily increases their level of risk (Orlitzky & Benjamin, 2001; Khoury, 2021).

A related view is the concept of agency theory, whereby the goals of the party who delegates work (the principal) differs from that of the party who carries it out (the agent) (Eisenhardt, 1989). According to this view, CSR activity is purely a cost which arises from managers seeking to promote their own personal interests at the expense of shareholders (Tampakoudis & Anagnostopoulou, 2020). According to Benabou and Tirole (2010), corporate Governance activities may arise as a result of “insider-initiated corporate philanthropy”, i.e., the board of directors pursuing their own interests, rather than a genuine desire to satisfy stakeholders or enhance firm value.

As Hoepner and Yu (2011) explain, CSR activities primarily create intangible assets, and can therefore be considered a direct expense for firms. As such, ESG activity may be seen as an irrational and inefficient use of firm resources. Through the pursuit of such sub-optimal activity, firms may undermine their own profitability. Furthermore, negative implications associated with ESG may decrease firms’ market value (Marsat & Williams, 2006).

### **2.3. Sector Differences**

Hoepner and Yu (2011) state that CSR is an inherently “contextual concept” (p.7). As such, the relative importance of certain ESG activities for a given firm are highly dependent on their industrial environment (Giese, 2024). Given that these activities differ in how they affect firm performance, the relationship between ESG and firm performance can therefore be expected to differ across sectors. Business norms, regulatory frameworks, and stakeholder demands for CSR activities may vary significantly depending on the industrial environment, thus influencing the sensitivity of a given firm’s performance to its success in ESG (McWilliams et al., 2006; Gholami, 2021). For example, firms in environmentally sensitive sectors, such as energy and materials, may be more likely to proactively pursue sustainable processes and be transparent with their environmental disclosures, leading to increased profitability and investor confidence (Matakanye, 2021; Lin et al., 2016). Conversely, firms in these sectors may also be excluded from certain investment portfolios based on socially responsible criteria, which may deteriorate their market value (Orsato et al., 2015).

In the following sections, I will explore the logic behind two additional mechanisms which may moderate this heterogenous relationship between ESG activity and firm financial performance across sectors. These are the *degree of privatization*, and *degree of innovation* in a given sector.

#### **2.3.1 Degree of Privatisation**

The degree of privatization within a sector may have a significant moderating effect on the relationship between ESG and firm financial performance.

As Kao et al. (2018) state, firms may have different motivations for investing in CSR and ESG depending on their ownership structure. Given that privately owned firms can utilize their resources more efficiently, and are primarily focused on maximizing firm value, they are more likely to garner lucrative returns from strategic investments in ESG (Ren et al., 2022, Kao et al., 2018). While publicly owned firms may benefit from greater legitimacy and access to resources, they may be more likely to experience agency problems with regards to ESG, with managers pursuing ESG activities to promote their own self-interest rather than increase firm value, given that their compensation is not directly related to firm performance (Kao et al., 2018). As such, the degree of privatization within a sector should positively moderate the relationship between ESG and firm performance.

### 2.3.2 Degree of Innovation

The degree of innovation within a sector should also have a positive moderating effect on the relationship between ESG and firm performance. As Zhong et al. (2023) notes, the ability of firms to create value through ESG practices may be limited by resource constraints, outdated technology, and information asymmetries. As such, increased innovation may enhance firms' ability to effectively develop and use sustainable technologies in their business practices (Gouvea et al., 2022).

## 2.4. Hypotheses

Given the theoretical framework laid out in the previous sections, this thesis will test two primary hypotheses:

*H1: There is no association between a firm's ESG score (total, Environmental, Social, Governance) and its financial performance.*

*H2: The relationship between a firm's ESG score (total, Environmental, Social, Governance) and its financial performance is similar across different sectors.*

Furthermore, based on the aforementioned mechanisms, this thesis proposes two additional explanatory hypotheses:

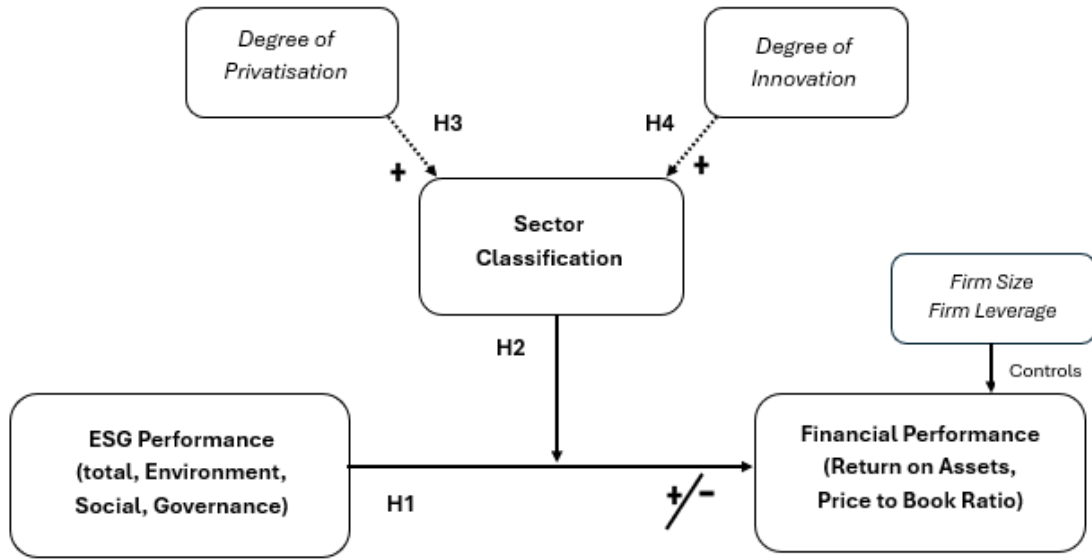
*H3: The degree of privatization within a given sector does not positively influence the relationship between ESG and firm performance in that sector.*

*H4: The degree of innovation within a given sector does not positively influence the relationship between ESG and firm performance in that sector.*

Figure 1 below graphically displays this theoretical framework.

Before delineating the research methods that I will use to investigate these hypotheses in my thesis, I will first turn to the varying evidence seen in the literature.

**Figure 2: Research Framework**



### **3. Literature Review**

This section will discuss the relevant literature for the above hypotheses. Firstly, I will focus on literature surrounding ESG & Firm Performance generally, before turning to studies which investigate distinct sectors or compare them to one another. I will then shortly discuss literature which highlights both of the mechanisms proposed in this paper.

#### **3.1. ESG & Firm Performance**

Numerous studies have been conducted which investigate the relationship between ESG and firm financial performance, with varying results. Aydogmus et al. (2022) investigate the relationship between ESG and firm value (measured through Tobin's Q, i.e., market value/total assets) and profitability (measured through return on assets) for the 5000 largest public firms listed on Bloomberg's database, finding a positive and significant relationship between ESG and profitability for ESG combined score and each of its respective pillars. With regards to firm value, a positive and significant relationship is found with ESG combined score, as well as the Social and Governance pillars, but not the Environmental pillar, indicating that profitability may be the more efficient indicator of a firm's Environmental performance. Focusing on our region of analysis, De Lucia et al. (2020) find a positive relationship between ESG indicators and both Return on Assets and Return on Equity for 1038 public companies across 22 European countries from 2018-2019. Similarly, Velte (2017) finds a positive relationship between ESG and both firm value and profitability for German listed firms from 2010-2014. Each of these findings show support for the previously established concept of stakeholder theory in their portrayal of ESG and CSR activities as a profitable pursuit.

However, an abundance of research also portrays a negative relationship between ESG and financial performance. Marsat and Williams (2013), for example, investigate the relationship between MSCI ESG scores and firm value for nearly 3000 international firms from 2005-2009, finding a negative relationship. This negative association is further pronounced for the Environmental pillar. Focusing again on the EU, Landi and Sciarelli (2019) find a negative relationship between ESG scores and financial performance for Italian listed firms between 2007-2015. These findings contrast the previously introduced concept of stakeholder theory upon which CSR and ESG are based, instead leaning in favor of the more traditional shareholder theory, wherein the sole purpose of firms is to increase value for their shareholders.

Closely linked to this is the concept of trade-off theory, which views ESG activities as an inefficient use of scarce resources which may reduce firm profitability (Friedman, 1970).

Multiple studies also exist which portray a mixed or inconclusive relationship between ESG and firm performance. Results become particularly disparate when decomposed into each ESG pillar (Shaikh, 2021; Alareeni & Hamdan, 2020). In Europe, Saygili et al. (2021) investigate the relationship between ESG and firm performance for listed companies in Turkey from 2007-2017, finding a positive association for Social and Governance pillars, but a negative association for the Environmental pillar. These findings support evidence that the Environmental pillar is the most complex from a reporting perspective and the one with the most lagged effect on profitability (Deloitte, 2024). Giannopoulos et al. (2022) investigate Norwegian listed firms from 2010-2019 and find a positive relationship between ESG ratings and firm profitability, but a negative relationship between ESG and firm value. Firm value here is measured through Tobin's Q, which is indicative of market perceptions. As such, any negative effect of ESG scores on Tobin's Q may be more indicative of shareholder skepticism toward ESG activity rather than ESG activity being inherently unprofitable.

### **3.2. Sector Specific Performance**

It is evident from the literature that the relationship between ESG and firm performance, while in large part positive, is far from conclusive. This lack of consensus becomes even more intriguing once we compare distinct sectors.

Buallay (2019) compares the relationship between ESG and firm performance for global firms in the finance and manufacturing sectors from 2008-2017. The author finds a positive association between ESG and firms' operational, financial and market performance for firms in the manufacturing sector, but a negative association between all variables for financial firms. The author attributes this disparity to the fact that sustainable innovation in the manufacturing sector is more concerned with tangible goals such as safety, environmental standards, and updating logistical processes, vs the more obtuse socially oriented sustainability objectives pursued in the financial sector.

Numerous studies have conducted more comprehensive cross-sector comparative analyses of the relationship between ESG and firm performance. ISS (2023) carry out such an investigation for a large sample of global companies from 2017-2022. The authors find a significant association between ESG and added market value for firms in seven of eleven sectors. Insignificant results were found in Consumer Staples, Real Estate, Information

Technology, and Materials. The most prominent positive results were found in the Communication and Energy sectors. However, the authors do not propose any mechanisms to explain this inter-sector heterogeneity. Gholami et al. (2021) conduct a similar study, investigating differences in the relationship between ESG and firm performance across different industries for Australian firms listed on Bloomberg database from 2007-2017. The authors find a positive and significant association between ESG scores and firm value for companies in the materials, consumer staples, energy and industrial sectors. They attribute these differences to the diverse regulatory environment and varying demands of stakeholders seen in each sector, such as the strict safety and environmental requirements seen in the energy, industrial and materials sectors. Similarly, Hoepner and Yu (2011) investigate the relationship between CSR and firm performance for 478 globally listed firms, finding significantly positive relationships in the Consumer Discretionary and Health industries. The authors suggest that high proximity to the end consumer within these sectors may be a contributing factor to this heterogeneity. Baron et al. (2009) investigate the relationship between firm performance and Corporate Social Performance for over 2000 listed US firms from 2000-2004, finding a positive relationship between the two for firms in consumer facing industries, and a negative relationship for industrial firms, suggesting a higher incentive for firms in the former group to engage in CSR activities than the latter.

Aside from these studies, cross-sector comparative analyses which investigate the relationship between ESG and firm performance are still quite scarce. While many studies exist which focus on one particular sector or subset of sectors, few compare the relationship between ESG and firm performance in different sectors at an economy wide level. Furthermore, no studies have empirically investigated possible institutional or organizational reasons as to why this relationship may differ across sectors, relying only on theoretical explanations. This paper hopes to fill these gaps in the literature by conducting a thorough cross-sector analysis of the relationship between ESG and firm performance, and providing two empirically founded explanations as to why this heterogeneity may exist.

### **3.3. Explanatory Mechanisms**

In this section I will examine the current consensus in the literature (or lack thereof) regarding the moderating effect of each of the aforementioned mechanisms on the relationship between ESG and firm performance.

### **3.3.1. Degree of Privatisation**

There is a relatively broad consensus in the literature with regards to the moderating effect of privatization on the relationship between ESG and firm performance. Numerous studies investigate the relationship between CSR activity and firm performance for A-listed firms in China during the late 2000s and early 2010s and find this relationship to be significantly worse for state-owned companies compared to private companies (Aang et al., 2022; Kao et al., 2018; Ren et al., 2022). Kuo et al. (2018) conduct a case study of 30 global airline carriers from 2012-2017 to investigate the effect of ownership structure on the relationship between ESG and firm performance. The authors find a positive relationship between firm performance and environmental and social indicators for both private and state-owned airlines, however this effect was more pronounced among the former group. The financial performance of both groups exhibited a U-shaped relationship with the relevant ESG indicators, initially decreasing upon implementation, before increasing after time. Interestingly, the effect of ESG on both of these firm types outperformed firms with a mixed ownership structure, which the authors attribute to a clash of leadership and culture.

### **3.3.2. Degree of Innovation**

Literature concerning the moderating effect of innovation on the relationship between ESG and firm performance is similarly coherent. Fu & Li (2023) sample A-listed firms in China from 2015-2021 and find that the rate of digital transformation (a score assigned to each firm based on digitalization keywords obtained from their annual reports) has a significantly positive moderating effect on the relationship between ESG and firm performance. The authors also note a desire to focus on specific sectors in further research, in order to address distinct sector-heterogeneous factors such as policy environment and user behavior. Similarly, Kong et al. (2023) investigate this relationship for 78 Chinese pharmaceutical companies from 2009-2022. The authors find a positive and significant relationship between firm value and social and environmental performance, with this relationship being strengthened by the degree of firms' technological innovation. Khoury (2021), however, fail to find a significant moderating effect of R&D expenditure on the relationship between ESG pillars and firm performance. However, the assignment of zero values to unreported R&D expenditures may have negatively biased these results. As such, innovation can primarily be seen to positively moderate any purported effects of ESG on firm financial performance.



