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How much does corporate sustainability impact the corporate financial performance in emerging markets? The case of Brazilian companies from 2011 to 2020

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Supervising Professor: Dr. Maria Amélia de Paula Dias

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ABSTRACT

This research aims to explore the impact of Corporate Sustainability Performance (CSP) on one-year lagged Corporate Financial Performance (CFP) on companies listed on the Brazilian Stock Exchange (B3) from 2011 to 2020. For that, ESG Scores were used as a proxy for CSP, and the CFP was measured both by a market-based metric – share price – and an accounting-based metric – return over assets. Eight different linear regression models were analysed, considering both the total *ESG Score* and the individual scores (i.e., Environmental Score, Social Score, and Governance Score). Several tests were performed in the models to determine the best estimation method and, ultimately, the pooled OLS was selected. The findings highlight a positive and significant impact of the total ESG score on both financial metrics, with the models explaining *Price* being more statistically significant. Further, all individual ESG Scores were significant and positively impacted *Price.* Nonetheless, only the Governance Score was significant for the models explaining ROA, which also reported a positive effect on CFP. This research contributes to the scarce literature examining CFP and CSP in emerging markets and, to the author's best knowledge, this is the first study focusing on the Brazilian market to analyse a period larger than 5 years.

Keywords: ESG investing, Socially Responsible Investing, Corporate Sustainability, Corporate Financial Performance.

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ABBREVIATIONS LIST

B3	Brazil Stock Exchange and Over-the Counter Market
BRICS	Brazil, Russian, India, China, and South Africa
BVPS	Book-value per share
CAGR	Compound Annual Growth Rate
CF	Corporate Finance
CFP	Corporate Financial Performance
CS	Corporate Sustainability
CSP	Corporate Sustainability Performance
CSR	Corporate Social Responsibility
ESG	Environmental, Social and Governance
MSCI	Morgan Stanley Capital International
PRI	Principles for Responsible Investment
ROA	Return over Assets
ROE	Return on Equity
ROI	Return on Investment
SI	Sustainable Investing
SkT	Stakeholder Theory
SRI	Socially Responsible Investing
ST	Shareholder Theory
UN	United Nations
WCED	World Commission on Environment and Development

SUMMARY

1. INTRODUCTION

Sustainable development can be understood as “development which meets the needs of current generations without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development (WCED), 1987). When integrated into corporations, the construct expands the classic economic goal of organisations to include environmental and social outcomes as well and is referred to as ‘corporate sustainability’ (CS) or ‘corporate social responsibility’ (CSR) (Ashrafi et al., 2018).

The increasing demand for companies to be more sustainable has driven the adoption of a new investment strategy in the capital market called socially responsible investing (SRI). In 2005, the United Nations (UN) created the Principles for Responsible Investment (PRI), an investors' global network that supports SRI by developing principles to understand and incorporate environmental, social, and governance[1] (ESG) factors into investment decisions (PRI, 2021). Since then, the network has been attracting more adherents, evident in the constant growth in both the number of signatories and the value of assets under management. In March of 2021, 3826 PRI signatories represented US$121.3 trillion in assets under management, achieving annual growth of 17% in monetary terms and 26% in the number of network participants (PRI, 2021).

In the United States (U.S.), the US SIF Foundation (2020) estimates that for each three dollars invested under professional management, one incorporates ESG strategies. Within the U.S. the evolution of SRI is also constant, having a compound

[1] Governance can be understood as “the system by which companies are directed and controlled” Cadbury, S