## 4. Data & Methodology

### 4.1. Dataset

This paper investigates the heterogeneous effect of sector classification on the relationship between ESG and firm performance. To do this, I create a panel dataset of publicly listed firms from the STOXX 600 European Index<sup>1</sup> from 2011-2022, using data from Refinitiv Eikon. LSEG's ESG reporting framework was introduced in 2003<sup>2</sup> and has grown increasingly complex since, with coverage of the STOXX beginning in 2008. As such, the period of study was chosen in order to ensure a comprehensive coverage of EU firms' ESG performance and limit any distortions caused by the 2008 financial crisis. The initial sample for these 600 firms across the 12-year period consists of 7200 firm-year observations. Filtering for firms with ESG data across the entire sample reduces this to a balanced panel dataset of 391 firms and 4692 firm-year observations. Extreme outliers for several variables (Return on Assets, Price-to-Book Ratio, and Debt to Asset ratio) were removed from the sample for values below and above the 1<sup>st</sup> and 99<sup>th</sup> percentile, resulting in a final unbalanced panel dataset of 4500 firm-year observations. Table 1 summarizes the number of firm-year observations in each year of the sample.

**Table 1: Yearly Breakdown of sampled firms**

YEAR	No. of Firms	Percent
2011	381	8.47%
2012	371	8.24%
2013	376	8.36%
2014	377	8.38%
2015	375	8.33%
2016	381	8.47%
2017	381	8.47%
2018	381	8.47%
2019	378	8.40%
2020	361	8.02%
2021	376	8.36%
2022	362	8.04%
TOTAL	4500	100%

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<sup>2</sup> [ESG Scores Methodology, LSEG](#)

## **4.2. Variables**

### **4.2.1. Dependent Variables**

Many pre-existing studies measure firm performance through both operational and market performance indicators in order to account for both company specific and systematic market risks (Khoury et al., 2021; Jung & Yoo, 2022). This study aligns with the literature and uses Return on Assets (ROA) to measure operational performance (Fu & Li, 2023; Chen et al., 2022). ROA (the percentage of net income/total assets) is a measure of profitability which determines how efficiently a business utilizes its assets in production to produce a profit (Naeem et al., 2022). We also Price-to-Book ratio (PBR) in order to measure market performance (Khoury et al., 2021). PBR measures the market value of a firm relative to the book value of its total assets (Investopedia, 2024). As such, a PBR of 1 indicates that a firm is fairly valued on the market with respect to its assets. A value of greater than/less than 1 indicates that a firm is overvalued/undervalued with respect to its assets. The use of both operational and market indicators in the study can be further justified as follows: While operational performance solely focuses on the effect of ESG activity on firm profitability, market performance also accounts for market sentiment and reputational benefits or risks to engaging in ESG. As such, the similarity or difference between these two results may provide further indication as to whether ESG activities truly add value to firms or simply enhance their reputation (Ioannou & Serafeim, 2014).

### **4.2.2. Independent Variables**

This paper utilizes four different independent variables. ESG total score, Environmental score, Social score, and Governance score. Data concerning ESG scores for sampled firms can be found on Refinitiv Eikon. Annual data is provided on combined ESG scores for a large number of publicly listed firms, as well as scores for the individual Environmental, Social and Governance pillars. All scores range from 0-100 and are stratified into a letter grade ranging from D- to A+ (with 100 and A+ being the best, respectively). Each ESG pillar score is decomposed into its relevant themes (such as Environmental Innovation, Resource Use, and Emissions for the Environmental pillar), which are again broken down into further sub-sections. Data for all scores are updated on a weekly basis. Scores are only marked as ‘definitive’ after five years have passed and are otherwise subject to weekly revision. This is

based on the reasoning that more recent scores may need to be retroactively updated given company restatements or data corrections (LSEG, 2024).

#### **4.2.3. Control Variables**

In line with previous studies, the following financial control variables will be used: firm size (measured here as both the number of employees and total firm assets) and firm leverage (measured through the Debt to Asset ratio) (Aydogmus et al., 2022; Garcia & Orsato, 2020). Comprehensive annual data for each of these variables can be found on Refinitiv Eikon.

The paper also includes further controls at the country level, namely: annual GDP, and the interest rate of each country's 10-year sovereign bond (known henceforth as LT Rate), which represents the opportunity cost of investment.

#### **4.2.4. Explanatory Mechanisms**

Comprehensive information on the ownership structure of each of the listed companies in the sample can be found on Refinitiv Eikon. In order to determine the degree of privatization for a given firm, the percentage of public ownership (measured through the percentage of shares owned by Government Agencies and Sovereign Wealth Funds) is subtracted from 1.

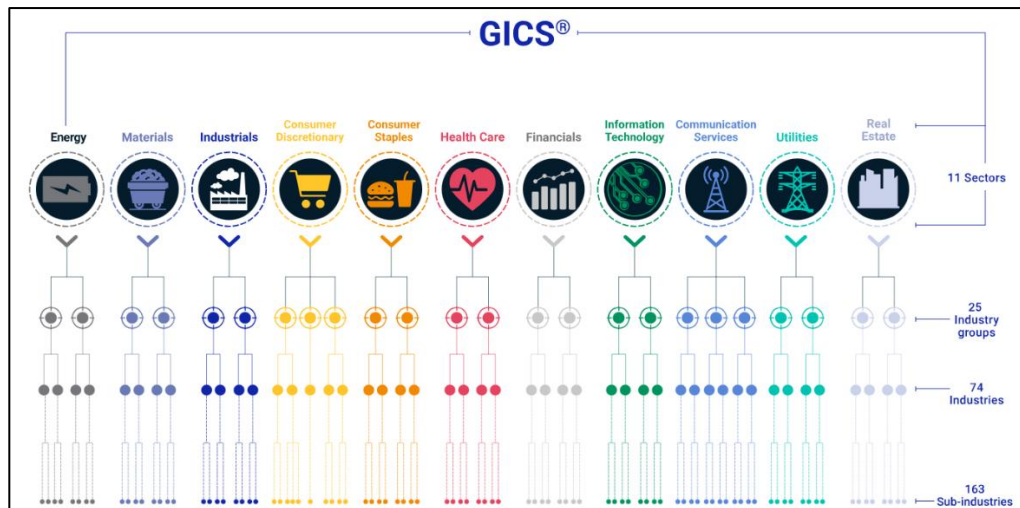
A common metric by which to measure the degree of innovation within a given firm or sector is R&D intensity (Hughes, 1988; Jung & Yoo, 2022), which measures a firm's expenditure on research and development (R&D) activities relative to its total net revenue. Data on R&D intensity can be found on Refinitiv Eikon for approximately half the sample (2348 firm-year observations). All variable definitions can be found in the table in Appendix A.

#### **4.2.5. Sector Classification**

Sector classification is categorized according to the MSCI and S&P Dow Jones Global Industry Classification Standard<sup>3</sup> (GICS), which groups business activity into eleven broad categories. These can be seen in Figure 3 below. For the sake of parsimony, this paper will further group these sectors into five categories: Industrials, Materials, Energy & Utilities (IMEU), Consumer Goods, Healthcare, Information Technology & Communication Services

(ICT) and Financials. There are no relevant Real Estate firms within the sample. Table 2 summarizes the number and proportion of sampled firms in each of these sector-groupings (see Table A1 in appendix for proportion of firms in each original industry grouping). s

**Figure 3: GICS Industry Classification**



Source: [MSCI \(2023\)](#)

**Table 2: Sector Breakdown for Sample**

SECTOR	No. of Firms	Percent
Consumer Goods	62	16.27%
Finance & PS	84	22.05%
Health	21	5.51%
ICT	39	10.24%
IMEU	175	45.93%

### 4.3. Empirical Approach

#### 4.3.1. ESG & Firm Performance

This paper conducts fixed-effects regression analysis on the above panel dataset to answer H1. Fixed-effects (FE) models assume that any time-invariant unobserved heterogeneity between firms affects the models' explanatory variables and can be captured through individual-firm-level effects (Farkas, 2005). Due to multicollinearity between each of the ESG pillars (Aydogmus et al., 2022), separate regression analyses will be conducted for ESG combined score and for each of its respective pillars. The baseline models for H1 are as follows:

$$(1) ROA_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 FirmControls_{i,t} + \beta_3 X_{i,t} + \beta_4 COVID_t + \delta_t + \alpha_i + \varepsilon_{i,t}$$

$$(2) PBR_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 FirmControls_{i,t} + \beta_3 X_{i,t} + \beta_4 COVID_t + \delta_t + \alpha_i + \varepsilon_{i,t}$$

$ROA_{i,t}$  and  $PBR_{i,t}$  refer to the return on assets and price-to-book ratio for firm  $i$  in year  $t$ , respectively, as provided by Refinitiv.  $ESG_{i,t-1}$  refers to the ESG score (total, Environmental, Social, Governance) of firm  $i$  in year  $t-1$ . ESG scores at time  $t-1$  are used to reflect the lagged effect of ESG on firm performance, as noted in the literature (Jung & Yoo, 2023; Barnett & Solomon, 2012). The use of lagged values also addresses endogeneity concerns arising from the potentially bidirectional relationship between ESG and firm performance (Orlitzky et al., 2003; Margolis & Walsh, 2003).  $FirmControls_{i,t}$  is a vector measuring the size and leverage of firm  $i$  in year  $t$ , as previously defined.  $X_{i,t}$  is a vector accounting for the region and time specific variables GDP and LT Rate.  $COVID_t$  is an indicator for the years 2020-2022 controlling for any negative bias in the outcome variables caused by the COVID-19 pandemic.  $\delta_t$  accounts for any linear time trend in the data.  $\alpha_i$  indicates firm-fixed effects, controlling for any unobserved firm heterogeneity which may cause bias in the data.  $\varepsilon_{i,t}$  is an idiosyncratic error term.

#### 4.3.2. Sector Heterogeneity

As mentioned in Section 2.1, the relevant metrics and weights used to calculate ESG scores differ according to industry. As such, a standard moderation analysis which attempts to investigate the proposed heterogeneous relationship between ESG and firm performance across

different sectors within the same model may not reflect this implicit heterogeneity (Fein et al., 2022). As such, in order to answer H2, this paper decomposes the sample dataset into each of its constituent sectors and uses models (1) and (2) to investigate the relationship between ESG and firm performance within each sector. It then compares these results across all sectors in the sample in order to investigate heterogeneity.

### 4.3.3. Explanatory Mechanisms

This paper utilizes a moderation analysis in order to investigate the proposed explanatory mechanisms put forth in Section 2.4. The models for H3 and H4 are as follows:

$$(3) ROA_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 Priv_{i,t} + \beta_3 ESG_{i,t-1} * Priv_{i,t} + \beta_4 X_{i,t} + \beta_5 COVID_t + \delta_t + \varepsilon_{i,t}$$

$$(4) PBR_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 Priv_{i,t} + \beta_3 ESG_{i,t-1} * Priv_{i,t} + \beta_4 X_{i,t} + \beta_5 COVID_t + \delta_t + \varepsilon_{i,t}$$

$$(5) ROA_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 RDInt_{i,t} + \beta_3 ESG_{i,t-1} * RDInt_{i,t} + \beta_4 X_{i,t} + \beta_5 COVID_t + \delta_t + \varepsilon_{i,t}$$

$$(6) PBR_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2 RDInt_{i,t} + \beta_3 ESG_{i,t-1} * RDInt_{i,t} + \beta_4 X_{i,t} + \beta_5 COVID_t + \delta_t + \varepsilon_{i,t}$$

All previously mentioned variables are as before.  $Priv_{i,t}$  and  $RDInt_{i,t}$  refer to the degree of privatization and degree of innovation (as measured by R&D intensity) for firm  $i$  in year  $t$ , respectively, as provided by Refinitiv.  $ESG_{i,t-1} * Priv_{i,t}$  and  $ESG_{i,t-1} * RDInt_{i,t}$  are interaction terms which capture the moderating effect of privatization and innovation on firm profitability/value, respectively. Firm controls have been omitted from this analysis due to possible multicollinearity.

## 5. Results

### 5.1. Descriptive Statistics

#### 5.1.1. Entire Sample

Table 5 displays descriptive statistics for all variables contained in the dataset, including ROA, PBR, total ESG Score and each of its pillars. Average scores for total ESG and each of its pillars are quite similar for the sample, ranging from 59.94 to 66.94. Each of the three pillars are somewhat more volatile than overall ESG score. The average value for ROA within the sample is 6.21%, slightly above the acceptable threshold of 5% (Forbes, 2023), albeit with significant variability. The average value for PBR within the sample is 2.81, with a median value of 2.06, indicating that most of the firms in the sample are overvalued. Due to their large ranges, Total Assets and No of Employees are log transformed before conducting analysis.

Figure 4 displays the distribution of total/pillar ESG scores for the sample. All scores are similarly distributed, with a slight skewness to the left. Figure 5 shows the distribution of the main dependent variables, ROA and PBR. ROA is slightly skewed to the right, with PBR even more so.

Table 5 displays the Pearson correlation matrix for all variables in the sample. Naturally, all ESG scores are highly and significantly correlated with one another. ROA is significantly negatively correlated with every ESG score, suggesting a negative relationship between ESG and firm profitability. PBR is significantly positively correlated with the Env pillar and significantly negatively correlated with the Soc Pillar suggesting contrasting relationships between these pillars and firm value. There is a significant and relatively high correlation (.53) between PBR and ROA. This is unsurprising given that they both measure firm performance, albeit they are not completely collinear.

Figure 4: Distribution of ESG Scores

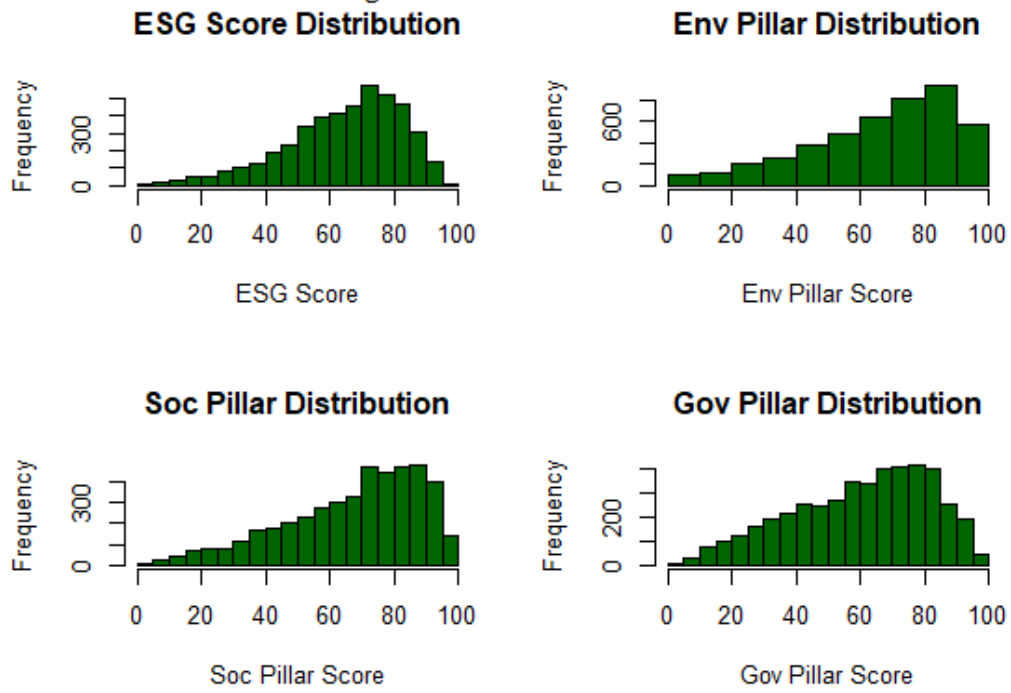
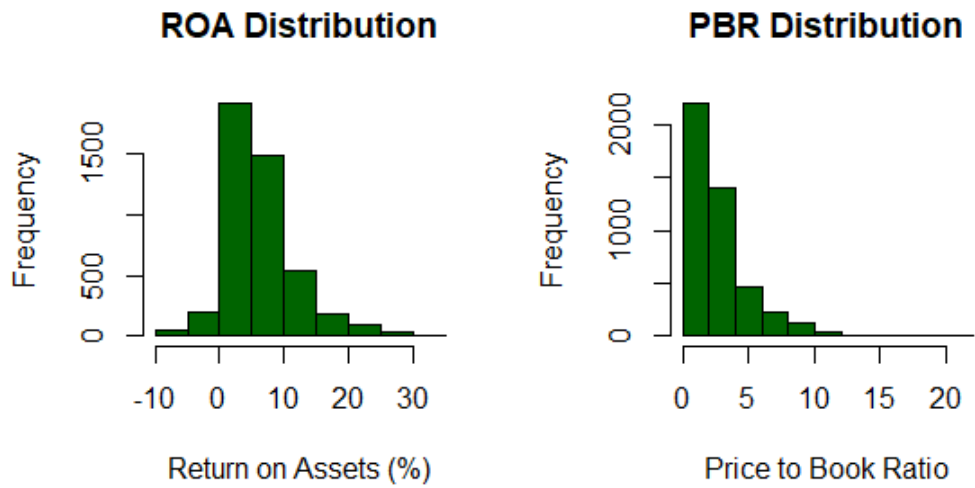


Figure 5: Distribution of Dependent Variables





**Table 4: Summary Statistics – Entire Dataset**

	N	Mean	SD	Min	Max	Median
ESG Score	4500	64.43	17.91	3.52	95.72	67.49
Env Pillar	4500	65.86	22.76	0.00	99.14	70.96
Soc Pillar	4500	66.94	21.20	2.41	98.20	71.53
Gov Pillar	4500	59.94	21.52	2.78	98.56	63.25
Return on Assets (%)	4500	6.21	5.70	-9.08	33.07	5.27
Price to Book Ratio	4500	2.81	2.45	0.32	21.10	2.06
Total Assets	4500	106,095,355	400,761,055	304,217	6,639,198,547	18,092,600
No of Employees	4500	49933.38	81429.39	9.00	672,789	18129.50
Debt Assets Ratio	4500	38.70	20.93	0.00	89.70	37.60
Year of Incorporation	4500	1934.25	65	1665	2021	1948

**Table 5: Correlation Matrix**

	ESGScore	EnvPillar	SocPillar	GovPillar	ROA	PBR	TAssets	NoEmp	DebtAssets	YearInc
ESGScore	1	.	.	.	.	.	.	.	.	.
EnvPillar	.80***	1	.	.	.	.	.	.	.	.
SocPillar	.89***	.66***	1	.	.	.	.	.	.	.
GovPillar	.68***	.31***	.39***	1	.	.	.	.	.	.
ROA	-.12***	-.16***	-.06**	-.11***	1	.	.	.	.	.
PBR	-.01	-.08***	.05*	-.03	.53***	1	.	.	.	.
TAssets	.14***	.18***	.10***	.13***	-.18***	-.14***	1	.	.	.
NoEmp	.32***	.26***	.33***	.14***	-.12***	-.03	.08***	1	.	.
DebtAssets	.21***	.22***	.17***	.13***	-.40***	-.03	.27***	.19***	1	.
YearInc	-.03	-.04	-.04	-.03	.04	.00	-.04	-.02	.02	1

### 5.1.2. Sector Level

Table 6 displays descriptive statistics for the sample dependent variables broken down by sector. Average ROA and PBR are both considerably higher in the Health sector, indicating that firms in this sector are both more profitable and more overvalued compared to firms in the rest of the sample, respectively. The least profitable and most fairly valued firms within the sample are in the Finance and Professional Services sector. Figures 4-8 in the appendix display a relatively similar sample distribution of ROA and PBR for each of these sectors.

Similarly, Table 7 displays descriptive statistics for ESG scores and each of its pillars broken down by sector. Average ESG scores for the sample are relatively similar across each sector, as are Gov pillar scores. Average Env pillar scores are broadly similar across each sector with the exception of the ICT sector, which seems to fare considerably worse than its peers. Average Soc Pillar scores are similar for each sector except Finance & PS, with a score almost 10 points lower than its nearest peer. Scores for each sector exhibit relatively similar variability to that seen within the entire sample, with the exception of the Env Pillar score for Finance & PS.

**Table 6: Outcome Variables by Sector**

SECTOR		N	Mean	SD	Min	Max	Median
Consumer Goods	Return on Assets (%)	734	7.78	5.96	-9.08	30.23	6.46
	Price to Book Ratio	734	3.62	2.77	0.33	17.39	2.78
Finance & PS	Return on Assets (%)	1001	3.89	5.87	-8.24	33.07	1.30
	Price to Book Ratio	1001	1.61	1.67	0.32	21.10	1.10
Health	Return on Assets (%)	244	10.59	6.72	-1.97	32.58	8.82
	Price to Book Ratio	244	4.74	3.68	0.54	20.80	3.44
ICT	Return on Assets (%)	456	7.03	5.05	-9.01	30.35	6.35
	Price to Book Ratio	456	3.69	2.48	0.63	17.27	2.92
IMEU	Return on Assets (%)	2065	6.07	4.97	-8.73	29.05	5.41
	Price to Book Ratio	2065	2.69	2.12	0.34	18.12	2.06

**Table 7: ESG Scores by Sector**

SECTORS		N	Mean	SD	Min	Max	Median
Consumer Goods	ESG Score	734	65.61	18.88	3.91	95.18	70.23
	Env Pillar	734	67.33	24.85	0.00	98.46	74.32
	Soc Pillar	734	69.58	22.55	2.41	98.19	76.00
	Gov Pillar	734	58.09	20.49	5.64	97.32	59.81
Finance & PS	ESG Score	1001	59.29	20.91	3.52	95.72	62.30
	Env Pillar	1001	64.20	27.11	0.00	99.14	73.52
	Soc Pillar	1001	58.65	22.81	4.18	97.96	61.77
	Gov Pillar	1001	60.31	22.62	2.78	97.73	65.32
Health	ESG Score	244	68.77	15.64	29.63	95.57	69.19
	Env Pillar	244	66.34	19.37	25.00	94.40	70.00
	Soc Pillar	244	74.06	17.97	30.49	97.75	78.38
	Gov Pillar	244	62.21	22.86	4.50	97.78	67.11
ICT	ESG Score	456	62.99	18.43	10.63	94.08	63.45
	Env Pillar	456	56.33	21.61	4.05	96.45	59.17
	Soc Pillar	456	68.30	20.38	9.80	98.20	71.31
	Gov Pillar	456	61.80	23.87	4.51	98.56	66.02
IMEU	ESG Score	2065	66.32	15.42	6.95	94.11	68.88
	Env Pillar	2065	68.18	19.47	0.28	98.12	71.90
	Soc Pillar	2065	68.87	19.27	2.91	98.08	73.02
	Gov Pillar	2065	59.74	20.57	3.57	98.01	62.74

## 5.2. Diagnostics

The following tests are used in order to ensure accurate estimation: Breusch-Pagan test for heteroskedasticity, Breusch-Godfrey test for serial correlation, Pesaran test for cross-sectional dependence. Heteroskedasticity, serial correlation, and cross-sectional dependence were found in the majority of models in the paper. However, this should not be an issue due to the short timeframe and large sample size in the paper (Aydogmus et al., 2022). Driscoll Kraay standard errors were used in order to ensure robustness against each of these issues in analysis (Hoechle, 2007).

With regards to selecting the most consistent model, both the Breusch-Pagan and F tests rejected Pooled OLS in favor of Random Effects (RE) and FE models, respectively. Hausman tests were conducted on each of the models to determine whether an RE or FE model was more suitable. With regards to H1, the Hausman test rejected the null hypothesis of consistent RE estimators ( $p < 0.01$ ) for all relevant models (Garcia et al., 2017). As such, FE was employed for all estimations for H1. With regards to analysis for H2 and H3, the Hausman test returned mixed results. As such, a mixture of RE and FE models were used here.

Variance inflation factors (VIFs) tests were also conducted on all models to test for multicollinearity. The majority of models returned VIFs of less than 5 for all variables. Several RE models return VIFs of 6-7 for certain industry indicators. However, this is still below the problematic threshold of 10 (rule of thumb) as noted by Gujarati (2003).

## 5.3. Regression Analysis

### 5.3.1. ESG & Firm Performance

Tables 10 and 11 below display regression results for models (1) and (2) as they relate to H1. All data analysis has been conducted in R.

Table 10 displays a positive and significant association between ESG Scores and firm profitability (as measured by ROA) for the Social pillar only. On average, a one-point increase in a firm's Social pillar score is associated with an increase in ROA of 0.008% points. In terms of control variables, both firm size (as measured through Total Assets and Number of Employees) and leverage (measured through the Debt to Asset ratio) are shown to be negatively and significantly associated with firm profitability, aligning with previous evidence (Niresh & Vilnampy, 2014; Fama & French, 2002). Regional GDP and regional long-term-interest rates are both shown to be positively and significantly associated with ROA. This latter result is quite counterintuitive given the evidence surrounding the negative association between benchmark interest rates and corporate profits (Bernanke & Blinder, 1992). As expected, firm profitability is significantly lower for years during the height of the COVID-19 pandemic.

With regards to firm value, Table 11 displays a positive and highly significant association between both the Environmental and Social pillars and PBR. On average, a one-point increase in a firm's Environmental and Social score is associated with a 0.005 and 0.007 increase in their PBR, respectively. A negative and highly significant association is found between the Gov pillar and firm value, whereby a one-point increase in a firm's Governance score is associated with a 0.003 decrease in their PBR. These results on the relationship between ESG scores and firm value align with previous studies such as those by Kong et al. (2023). Similar to profitability, a negative and significant association is found between firm value and total assets, as well as regional GDP. Firm value is also significantly lower for years during the COVID-19 pandemic. In contrast to firm profitability, a positive relationship is found between firm value and both firm leverage and number of employees.

**Table 10: Effect of Lagged ESG Scores on ROA**

	<i>Dependent variable:</i>			
	Return on Assets (%)			
	ESG	Env	Soc	Gov
ESGScore	0.007 (0.008)			
EnvPillar		0.005 (0.014)		
SocPillar			0.008* (0.004)	
GovPillar				-0.001 (0.004)
LogTAssets	-0.567** (0.263)	-0.573** (0.287)	-0.578** (0.260)	-0.535** (0.243)
LogNoEmp	-0.494** (0.250)	-0.480* (0.251)	-0.497** (0.253)	-0.476* (0.246)
DebtAssets	-0.106*** (0.014)	-0.106*** (0.014)	-0.105*** (0.014)	-0.106*** (0.014)
LogGDP	2.336* (1.353)	2.323 (1.436)	2.332* (1.344)	2.363* (1.326)
LTRate	0.278*** (0.070)	0.279*** (0.068)	0.282*** (0.071)	0.279*** (0.070)
COVID	-0.732** (0.316)	-0.726** (0.317)	-0.717** (0.317)	-0.721** (0.320)
Model	FE	FE	FE	FE
Observations	4,500	4,500	4,500	4,500
R <sup>2</sup>	0.090	0.090	0.091	0.090
Adjusted R <sup>2</sup>	0.002	0.002	0.002	0.002
F Statistic (df = 8; 4101)	50.999***	50.995***	51.127***	50.895***

*Note:*

\* p&lt;0.1; \*\* p&lt;0.05; \*\*\* p&lt;0.01

**Table 11: Effect of Lagged ESG Scores on PBR**

	<i>Dependent variable:</i>			
	Price to Book Ratio			
	ESG	Env	Soc	Gov
ESGScore	0.004 (0.002)			
EnvPillar		0.005*** (0.001)		
SocPillar			0.007*** (0.001)	
GovPillar				-0.003*** (0.001)
LogTAssets	-0.836*** (0.084)	-0.858*** (0.085)	-0.856*** (0.084)	-0.813*** (0.088)
LogNoEmp	0.282*** (0.056)	0.288*** (0.055)	0.274*** (0.054)	0.295*** (0.055)
DebtAssets	0.038*** (0.001)	0.038*** (0.001)	0.039*** (0.001)	0.038*** (0.001)
LogGDP	1.260** (0.625)	1.232* (0.630)	1.247** (0.634)	1.273** (0.622)
LTRate	-0.048 (0.053)	-0.047 (0.054)	-0.045 (0.052)	-0.045 (0.054)
COVID	-0.635*** (0.168)	-0.633*** (0.166)	-0.625*** (0.171)	-0.619*** (0.164)
Model	FE	FE	FE	FE
Observations	4,500	4,500	4,500	4,500
R <sup>2</sup>	0.113	0.114	0.115	0.113
Adjusted R <sup>2</sup>	0.027	0.028	0.029	0.027
F Statistic (df = 8; 4101)	65.288***	66.043***	66.582***	65.533***

*Note:*

\* p&lt;0.1; \*\* p&lt;0.05; \*\*\* p&lt;0.01

### 5.3.2. Sector Heterogeneity

Table 12 below displays the relationship between overall ESG score and firm profitability for firms decomposed into the sector groups previously established in Section 4.2.5. No significant associations are found between total ESG score and firm profitability for any individual sectors. As such, it seems that firms in different sectors do not systematically differ with regards to their relationship between ESG score and profitability. However, when these scores are decomposed to the pillar level, some slightly heterogeneity appears. A positive and highly significant association is found between Environmental score and profitability for firms in the Consumer Goods sector, whereby a one-point increase in a firm's Environmental score is associated with a 0.026%-point increase in ROA, all else equal (see Table C1 in appendix). With respect to the Governance pillar, Table C3 shows that a one-point increase in a firm's Governance score is significantly associated with a 0.008%-point decrease in ROA for firms in the Consumer Goods sector.

Table 13 below displays the relationship between total ESG score and firm value for firms decomposed into each sector. A positive and highly significant association is shown between ESG score and firm value for firms in the Consumer Goods sector only. Decomposing this at the pillar level, we can see that the positive association in this sector arises primarily from the Environmental and Social pillars (see tables C4-C5 in appendix). A negative and highly significant association however is found between the Governance pillar and firm value for firms in the Consumer Goods sector. A positive and significant association is also found between firm value and Environmental score for firms in the Health sector when analyzing results at the pillar level (see table C4 in appendix).

Positive values between ESG scores and firm profitability and value within the Consumer Goods sector heavily align with the previously discussed findings from Gholami et al. (2021) and Baron et al. (2009). The positive relationships seen between Environmental scores and firm value in both the Consumer Goods and Health sectors also corroborate the results of Hoepner and Yu (2011). However, the negative relationship between Governance score and both firm profitability and value for firms in the Consumer Goods sector requires further investigation.



**Table 12: Effect of Lagged ESG Score on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.007 (0.008)	0.014 (0.059)	-0.002 (0.017)	0.005 (0.008)	0.011 (0.032)	0.008 (0.020)
LogTAssets	-0.567** (0.263)	2.039 (1.616)	0.751 (0.507)	-4.990*** (0.371)	1.562 (2.406)	-0.628** (0.255)
LogNoEmp	-0.494** (0.250)	-4.402** (2.071)	-1.135*** (0.398)	0.050 (0.503)	-0.443 (1.521)	-0.331 (0.246)
DebtAssets	-0.106*** (0.014)	-0.063*** (0.022)	-0.139*** (0.011)	-0.072*** (0.022)	-0.053** (0.021)	-0.065*** (0.012)
LogGDP	2.336* (1.353)	4.142** (1.814)	3.218** (1.362)	1.803 (1.275)	1.891 (2.842)	0.078 (0.560)
LTRate	0.278*** (0.070)	0.260 (0.283)	0.136 (0.092)	0.532*** (0.080)	-0.216 (0.355)	0.121 (0.111)
COVID	-0.732** (0.316)	-1.389* (0.830)	-0.249 (0.509)	-1.669*** (0.371)	-0.108 (0.587)	-0.804* (0.427)
Model	FE	FE	FE	FE	FE	RE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.090	0.085	0.119	0.303	0.021	0.103
Adjusted R <sup>2</sup>	0.002	-0.018	0.033	0.229	-0.112	0.095
F Statistic	50.999*** (df = 8; 4101)	4.745*** (df = 8; 409)	31.713*** (df = 8; 1880)	36.039*** (df = 8; 663)	0.565 (df = 8; 214)	109.905***

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 13: Effect of Lagged ESG Score on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.004 (0.002)	0.005 (0.007)	-0.002 (0.003)	0.017** (0.008)	-0.014 (0.010)	0.003 (0.004)
LogTAssets	-0.836*** (0.084)	-0.471** (0.234)	-0.391** (0.180)	-2.769*** (0.110)	-4.062*** (0.862)	0.078 (0.094)
LogNoEmp	0.282*** (0.056)	-0.284*** (0.098)	0.432*** (0.040)	0.353*** (0.096)	3.290*** (1.270)	0.009 (0.044)
DebtAssets	0.038*** (0.001)	0.057*** (0.015)	0.037*** (0.004)	0.056*** (0.004)	0.077*** (0.016)	0.013*** (0.003)
LogGDP	1.260** (0.625)	0.180 (0.512)	2.099*** (0.677)	0.383 (0.737)	2.000 (1.703)	-0.163 (0.230)
LTRate	-0.048 (0.053)	-0.074 (0.060)	-0.098*** (0.033)	-0.019 (0.087)	-0.311*** (0.072)	0.049 (0.044)
COVID	-0.635*** (0.168)	-0.942*** (0.218)	-0.433*** (0.141)	-1.077*** (0.219)	-0.828 (0.511)	-0.450*** (0.102)
Model	FE	RE	FE	FE	FE	FE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.113	0.247	0.136	0.268	0.194	0.054
Adjusted R <sup>2</sup>	0.027	0.231	0.052	0.190	0.085	-0.047
F Statistic	65.288*** (df = 8; 4101)	144.451*** (df = 8; 409)	37.021*** (df = 8; 1880)	30.290*** (df = 8; 663)	6.448*** (df = 8; 214)	6.506*** (df = 8; 903)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## **5.4. Robustness**

### **5.4.1. Current Year ESG Values**

Despite the documented lagged effect of ESG scores on firm performance, as well as concerns about a potentially endogenous relationship, many studies exist which investigate the relationship between current year ESG scores and firm value and profitability (Gholami 2021; Buallay, 2019). Furthermore, using current year ESG scores may help to give a more immediate insight into this relationship, which may prove more useful for investors and other stakeholders (Giese, 2024). As such, we carry out a robustness analysis using current year ESG scores to see if the previously established relationship holds. With regards to H1, tables D1 and D2 in the appendix display the relationship between firm profitability and value for total ESG score and each pillar across the entire sample, respectively. The previously significant and positive relationship between a firm's Social score and profitability remains when using current year ESG scores. With regards to firm value, there remains a positive and significant association with Environmental and Social scores. However, the relationship between firm value and Governance score, while still negative, becomes insignificant with the use of current year ESG scores, indicating that the negative effect of corporate governance activities on firm value may take time to substantiate. The positive relationship between ESG total score and firm value also becomes significant once current year ESG scores are used, indicating that there may be a more immediate relationship between ESG and firm value than previously assumed.

Tables D3-D10 in the appendix display the relationship between ESG scores and firm performance at the sector level using current year scores. The significant relationship between profitability and Environmental and Governance scores in the Consumer Goods sector becomes insignificant once current year scores are used, again indicating a lagged effect of ESG on firm performance. The relationship between Social scores and profitability becomes significant for firms in the IMEU sector when current year scores are used, indicating that corporate social activities may have an immediate impact on profitability in this sector. With regards to firm value, the positive relationships between PBR and Environmental and Social scores, as well as the negative relationship with Governance scores, remain significant for firms in the Consumer Goods sector when using current year scores. The relationship between total ESG score and firm value however becomes insignificant. There are also positive and significant relationships established between firm profitability and total ESG and Social pillar scores for firms in the FPS sector when using current year ESG scores. This immediate relationship between

corporate social activities and profitability in the financial sector supports the idea that financial firms are more focused on short-term horizons (Clarke, 2014).

#### **5.4.2. Balanced Panel**

As noted in Section 4.2., the removal of extreme outliers from the dataset resulted in an imbalanced panel dataset of 4500 firm-year observations across 391 different firms. While the use of robust standard errors and fixed-effects models may ensure that explanatory power still remains when using an unbalanced panel dataset, it may nevertheless increase the likelihood of biased or inaccurate estimators (Baltagi, 2008; Greene, 2005). As such, a robustness analysis using a balanced panel dataset of 3528 firm-year observations across 294 different firms is conducted.

With regards to H1, tables E1 and E2 in the appendix display the relationship between firm profitability and value for total ESG scores and each pillar across the entire sample, respectively. The previously established positive relationship between Social score and profitability becomes insignificant when limiting the analysis to a balanced sample. With regards to firm value, the previously established positive and negative relationships between PBR and Social and Governance scores remain significant for the balanced sample, respectively. The previously established positive relationship between firm value and Environmental score, however, is rendered insignificant.

Tables E3-E10 in the appendix display the relationship between ESG scores and firm performance at the sector level using a balanced panel dataset. Previously established positive and negative relationships between firm profitability and Environmental and Governance scores for firms in the Consumer Goods sector become insignificant when using a balanced sample, respectively. With regards to firm value, the previously established relationships between PBR and total, Governance and Social scores remain significant for firms in the Consumer Goods sector. The previously established relationship between PBR and Environmental score for firms in the same sector, however, becomes insignificant.

Results become quite different when restricting the sample to a balanced panel dataset, with some relationships becoming insignificant and others gaining significance. However, despite the change in significance, the direction of most variables remains the same. While a balanced panel dataset is often found to be more empirically robust, transforming the above sample from unbalanced to balanced resulted in a loss of nearly 1000 firm-year observations.

As such, any gain in consistency or reduction in bias must be weighed against a loss of explanatory power from a reduction in sample size (Baltagi, 2008; Hsaoi, 2014).

## 5.5. Explanatory Mechanisms

Diverse regulatory environments and varying demands of stakeholders may somewhat explain the heterogenous relationship seen between ESG and firm performance across different sectors (Gholami, 2021). However, as shown in Sections 3.3.1 and 3.3.2, the levels of privatization and/or innovation within a company have also been shown to (positively) moderate this relationship (Kao et al., 2018; Fu & Li, 2023). As such, it is worth exploring whether these mechanisms contribute to the heterogeneity in the relationship between ESG and firm performance seen between different sectors.

Table 8 displays descriptives for the degree of privatization for the entire sample and at the sector level. The degree of privatization within the sample is quite high, with an average of 94% privately owned shares for sampled firms (see figure B6 in appendix). Average levels of privatization are virtually identical across all sectors in the dataset. The IMEU sector seems to have the most variability in the sample, with values ranging from 0 to 1, compared to others such as Health which has a minimum private ownership of 0.67. This is unsurprising given the abundance of formerly state-owned enterprises in the utilities and energy industries (Andrews-Speed et al., 2013). Table 9 similarly displays descriptives for the degree of innovation (as measured by R&D Intensity) for the entire sample and broken down by sector. The highest degree of innovation seems to be in the Health sector, which is intuitive given the vast amount of R&D undertaken in the pharmaceutical industry (Mackenbach et al., 2019). The lowest degree of innovation within the sample is in the Consumer Goods sector.

**Table 8: Degree of Privatization by Sector**

SECTOR		N	Mean	SD	Min	Max	Median
ALL	Degree of Privatization	4500	0.94	0.11	0.00	1.00	0.98
Consumer Goods	Degree of Privatization	723	0.96	0.07	0.46	1.00	0.98
Finance & PS	Degree of Privatization	991	0.95	0.11	0.32	1.00	0.98
Health	Degree of Privatization	244	0.96	0.06	0.67	1.00	0.98
ICT	Degree of Privatization	458	0.95	0.10	0.44	1.00	0.98
IMEU	Degree of Privatization	2065	0.93	0.13	0.00	1.00	0.98

**Table 9: R&D Intensity by Sector**

SECTOR		N	Mean	SD	Min	Max	Median
ALL	R&D Intensity	2170	4.57	19.73	0.00	793.72	1.93
Consumer Goods	R&D Intensity	324	2.24	3.23	0.02	20.60	1.27
Finance & PS	R&D Intensity	420	4.27	5.55	0.02	27.75	2.09
Health	R&D Intensity	133	6.78	5.48	0.12	24.61	4.14
ICT	R&D Intensity	231	3.78	4.43	0.03	21.84	2.06
IMEU	R&D Intensity	1024	3.41	4.53	0.02	24.62	1.81

### 5.5.1. Degree of Privatisation

Table 14 below displays the relationship between total ESG score, the degree of privatization, and its moderating effect on ESG and firm profitability. When the degree of privatization is included, the relationship between total ESG score and firm profitability for firms in the Consumer Goods sector becomes negative and significant, indicating that the positive effect observed in the base model may have been masking more complex dynamics. The relationship between the degree of privatization and firm profitability in the Consumer Goods sector is also highly negative and significant. With regards to the moderating variable, a positive and significant relationship is found between the interaction term and firm profitability for firms in the Consumer Goods sector. This implies that in less privatized firms, higher ESG scores are associated with lower ROA. As privatization increases, the negative effect of ESG on firm profitability in the Consumer Goods sector diminishes. Investigating results at the pillar level, we see that the positive moderating effect of privatisation on ESG score and firm profitability in this sector arises from the Social Pillar.

Table 15 displays the same independent variables and their relationship with firm value. Once again, a positive and significant relationship is found between the interaction term and firm value for firms in the Consumer Goods sector, implying that the negative effect of ESG on firm profitability in this sector diminishes as privatisation increases. In contrast to firm profitability, this positive moderating effect is also present in each individual ESG pillar (see Appendix F). The relationship between total ESG score and firm value is also negative and significant for the IMEU sector. Once again, privatisation seems to have a positive moderating effect on this relationship. Investigating at the pillar level, this positive moderation in the IMEU sector arises from the Social and Governance pillars. The relationships between total ESG score and firm value for firms in the ICT and Health sectors become positive and significant once

privatisation is included in the model. There is also a negative moderating effect of privatisation found in both of these sectors, indicating that the positive effect of ESG on firm profitability in these sectors diminishes as privatisation increases. As such, we can partially reject H3.

### **5.5.2. Degree of Innovation**

Table 16 displays the relationship between total ESG score, the degree of innovation (as measured through R&D Intensity), and its moderating effect on ESG and firm profitability. The relationship between total ESG score and firm profitability for firms in the Consumer Goods sector again becomes negative and significant once we control for innovation, indicating once more that the positive effect observed in the base model may have been masking a more complex relationship. The relationship between the degree of innovation and firm profitability in the Consumer Goods sector is also highly negative and significant. A positive and significant relationship is found between the interaction term and firm profitability. This implies that the negative effect of ESG on firm profitability in the Consumer Goods sector diminishes as the degree of innovation increases. Investigating at the pillar level again shows that this relationship originates from firms' Social score. The degree of innovation is also shown to negatively moderate the relationship between total ESG score and firm value for firms in the FPS sector, the effect of which can be seen in both Environmental and Governance scores. Innovation positively moderates the relationship between Environmental score and firm profitability for firms in the ICT and Health sectors, and negatively moderates the relationship between Governance score and profitability in the ICT sector (see Tables F7-F9 in appendix).

Table 17 displays the same independent variables and their relationship with firm value. The relationship between total ESG score and firm value in the ICT and FPS sectors become positive and significant when controlling for the degree of innovation. The level of R&D intensity in both of these sectors has a positive and significant association with firm value. The degree of innovation in the ICT sector is shown to negatively moderate the relationship between total ESG score and firm value, implying that the positive effect of ESG on firm value in this sector diminishes as the degree of innovation increases, suggesting decreasing returns to scale from innovating. This effect primarily arises from the Social pillar (see Appendix Table F11). The relationship between total ESG score and firm value in the IMEU and Health sectors become negative and significant when controlling for the degree of innovation. The degree of innovation in the IMEU sector negatively moderates the relationship between ESG score and firm value, implying that the negative effect of ESG on firm value is exacerbated as the degree

of innovation increases. This moderating effect can be found across all three pillars in the IMEU sector. The degree of innovation in the Health sector however positively moderates the relationship between ESG score and firm value, indicating that the negative effect of ESG score on firm value diminishes as innovation increases. This positive moderating effect is again seen across all ESG pillars in the Health sector (see appendix Tables F10-F12). As such, we have evidence to at least partially reject H4.

**Table 14: Effect of ESG Score and Privatisation on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	-0.072 (0.076)	-0.204 (0.190)	0.106* (0.064)	-0.305** (0.141)	-0.726 (0.529)	-0.027 (0.072)
Priv	-6.278 (6.387)	-21.504 (16.646)	11.375** (5.408)	-37.261*** (13.722)	-33.799 (30.110)	-2.737 (4.577)
PrivESG	0.080 (0.081)	0.199 (0.229)	-0.112 (0.076)	0.312** (0.142)	0.767 (0.568)	0.015 (0.069)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.016	0.037	0.020	0.202	0.023	0.011
Adjusted R <sup>2</sup>	-0.080	-0.069	-0.075	0.119	-0.105	0.004
F Statistic	9.213*** (df = 7; 4095)	2.238** (df = 7; 412)	5.509*** (df = 7; 1881)	24.061*** (df = 7; 664)	0.710 (df = 7; 215)	8.701

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 15: Effect of ESG Score and Privatisation on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	-0.028 (0.024)	0.291*** (0.038)	-0.035** (0.018)	-0.126*** (0.044)	0.508*** (0.124)	0.004 (0.006)
Priv	-2.868 (1.894)	7.599* (4.325)	-2.689* (1.624)	-13.108*** (3.679)	48.303*** (10.795)	-0.325 (0.332)
PrivESG	0.030 (0.024)	-0.303*** (0.041)	0.035* (0.020)	0.129*** (0.042)	-0.536*** (0.123)	-0.0001 (0.006)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.035	0.232	0.059	0.074	0.085	0.031
Adjusted R <sup>2</sup>	-0.058	0.149	-0.033	-0.022	-0.034	-0.073
F Statistic	21.249*** (df = 7; 4095)	17.828*** (df = 7; 412)	16.812*** (df = 7; 1881)	7.592*** (df = 7; 664)	2.856*** (df = 7; 215)	4.115*** (df = 7; 894)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 16: Effect of ESG Score and Innovation on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	-0.012 (0.010)	0.009 (0.078)	-0.018 (0.022)	-0.076** (0.039)	0.014 (0.077)	-0.014 (0.018)
RDInt	-0.067 (0.041)	-0.685 (1.795)	0.068 (0.288)	-1.153*** (0.344)	-0.839** (0.422)	0.372** (0.187)
RDESG	0.001* (0.001)	0.002 (0.014)	0.001 (0.004)	0.014*** (0.004)	0.009 (0.008)	-0.004* (0.002)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.017	0.040	0.020	0.220	0.036	0.037
Adjusted R <sup>2</sup>	-0.111	-0.104	-0.107	0.083	-0.146	0.021
F Statistic	4.805*** (df = 7; 1919)	1.189 (df = 7; 200)	2.600** (df = 7; 906)	11.051*** (df = 7; 275)	0.591 (df = 7; 111)	6.872

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 17: Effect of ESG Score and Innovation on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.007 (0.005)	0.056*** (0.015)	-0.008* (0.004)	-0.020 (0.023)	-0.100*** (0.034)	0.017*** (0.006)
RDInt	0.012 (0.017)	0.317*** (0.094)	0.081*** (0.010)	-0.795*** (0.142)	-1.161*** (0.265)	0.096** (0.047)
RDESG	-0.0002 (0.0003)	-0.006*** (0.001)	-0.002*** (0.0002)	0.009*** (0.002)	0.020*** (0.006)	-0.001 (0.001)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.037	0.203	0.102	0.065	0.210	0.037
Adjusted R <sup>2</sup>	-0.089	0.084	-0.014	-0.098	0.061	-0.114
F Statistic	10.437*** (df = 7; 1919)	7.297*** (df = 7; 200)	14.684*** (df = 7; 906)	2.739*** (df = 7; 275)	4.225*** (df = 7; 111)	2.010* (df = 7; 362)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01



## 6. Discussion & Limitations

Results from the primary analysis provide a mixed conclusion with regards to support of either stakeholder or shareholder theory as it pertains to the relationship between ESG and firm performance. As noted in Section 5.3.1, a positive and significant association was found between ESG score and both firm profitability and value for the Social pillar. As such, we can at least partially reject H1. However, no relationship was found between ESG and firm profitability for Environmental or Governance pillars. This could be due to several reasons. As Aydogmus et al. (2022) note, Social sustainability criteria for firms may be faster and less costly to implement than Environmental criteria, which may take a number of years to affect firm performance. Similarly, Governance criteria such as board practice and compliance measures may also have long-term payoffs which are not immediately reflected in profitability (Ishii & Metrick, 2003). Social scores, conversely, may capture more immediate and tangible benefits, such as employee retention rates and customer satisfaction, which directly correlate with profitability (Ioannou & Serafeim, 2014). These results are also robust to the use of current year Social scores, reconfirming the immediate effect of Social sustainability criteria on firm performance.

Positive and significant relationships are also found between ESG and firm value for the Environmental pillar, indicating a divergence between these two measures of firm performance. As established, ROA is solely concerned with operational performance, whereas PBR incorporates market risk and sentiment. As noted above, environmental firm initiatives often involve investments in sustainable practices and technologies which may not immediately improve firm profitability but still create long-term value for a company (Clarkson et al., 2008). As such, forward-looking investors who view environmental initiatives as a long-term investment may not penalise this in the market (Pham et al., 2022). This result is also robust to the use of current year Environmental scores. There is a negative association however found between ESG and firm value for the Governance pillar. As noted by Ishii and Metrick (2003), investors may be skeptical about the benefits of corporate governance reforms, perceiving them as mere compliance rather than value-adding initiatives. As such, this may lead to firms being penalized on the market. This result however is not robust to the use of current year Governance scores.

As noted in section 5.5, a positive and significant association was found between Environmental scores and both measures of firm performance for firms in the Consumer Goods industry, as well as Social scores and firm value. A significantly positive relationship was also

found between Environmental scores and firm value in the Health sector. As such, we can safely reject H2. These results align heavily with findings from Hoepner and Yu (2011) and Gholami et al. (2021) who conduct similar cross-sector analyses.

The significance of the relationship between ESG and firm performance in the Consumer Goods sector is particularly noteworthy, supporting Baron et al.'s (2009) findings that the relationship between CSR and firm performance is stronger for firms in consumer facing industries. Similarly, Hoepner and Yu (2011) find that CSR activity may be more beneficial in industries which have a higher proximity to end consumers, as sustainable initiatives may directly establish trust. Furthermore, consumer demand for sustainable products and enhanced brand reputation may also enhance the benefit of ESG activities with respect to firms' operational and market performance (Orsato, 2006; Flammer, 2015). The relationship between Environmental scores and firm profitability however is not robust to the use of current year scores, indicating that sustainable initiatives in the Consumer Goods industry may take time to translate to increased revenue.

This study uses a moderation analysis to empirically investigate two additional explanations which may explain why the relationship between ESG and firm performance is distinct across different sectors. These are the degree of privatization and the degree of innovation within a given sector. With regards to the Consumer Goods sector, the degree of privatization was shown to have a positive moderating effect on the relationship between ESG and firm profitability, whereby the degree of privatization diminishes the negative effect of ESG scores on ROA. This relationship is particularly evident with regards to the Social pillar. A positive moderating effect of privatization was also found for the relationship between ESG and firm value in the Consumer Goods sector and was present across all pillars. As Ang et al. (2021) note, private firms may be more equipped to efficiently allocate resources to the pursuit of sustainable criteria, as well as more comprehensively weigh the costs and benefits of such actions. As such, the authors find a relatively stronger relationship between CSR activity and firm performance in private vs state-owned enterprises. As Peev & Segalla (2017) note, privatization enhances operational efficiency and flexibility, enabling firms to respond more effectively to market changes, including the demand for sustainable criteria. However, it is uncertain why this relationship is different for firms in the Consumer Goods sector compared to the rest of the sample, and as such may require further investigation.

The degree of innovation in the Consumer Goods sector was again shown to have a positive moderating effect on the relationship between ESG and firm profitability, particularly with regards to the Social pillar. As such, the degree of innovation diminishes the negative effect of ESG on ROA. Monsen and Heggen (2020) similarly find a positive moderating effect of innovation on the relationship between CSR and firm performance in the Consumer Staples industry. The degree of innovation in the Health sector was also shown to positively moderate the relationship between ESG and firm value, evident across all pillars. Sepetis et al. (2024) highlight the importance of digital transformation criteria in the health sector in order to achieve numerous ESG objectives and positively affect KPIs. Both of these findings align with studies from Khong et al. (2023) and Fu and Li (2023) which find a positive moderating effect of digital innovation on the relationship between ESG and firm performance.

The implications of the above findings are threefold. With regards to the primary analysis, the study provides additional evidence broadly in support of the stakeholder view of ESG and firm performance (Freeman, 1984; Freeman & McVea, 2001). This study shows that Social sustainability initiatives create significant benefit for firm profitability, and as such should be prioritised by managers as a strategic investment (Pham et al., 2022). Furthermore, rather than ESG activity leading to market ‘punishment’ from sceptical investors (Marsat & Williams, 2006) Environmental and Social initiatives seem to increase the market value of firms through reputational benefits and decreased risk perceptions (Giese, 2024). As such, managers should be mindful of the positive market perceptions surrounding ESG when deciding whether to undertake long-term Environmental sustainability initiatives.

The sector analysis of this study also corroborated previous findings which highlight that the relationship between ESG and firm performance is inherently contextual and sector specific (Fu & Li, 2023; Chang et al, 2022; Hoepner & Yu, 2011). As such, both policymakers and firms should be mindful of the regulatory framework and stakeholder demands in their industrial environment when deciding (whether) to promote or pursue ESG activities. This study in particular highlighted the relationship between ESG and firm performance in the Consumer Goods sector, which may benefit from further investigation.

Previous studies have only investigated the moderating effects of privatisation and innovation on ESG and firm performance at the economy wide level. Pre-existing cross-sector comparisons have only discussed theoretical reasons as to why this relationship differs across industries. As such, the explanatory mechanisms proposed in the study also provide two useful metrics by which to further analyse these industrial environments and their heterogeneous effect on ESG and performance.

As noted in section 2.1, Environmental and Social scores for firms are calculated relative to their industry peers, with the 186 most relevant metrics chosen to calculate scores for each sector. A cross-sector analysis investigating the relationship between ESG and firm performance may therefore fail to account for the inherent heterogeneity present within the construction of these scores. As such, this study was unable to conduct an extended moderation analysis to investigate the effect that sector classification may have on the relationship between ESG and firm performance. Several steps may be taken to address this issue. Firstly, focus could be restricted to fundamental ESG indicators which are included across all sector ratings, in order to provide a more consistent basis for analysis (SASB, 2018; GRI, 2020). Alternatively, one could calculate industry-adjusted ESG scores by standardizing ESG values within each industry, which can help account for the industry-specific biases present in ESG score construction. Furthermore, comparison could also be based on an objective method such as ESG controversies per sector (LSEG, 2024).

Additionally, the use of a fixed-effects model in the analysis means that we are unable to identify any firm- or sector-specific time-invariant characteristics which may impact the relationship between ESG and firm performance (Hill et al., 2019). In an attempt to assuage these worries, a Hausman was carried out in order to ascertain whether a fixed-effects or random-effects model was the most suitable method in each instance. Furthermore, the given model may fail to account for other time-varying firm or sector-specific characteristics which explain the relationship between ESG and firm performance. It is hoped that a reliance on previous literature has ensured that all relevant variables are included in the model.

Finally, the region of analysis was focused on Europe in order to provide actionable information for both European businesses and policymakers. Given the unique regulatory and business environment in Europe, care should be taken not to extrapolate findings for regions which have vastly different business norms and regulatory frameworks, such as the US or BRCIS regions (European Commission, 2018; OECD, 2017).

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## Appendices

### Appendix A – Industry Table

**Table A: Industry Breakdown for Sample**

INDUSTRY	No. of Firms	Percent
Communications	9	2.41%
Consumer Discretionary	31	8.29%
Consumer Staples	28	7.49%
Energy	12	3.21%
Finance & PS	80	21.39%
Health	21	5.61%
Industrials	78	20.86%
IT	30	8.02%
Materials	47	12.57%
Utilities	38	10.16%

## Appendix B – Distribution of Dependent Variables by Sector

Figure B1: Distribution of Dependent Variables - ICT Sector

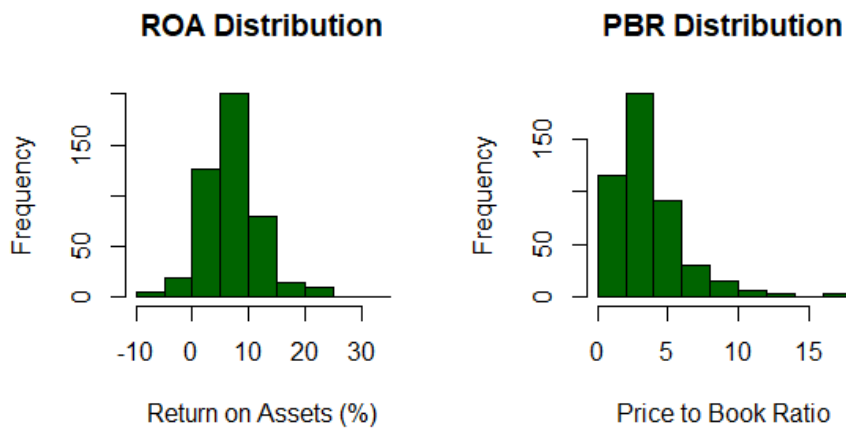


Figure B2: Distribution of Dependent Variables - IMEU Sector

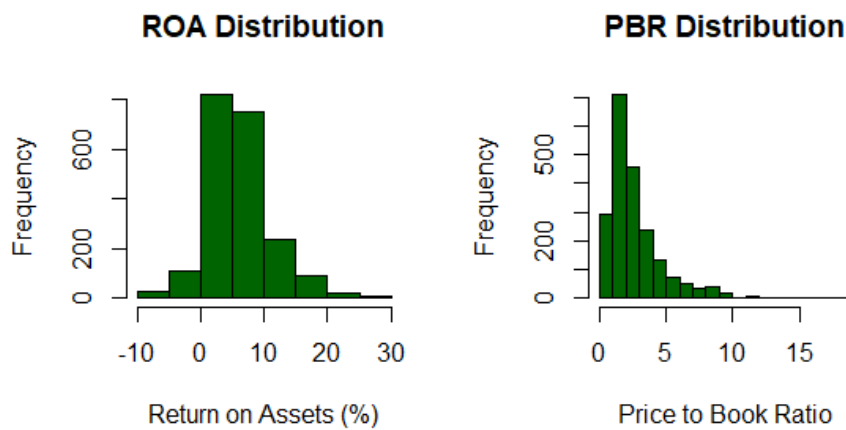


Figure B3: Distribution of Dependent Variables - Cons Goods Sector

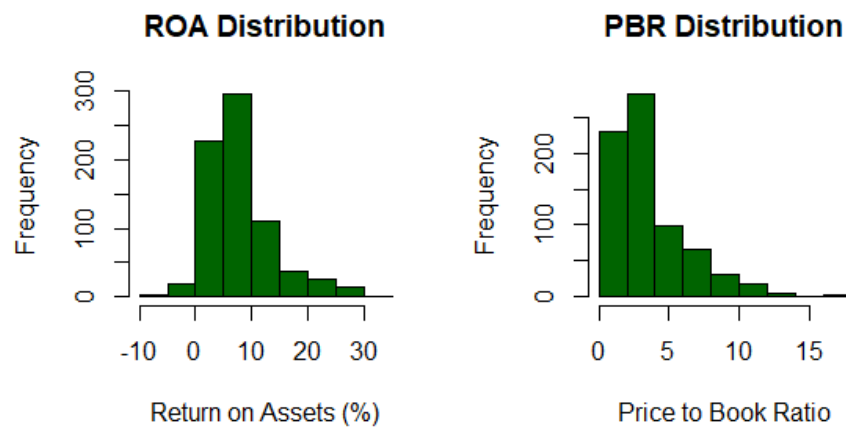


Figure B4: Distribution of Dependent Variables - Health Sector

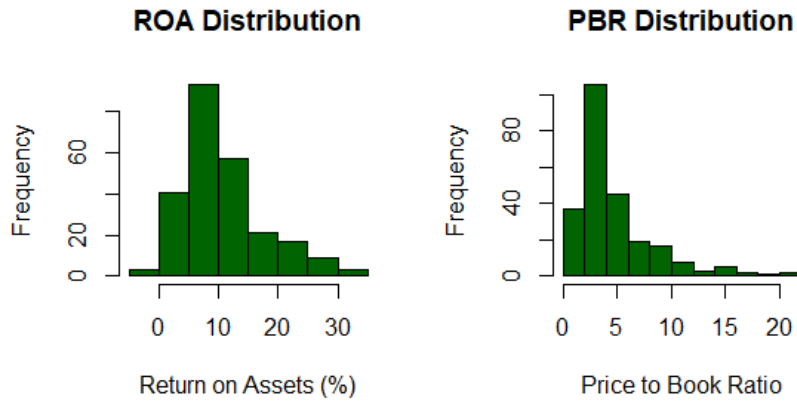


Figure B5: Distribution of Dependent Variables - FPS Sector

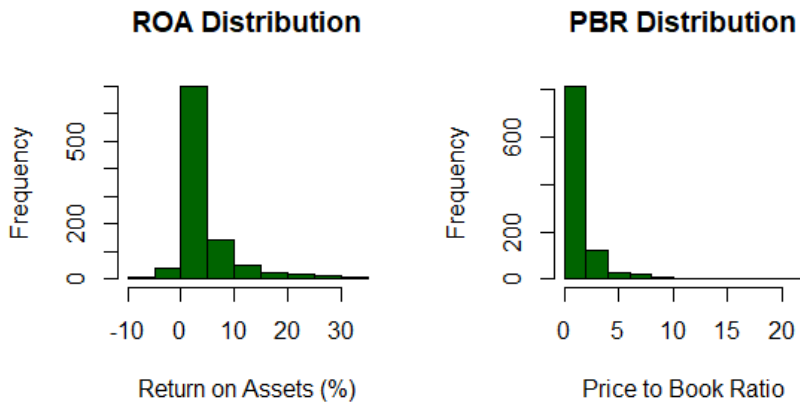
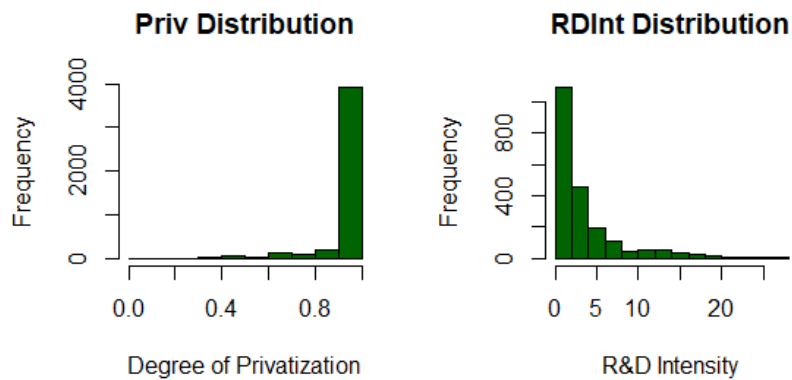


Figure 6: Distribution of Explanatory Variables



## Appendix C – Sector Analysis for Lagged Pillar Scores

**Table C1: Effect of Lagged Env Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.005 (0.014)	0.029 (0.037)	-0.003 (0.021)	0.026*** (0.009)	0.051 (0.040)	-0.005 (0.018)
LogTAssets	-0.573** (0.287)	1.975 (1.645)	0.758 (0.499)	-5.126*** (0.340)	1.552 (1.231)	-0.585** (0.258)
LogNoEmp	-0.480* (0.251)	-4.389** (1.912)	-1.132*** (0.404)	0.147 (0.531)	-2.138** (0.846)	-0.299* (0.171)
DebtAssets	-0.106*** (0.014)	-0.062*** (0.022)	-0.139*** (0.011)	-0.070*** (0.021)	-0.060** (0.029)	-0.065*** (0.011)
LogGDP	2.323 (1.436)	3.980** (1.810)	3.232** (1.427)	1.879 (1.276)	2.037 (1.662)	0.082 (0.611)
LTRate	0.279*** (0.068)	0.268 (0.276)	0.135 (0.087)	0.531*** (0.069)	-0.332 (0.379)	0.127 (0.079)
COVID	-0.726** (0.317)	-1.459* (0.790)	-0.251 (0.513)	-1.797*** (0.326)	0.096 (1.041)	-0.794** (0.362)
Model	FE	FE	FE	FE	RE	RE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.090	0.089	0.119	0.306	0.129	0.103
Adjusted R <sup>2</sup>	0.002	-0.014	0.033	0.233	0.096	0.094
F Statistic	50.995*** (df = 8; 4101)	4.979*** (df = 8; 409)	31.725*** (df = 8; 1880)	36.600*** (df = 8; 663)	19.040**	109.746***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table C2: Effect of Lagged Soc Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.008* (0.004)	0.009 (0.046)	0.001 (0.005)	0.004 (0.012)	-0.002 (0.029)	0.011 (0.010)
LogTAssets	-0.578** (0.260)	2.022 (1.622)	0.737 (0.488)	-4.987*** (0.395)	1.561 (3.328)	-0.644*** (0.177)
LogNoEmp	-0.497** (0.253)	-4.351** (1.998)	-1.142*** (0.420)	0.050 (0.480)	-0.346 (2.960)	-0.343* (0.193)
DebtAssets	-0.105*** (0.014)	-0.063*** (0.022)	-0.138*** (0.011)	-0.072*** (0.023)	-0.054* (0.028)	-0.064*** (0.011)
LogGDP	2.332* (1.344)	4.118** (1.814)	3.201** (1.286)	1.798 (1.270)	2.095 (4.090)	0.062 (0.585)
LTRate	0.282*** (0.071)	0.266 (0.279)	0.136 (0.092)	0.535*** (0.080)	-0.228 (0.581)	0.124 (0.077)
COVID	-0.717** (0.317)	-1.350 (0.915)	-0.250 (0.516)	-1.661*** (0.379)	-0.078 (1.052)	-0.783** (0.380)
Model	FE	FE	FE	FE	FE	RE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.091	0.085	0.119	0.303	0.020	0.104
Adjusted R <sup>2</sup>	0.002	-0.018	0.033	0.229	-0.112	0.096
F Statistic	51.127*** (df = 8; 4101)	4.734*** (df = 8; 409)	31.709*** (df = 8; 1880)	36.040*** (df = 8; 663)	0.556 (df = 8; 214)	111.682***

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table C3: Effect of Lagged Gov Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.001 (0.004)	-0.007 (0.023)	0.001 (0.006)	-0.008* (0.005)	-0.014 (0.024)	0.003 (0.006)
LogTAssets	-0.535** (0.243)	2.080 (1.720)	0.737 (0.482)	-4.949*** (0.376)	1.759 (1.213)	-0.617*** (0.214)
LogNoEmp	-0.476* (0.246)	-4.222** (2.005)	-1.145*** (0.416)	0.044 (0.501)	-1.902** (0.889)	-0.313 (0.226)
DebtAssets	-0.106*** (0.014)	-0.061*** (0.022)	-0.139*** (0.010)	-0.072*** (0.022)	-0.062** (0.029)	-0.065*** (0.012)
LogGDP	2.363* (1.326)	4.067** (1.820)	3.196** (1.269)	1.747 (1.295)	2.071 (1.750)	0.080 (0.569)
LTRate	0.279*** (0.070)	0.278 (0.284)	0.135 (0.095)	0.531*** (0.084)	-0.302 (0.400)	0.122 (0.115)
COVID	-0.721** (0.320)	-1.391* (0.793)	-0.255 (0.510)	-1.631*** (0.386)	0.311 (1.033)	-0.797* (0.423)
Model	FE	FE	FE	FE	RE	RE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.090	0.085	0.119	0.304	0.114	0.103
Adjusted R <sup>2</sup>	0.002	-0.018	0.033	0.230	0.080	0.094
F Statistic	50.895*** (df = 8; 4101)	4.729*** (df = 8; 409)	31.713*** (df = 8; 1880)	36.132*** (df = 8; 663)	15.474* (df = 8; 214)	109.812*** (df = 8; 903)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table C4: Effect of Lagged Env Score on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.005*** (0.001)	-0.004 (0.008)	0.0003 (0.002)	0.018*** (0.002)	0.017* (0.010)	0.002 (0.002)
LogTAssets	-0.858*** (0.085)	-0.459* (0.241)	-0.402** (0.181)	-2.795*** (0.136)	-4.108*** (0.842)	0.067 (0.096)
LogNoEmp	0.288*** (0.055)	-0.230*** (0.089)	0.425*** (0.037)	0.382*** (0.102)	3.218** (1.286)	0.014 (0.037)
DebtAssets	0.038*** (0.001)	0.057*** (0.016)	0.037*** (0.004)	0.056*** (0.004)	0.078*** (0.015)	0.013*** (0.003)
LogGDP	1.232* (0.630)	0.247 (0.560)	2.085*** (0.678)	0.390 (0.709)	1.302 (1.812)	-0.176 (0.236)
LTRate	-0.047 (0.054)	-0.073 (0.058)	-0.098*** (0.033)	-0.027 (0.094)	-0.271*** (0.089)	0.050 (0.045)
COVID	-0.633*** (0.166)	-0.944*** (0.211)	-0.434*** (0.141)	-1.129*** (0.232)	-0.889* (0.530)	-0.439*** (0.102)
Model	FE	RE	FE	FE	FE	FE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.114	0.246	0.136	0.273	0.196	0.055
Adjusted R <sup>2</sup>	0.028	0.231	0.051	0.197	0.087	-0.047
F Statistic	66.043*** (df = 8; 4101)	143.773*** (df = 8; 409)	36.986*** (df = 8; 1880)	31.185*** (df = 8; 663)	6.534*** (df = 8; 214)	6.517*** (df = 8; 903)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table C5: Effect of Lagged Soc Score on PBR**

<i>Dependent variable:</i>						
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.007*** (0.001)	0.013 (0.011)	0.001 (0.001)	0.026*** (0.006)	0.009 (0.021)	0.002 (0.001)
LogTAssets	-0.856*** (0.084)	-1.413*** (0.216)	-0.408** (0.172)	-2.831*** (0.110)	0.054 (0.447)	0.084 (0.087)
LogNoEmp	0.274*** (0.054)	0.728*** (0.156)	0.423*** (0.038)	0.397*** (0.104)	-0.771 (0.617)	0.010 (0.036)
DebtAssets	0.039*** (0.001)	0.052*** (0.006)	0.037*** (0.004)	0.058*** (0.005)	0.054*** (0.009)	0.013*** (0.003)
LogGDP	1.247** (0.634)	2.217** (0.906)	2.082*** (0.673)	0.402 (0.765)	0.250 (0.886)	-0.161 (0.218)
LTRate	-0.045 (0.052)	-0.121** (0.051)	-0.098*** (0.032)	0.011 (0.089)	-0.254** (0.108)	0.051 (0.043)
COVID	-0.625*** (0.171)	-1.044*** (0.169)	-0.432*** (0.140)	-1.061*** (0.243)	-0.528 (0.608)	-0.443*** (0.103)
Model	FE	FE	FE	FE	RE	FE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.115	0.252	0.136	0.283	0.128	0.054
Adjusted R <sup>2</sup>	0.029	0.168	0.052	0.207	0.095	-0.048
F Statistic	66.582*** (df = 8; 4101)	17.213*** (df = 8; 409)	37.014*** (df = 8; 1880)	32.659*** (df = 8; 663)	20.972** (df = 8; 214)	6.449*** (df = 8; 903)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table C6: Effect of Lagged Gov Score on PBR**

<i>Dependent variable:</i>						
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.003*** (0.001)	-0.003 (0.004)	-0.002 (0.002)	-0.012*** (0.003)	-0.017 (0.012)	0.0005 (0.003)
LogTAssets	-0.813*** (0.088)	-0.467** (0.219)	-0.396** (0.178)	-2.661*** (0.153)	-4.224*** (0.705)	0.084 (0.100)
LogNoEmp	0.295*** (0.055)	-0.245* (0.138)	0.431*** (0.040)	0.316*** (0.076)	3.317*** (1.024)	0.018 (0.036)
DebtAssets	0.038*** (0.001)	0.058*** (0.015)	0.037*** (0.004)	0.055*** (0.005)	0.077*** (0.016)	0.013*** (0.003)
LogGDP	1.273** (0.622)	0.212 (0.452)	2.097*** (0.679)	0.271 (0.671)	1.744 (1.778)	-0.133 (0.223)
LTRate	-0.045 (0.054)	-0.069 (0.064)	-0.096*** (0.033)	-0.025 (0.087)	-0.284*** (0.062)	0.049 (0.047)
COVID	-0.619*** (0.164)	-0.944*** (0.235)	-0.427*** (0.141)	-0.996*** (0.210)	-0.719 (0.489)	-0.447*** (0.098)
Model	FE	RE	FE	FE	FE	FE
Observations	4,500	456	2,065	734	244	1,001
R <sup>2</sup>	0.113	0.246	0.136	0.271	0.199	0.054
Adjusted R <sup>2</sup>	0.027	0.231	0.052	0.194	0.090	-0.048
F Statistic	65.533*** (df = 8; 4101)	144.042*** (df = 8; 409)	37.100*** (df = 8; 1880)	30.738*** (df = 8; 663)	6.642*** (df = 8; 214)	6.388*** (df = 8; 903)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

## Appendix D – Overall and Sector Analysis for Current Year Total and Pillar Scores

**Table D2: Effect of Current ESG Scores on PBR**

	<i>Dependent variable:</i>			
	Price to Book Ratio			
	ESG	Env	Soc	Gov
ESGScore	0.002* (0.001)			
EnvPillar		0.002* (0.001)		
SocPillar			0.006*** (0.001)	
GovPillar				-0.001 (0.001)
Controls	YES	YES	YES	YES
Observations	4,875	4,875	4,875	4,875
R <sup>2</sup>	0.126	0.126	0.127	0.126
Adjusted R <sup>2</sup>	0.048	0.048	0.050	0.048
F Statistic (df = 8; 4476)	80.627***	80.631***	81.733***	80.629***
<i>Note:</i>		* p<0.1; ** p<0.05; *** p<0.01		

**Table D1: Effect of Current ESG Scores on ROA**

	<i>Dependent variable:</i>			
	Return on Assets (%)			
	ESG	Env	Soc	Gov
ESGScore	0.012 (0.009)			
EnvPillar		0.003 (0.010)		
SocPillar			0.013*** (0.004)	
GovPillar				0.002 (0.004)
Controls	YES	YES	YES	YES
Observations	4,875	4,875	4,875	4,875
R <sup>2</sup>	0.092	0.091	0.092	0.091
Adjusted R <sup>2</sup>	0.011	0.011	0.012	0.011
F Statistic (df = 8; 4476)	56.568***	56.270***	56.999***	56.267***
<i>Note:</i>		* p<0.1; ** p<0.05; *** p<0.01		

**Table D3: Effect of Current ESG Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.012 (0.009)	0.020 (0.058)	0.008 (0.012)	-0.008 (0.011)	-0.040*** (0.014)	0.024 (0.021)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.092	0.083	0.118	0.295	0.033	0.036
Adjusted R <sup>2</sup>	0.011	-0.011	0.039	0.227	-0.086	-0.059
F Statistic	56.568*** (df = 8; 4476)	5.067*** (df = 8; 448)	34.390*** (df = 8; 2055)	37.766*** (df = 8; 722)	1.005 (df = 8; 235)	4.554*** (df = 8; 984)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table D4: Effect of Current Env Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.003 (0.010)	-0.003 (0.034)	-0.001 (0.015)	0.007 (0.007)	0.023 (0.049)	0.005 (0.012)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.091	0.082	0.118	0.295	0.116	0.098
Adjusted R <sup>2</sup>	0.011	-0.012	0.039	0.227	0.085	0.090
F Statistic	56.270*** (df = 8; 4476)	4.988*** (df = 8; 448)	34.314*** (df = 8; 2055)	37.785*** (df = 8; 722)	19.583** (df = 8; 235)	112.138*** (df = 8; 984)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table D5: Effect of Current Soc Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.013*** (0.004)	0.032 (0.044)	0.011*** (0.003)	-0.005 (0.013)	-0.009 (0.024)	0.012 (0.009)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.092	0.087	0.119	0.295	0.029	0.100
Adjusted R <sup>2</sup>	0.012	-0.007	0.040	0.227	-0.091	0.092
F Statistic	56.999*** (df = 8; 4476)	5.341*** (df = 8; 448)	34.580*** (df = 8; 2055)	37.752*** (df = 8; 722)	0.881 (df = 8; 235)	114.967*** (df = 8; 984)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table D6: Effect of Current Gov Score on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	0.002 (0.004)	-0.005 (0.024)	0.005 (0.005)	-0.004 (0.005)	-0.040 (0.028)	0.014 (0.010)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.091	0.082	0.118	0.295	0.118	0.035
Adjusted R <sup>2</sup>	0.011	-0.012	0.039	0.227	0.087	-0.060
F Statistic	56.267*** (df = 8; 4476)	4.996*** (df = 8; 448)	34.407*** (df = 8; 2055)	37.767*** (df = 8; 722)	21.264** (df = 8; 235)	4.454*** (df = 8; 984)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01



**Table D7: Effect of Current ESG Score on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.002* (0.001)	0.006 (0.008)	0.0002 (0.003)	0.009 (0.006)	-0.026** (0.013)	0.004** (0.002)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.126	0.261	0.159	0.256	0.196	0.053
Adjusted R <sup>2</sup>	0.048	0.247	0.084	0.184	0.097	-0.040
F Statistic	80.627*** (df = 8; 4476)	169.705***	48.557*** (df = 8; 2055)	31.077*** (df = 8; 722)	7.184*** (df = 8; 235)	6.882*** (df = 8; 984)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table D8: Effect of Current Env Score on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.002* (0.001)	-0.009 (0.007)	-0.001 (0.002)	0.010** (0.004)	0.0002 (0.017)	0.0003 (0.001)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.126	0.262	0.159	0.258	0.191	0.051
Adjusted R <sup>2</sup>	0.048	0.248	0.084	0.186	0.091	-0.042
F Statistic	80.631*** (df = 8; 4476)	170.913***	48.582*** (df = 8; 2055)	31.353*** (df = 8; 722)	6.921*** (df = 8; 235)	6.619*** (df = 8; 984)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table D9: Effect of Current Soc Score on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.006*** (0.001)	0.006 (0.007)	0.002 (0.002)	0.020*** (0.006)	-0.009 (0.012)	0.003*** (0.001)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.127	0.260	0.159	0.266	0.192	0.053
Adjusted R <sup>2</sup>	0.050	0.247	0.084	0.195	0.092	-0.041
F Statistic	81.733*** (df = 8; 4476)	169.527***	48.679*** (df = 8; 2055)	32.679*** (df = 8; 722)	6.968*** (df = 8; 235)	6.851*** (df = 8; 984)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table D10: Effect of Current Gov Score on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.001 (0.001)	0.003 (0.003)	0.0003 (0.002)	-0.010*** (0.002)	-0.013 (0.010)	0.002 (0.002)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,875	495	2,240	793	265	1,082
R <sup>2</sup>	0.126	0.260	0.159	0.260	0.135	0.052
Adjusted R <sup>2</sup>	0.048	0.246	0.084	0.189	0.105	-0.042
F Statistic	80.629*** (df = 8; 4476)	169.173***	48.560*** (df = 8; 2055)	31.758*** (df = 8; 722)	31.143***	6.699*** (df = 8; 984)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## Appendix E – Overall and Sector Analysis for Lagged Total and Pillar Scores (Balanced Panel)

**Table E1: Effect of Lagged ESG Scores on ROA (Balanced)**

	<i>Dependent variable:</i>			
	Return on Assets (%)			
	ESG	Env	Soc	Gov
ESGScore	0.005 (0.011)			
EnvPillar		-0.001 (0.012)		
SocPillar			0.003 (0.003)	
GovPillar				0.002 (0.005)
Controls	YES	YES	YES	YES
Observations	3,528	3,528	3,528	3,528
R <sup>2</sup>	0.080	0.080	0.080	0.080
Adjusted R <sup>2</sup>	-0.006	-0.006	-0.006	-0.006
F Statistic (df = 8; 3226)	35.012***	34.954***	34.999***	34.966***
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		

**Table E2: Effect of Lagged ESG Scores on PBR (Balanced)**

	<i>Dependent variable:</i>			
	Price to Book Ratio			
	ESG	Env	Soc	Gov
ESGScore	-0.002 (0.001)			
EnvPillar		-0.0004 (0.001)		
SocPillar			0.002* (0.001)	
GovPillar				-0.003*** (0.001)
Controls	YES	YES	YES	YES
Observations	3,528	3,528	3,528	3,528
R <sup>2</sup>	0.133	0.133	0.133	0.134
Adjusted R <sup>2</sup>	0.052	0.052	0.052	0.053
F Statistic (df = 8; 3226)	61.790***	61.684***	61.798***	62.338***
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01		

**Table E3: Effect of Lagged ESG Score on ROA (Balanced)**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	0.005 (0.011)	-0.024 (0.042)	-0.0001 (0.021)	-0.007 (0.011)	0.055 (0.035)	0.029*** (0.008)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.080	0.118	0.113	0.163	0.045	0.047
Adjusted R <sup>2</sup>	-0.006	0.017	0.027	0.150	0.0004	-0.051
F Statistic	35.012*** (df = 8; 3226)	5.381*** (df = 8; 322)	23.966*** (df = 8; 1510)	112.618***	9.086	4.030*** (df = 8; 652)

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E4: Effect of Lagged Env Score on ROA (Balanced)**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	-0.001 (0.012)	0.008 (0.032)	-0.003 (0.019)	-0.008 (0.009)	0.079* (0.044)	0.002 (0.008)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.080	0.116	0.113	0.163	0.060	0.040
Adjusted R <sup>2</sup>	-0.006	0.015	0.028	0.150	0.016	-0.058
F Statistic	34.954*** (df = 8; 3226)	5.296*** (df = 8; 322)	23.980*** (df = 8; 1510)	112.681***	12.371	3.417*** (df = 8; 652)

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E5: Effect of Lagged Soc Score on ROA (Balanced)**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.003 (0.003)	-0.021 (0.030)	0.004 (0.006)	-0.005 (0.010)	-0.002 (0.026)	0.018* (0.010)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.080	0.118	0.113	0.163	0.020	0.120
Adjusted R <sup>2</sup>	-0.006	0.017	0.028	0.150	-0.111	0.109
F Statistic	34.999*** (df = 8; 3226)	5.400*** (df = 8; 322)	23.990*** (df = 8; 1510)	112.294***	0.456 (df = 8; 179)	96.639***

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E6: Effect of Lagged Gov Score on ROA (Balanced)**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	0.002 (0.005)	-0.016 (0.024)	-0.001 (0.010)	-0.002 (0.003)	0.001 (0.020)	0.023*** (0.008)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.080	0.118	0.113	0.163	0.026	0.116
Adjusted R <sup>2</sup>	-0.006	0.017	0.027	0.150	-0.019	0.104
F Statistic	34.966*** (df = 8; 3226)	5.408*** (df = 8; 322)	23.968*** (df = 8; 1510)	112.230***	5.144	92.819***

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E7: Effect of Lagged ESG Score on PBR (Balanced)**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
ESGScore	-0.002 (0.001)	-0.025*** (0.005)	-0.007* (0.003)	0.013*** (0.004)	-0.005 (0.010)	0.002 (0.003)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.133	0.315	0.144	0.193	0.242	0.056
Adjusted R <sup>2</sup>	0.052	0.237	0.061	0.108	0.140	-0.041
F Statistic	61.790*** (df = 8; 3226)	18.548*** (df = 8; 322)	31.667*** (df = 8; 1510)	15.863*** (df = 8; 531)	7.131*** (df = 8; 179)	4.843*** (df = 8; 652)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E8: Effect of Lagged Env Score on PBR (Balanced)**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	-0.0004 (0.001)	-0.024*** (0.005)	-0.003 (0.002)	0.006 (0.004)	0.032*** (0.008)	-0.0001 (0.002)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.133	0.322	0.143	0.165	0.225	0.056
Adjusted R <sup>2</sup>	0.052	0.244	0.060	0.152	0.189	-0.041
F Statistic	61.684*** (df = 8; 3226)	19.109*** (df = 8; 322)	31.400*** (df = 8; 1510)	113.958***	56.329***	4.800*** (df = 8; 652)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E9: Effect of Lagged Soc Score on PBR (Balanced)**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.002* (0.001)	-0.012* (0.007)	-0.002 (0.001)	0.022*** (0.003)	-0.002 (0.007)	-0.00003 (0.002)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.133	0.308	0.142	0.210	0.195	0.056
Adjusted R <sup>2</sup>	0.052	0.228	0.060	0.126	0.157	-0.041
F Statistic	61.798*** (df = 8; 3226)	17.914*** (df = 8; 322)	31.328*** (df = 8; 1510)	17.597*** (df = 8; 531)	46.862***	4.800*** (df = 8; 652)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table E10: Effect of Lagged Gov Score on PBR (Balanced)**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.003*** (0.001)	-0.014** (0.007)	-0.003 (0.002)	-0.008*** (0.003)	-0.004 (0.011)	0.001 (0.002)
Controls	YES	YES	YES	YES	YES	YES
Observations	3,528	360	1,656	588	204	720
R <sup>2</sup>	0.134	0.314	0.143	0.168	0.200	0.050
Adjusted R <sup>2</sup>	0.053	0.235	0.061	0.155	0.163	0.038
F Statistic	62.338*** (df = 8; 3226)	18.441*** (df = 8; 322)	31.500*** (df = 8; 1510)	116.548***	48.408***	37.333***

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

## Appendix F – Moderation Analysis for Lagged Pillar Scores

**Table F1: Effect of Env Score and Privatisation on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	-0.028 (0.065)	-0.147 (0.213)	0.112** (0.047)	-0.152 (0.158)	-0.493 (0.444)	-0.118** (0.052)
Priv	-3.150 (5.725)	-19.598 (16.646)	12.730*** (4.185)	-30.313** (14.124)	-24.842 (28.865)	-13.556*** (5.139)
PrivEnv	0.030 (0.066)	0.170 (0.233)	-0.128** (0.056)	0.174 (0.160)	0.549 (0.467)	0.115* (0.065)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.015	0.035	0.023	0.196	0.075	0.017
Adjusted R <sup>2</sup>	-0.081	-0.070	-0.072	0.113	0.047	-0.089
F Statistic	8.666*** (df = 7; 4095)	2.132** (df = 7; 412)	6.266*** (df = 7; 1881)	23.163*** (df = 7; 664)	6.219	2.146** (df = 7; 894)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table F2: Effect of Soc Score and Privatisation on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	-0.040 (0.051)	0.071 (0.074)	0.045 (0.045)	-0.365*** (0.084)	-0.611 (0.541)	0.065* (0.035)
Priv	-4.805 (4.718)	-4.874 (14.288)	6.093* (3.595)	-42.492*** (10.826)	-32.269 (37.965)	-0.672 (1.937)
PrivSoc	0.055 (0.053)	-0.092 (0.121)	-0.033 (0.049)	0.392*** (0.088)	0.639 (0.564)	-0.056* (0.033)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.016	0.034	0.019	0.212	0.019	0.016
Adjusted R <sup>2</sup>	-0.080	-0.072	-0.076	0.130	-0.108	-0.089
F Statistic	9.415*** (df = 7; 4095)	2.071** (df = 7; 412)	5.276*** (df = 7; 1881)	25.493*** (df = 7; 664)	0.604 (df = 7; 215)	2.114** (df = 7; 894)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table F3: Effect of Gov Score and Privatisation on ROA**

<i>Dependent variable:</i>						
Return on Assets (%)						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.078 (0.053)	-0.416*** (0.076)	0.060 (0.048)	-0.242 (0.169)	-0.642 (0.425)	-0.090 (0.057)
Priv	-5.402 (4.303)	-30.487** (13.130)	7.723** (3.547)	-32.051** (13.761)	-23.591 (20.202)	-7.205 (4.874)
PrivGov	0.078 (0.057)	0.423*** (0.088)	-0.068 (0.056)	0.234 (0.172)	0.645 (0.436)	0.090 (0.067)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.016	0.058	0.019	0.197	0.086	0.012
Adjusted R <sup>2</sup>	-0.080	-0.045	-0.077	0.114	0.059	0.005
F Statistic	9.445*** (df = 7; 4095)	3.598*** (df = 7; 412)	5.144*** (df = 7; 1881)	23.312*** (df = 7; 664)	5.949	10.186

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table F4: Effect of Env Score and Privatisation on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	-0.018 (0.017)	0.297*** (0.030)	-0.018 (0.013)	-0.069 (0.046)	0.169* (0.087)	0.008 (0.009)
Priv	-2.387 (1.622)	7.175** (3.312)	-1.718 (1.269)	-10.440*** (3.728)	25.288*** (7.880)	0.520 (0.794)
PrivEnv	0.021 (0.018)	-0.321*** (0.032)	0.021 (0.015)	0.075* (0.045)	-0.156* (0.095)	-0.008 (0.009)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.035	0.237	0.057	0.067	0.077	0.029
Adjusted R <sup>2</sup>	-0.059	0.154	-0.034	-0.030	-0.043	0.022
F Statistic	21.127*** (df = 7; 4095)	18.300*** (df = 7; 412)	16.357*** (df = 7; 1881)	6.810*** (df = 7; 664)	2.562** (df = 7; 215)	24.126***

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table F5: Effect of Soc Score and Privatisation on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	-0.014 (0.018)	0.243*** (0.033)	-0.029** (0.012)	-0.140*** (0.022)	0.232** (0.117)	0.010 (0.006)
Priv	-2.046 (1.579)	6.510* (3.657)	-2.309* (1.207)	-15.102*** (2.597)	30.687** (12.355)	0.264 (0.244)
PrivSoc	0.017 (0.018)	-0.249*** (0.033)	0.028** (0.014)	0.158*** (0.022)	-0.245** (0.111)	-0.009* (0.005)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.034	0.261	0.059	0.086	0.097	0.030
Adjusted R <sup>2</sup>	-0.059	0.180	-0.033	-0.009	0.070	-0.074
F Statistic	20.895*** (df = 7; 4095)	20.778*** (df = 7; 412)	16.844*** (df = 7; 1881)	8.898*** (df = 7; 664)	14.391** 3.949*** (df = 7; 894)	

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table F6: Effect of Gov Score and Privatisation on PBR**

<i>Dependent variable:</i>						
Price to Book Ratio						
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.023 (0.016)	0.081 (0.089)	-0.022* (0.012)	-0.104* (0.054)	0.320 (0.232)	-0.007 (0.005)
Priv	-2.073* (1.217)	-4.844 (5.258)	-1.658 (1.009)	-10.233** (4.052)	29.770* (16.277)	-0.840*** (0.252)
PrivGov	0.021 (0.017)	-0.087 (0.098)	0.024* (0.014)	0.099* (0.053)	-0.339 (0.236)	0.009** (0.004)
Controls	YES	YES	YES	YES	YES	YES
Observations	4,493	458	2,065	734	244	991
R <sup>2</sup>	0.035	0.177	0.057	0.063	0.105	0.030
Adjusted R <sup>2</sup>	-0.058	0.087	-0.034	0.054	0.078	-0.074
F Statistic	21.309*** (df = 7; 4095)	12.624*** (df = 7; 412)	16.393*** (df = 7; 1881)	46.397***	16.848** 3.940*** (df = 7; 894)	

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table F7: Effect of Env Score and Innovation on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.006 (0.014)	-0.022 (0.047)	-0.0002 (0.025)	0.074*** (0.018)	-0.021 (0.047)	0.007 (0.011)
RDInt	-0.012 (0.009)	-2.044 (1.426)	0.175 (0.231)	0.339 (0.345)	-0.553** (0.261)	0.468*** (0.050)
RDEnv	0.0004* (0.0002)	0.022** (0.009)	-0.0002 (0.004)	-0.004 (0.004)	0.010** (0.005)	-0.004*** (0.001)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.017	0.080	0.019	0.231	0.077	0.017
Adjusted R <sup>2</sup>	-0.111	-0.058	-0.108	0.097	0.025	-0.137
F Statistic	4.733*** (df = 7; 1919)	2.478** (df = 7; 200)	2.499** (df = 7; 906)	11.831*** (df = 7; 275)	3.941	0.915 (df = 7; 362)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table F8: Effect of Soc Score and Innovation on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.004 (0.006)	-0.005 (0.059)	-0.014 (0.011)	-0.112** (0.049)	-0.012 (0.061)	0.013** (0.006)
RDInt	-0.033* (0.018)	-1.142 (2.002)	-0.044 (0.210)	-1.774*** (0.361)	-1.106** (0.559)	0.077 (0.124)
RDSoc	0.001** (0.0002)	0.008 (0.020)	0.003 (0.003)	0.021*** (0.004)	0.012 (0.009)	0.001 (0.002)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.017	0.044	0.021	0.235	0.041	0.014
Adjusted R <sup>2</sup>	-0.111	-0.100	-0.105	0.101	-0.140	-0.142
F Statistic	4.809*** (df = 7; 1919)	1.305 (df = 7; 200)	2.797*** (df = 7; 906)	12.065*** (df = 7; 275)	0.683 (df = 7; 111)	0.716 (df = 7; 362)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table F9: Effect of Gov Score and Innovation on ROA**

	<i>Dependent variable:</i>					
	Return on Assets (%)					
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.013*** (0.002)	0.036 (0.048)	-0.003 (0.008)	-0.027** (0.013)	-0.043 (0.069)	0.010 (0.014)
RDInt	0.011 (0.011)	0.564 (1.274)	0.246 (0.152)	-0.085 (0.281)	-0.307 (0.409)	0.627*** (0.239)
RDGov	-0.0001 (0.0002)	-0.015* (0.009)	-0.001 (0.003)	0.001 (0.003)	0.004 (0.005)	-0.007** (0.003)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.018	0.057	0.020	0.217	0.061	0.056
Adjusted R <sup>2</sup>	-0.110	-0.084	-0.106	0.080	0.009	0.040
F Statistic	5.071*** (df = 7; 1919)	1.735 (df = 7; 200)	2.659** (df = 7; 906)	10.881*** (df = 7; 275)	1.639	16.546***

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01



**Table F10: Effect of Env Score and Innovation on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
EnvPillar	0.004 (0.003)	0.019*** (0.006)	-0.004 (0.004)	0.010 (0.011)	-0.030 (0.030)	0.002 (0.003)
RDInt	0.004 (0.006)	0.031 (0.093)	0.056*** (0.015)	-0.280* (0.157)	-0.688*** (0.144)	0.064* (0.037)
RDEnv	-0.0001 (0.0001)	-0.002 (0.002)	-0.001*** (0.0003)	0.003** (0.001)	0.016*** (0.005)	-0.001** (0.0004)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.036	0.170	0.099	0.063	0.210	0.024
Adjusted R <sup>2</sup>	-0.089	0.046	-0.018	-0.101	0.061	0.007
F Statistic	10.353*** (df = 7; 1919)	5.870*** (df = 7; 200)	14.151*** (df = 7; 906)	2.643** (df = 7; 275)	4.226*** (df = 7; 111)	6.736

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table F11: Effect of Soc Score and Innovation on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
SocPillar	0.006** (0.003)	0.056*** (0.016)	-0.003 (0.003)	0.004 (0.020)	-0.123*** (0.035)	0.012*** (0.003)
RDInt	0.009 (0.007)	0.599*** (0.189)	0.045*** (0.008)	-0.594*** (0.113)	-1.218*** (0.280)	0.094*** (0.030)
RDSoc	-0.0001 (0.0001)	-0.009*** (0.002)	-0.001*** (0.0001)	0.007*** (0.002)	0.019*** (0.005)	-0.001*** (0.0004)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.038	0.226	0.098	0.075	0.197	0.033
Adjusted R <sup>2</sup>	-0.088	0.110	-0.018	-0.087	0.152	-0.119
F Statistic	10.712*** (df = 7; 1919)	8.360*** (df = 7; 200)	14.079*** (df = 7; 906)	3.173*** (df = 7; 275)	27.582*** (df = 7; 111)	1.772* (df = 7; 362)

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

**Table F12: Effect of Gov Score and Innovation on PBR**

	<i>Dependent variable:</i>					
	Price to Book Ratio					
	All	ICT	IMEU	Cons. Goods	Health	FPS
GovPillar	-0.0003 (0.002)	0.016* (0.009)	0.003** (0.001)	-0.016** (0.008)	-0.076*** (0.029)	0.007 (0.006)
RDInt	-0.005 (0.003)	0.050 (0.116)	0.029* (0.015)	-0.066 (0.222)	-0.543*** (0.155)	0.043 (0.039)
RDGov	0.0001* (0.00005)	-0.002 (0.001)	-0.001*** (0.0003)	0.0004 (0.002)	0.011*** (0.003)	-0.0002 (0.0005)
Regional Controls	YES	YES	YES	YES	YES	YES
Observations	2,170	231	1,024	324	133	420
R <sup>2</sup>	0.036	0.166	0.094	0.092	0.157	0.025
Adjusted R <sup>2</sup>	-0.090	0.041	-0.024	0.072	0.109	-0.128
F Statistic	10.169*** (df = 7; 1919)	5.694*** (df = 7; 200)	13.356*** (df = 7; 906)	20.439***	19.876***	1.342 (df = 7; 362)

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01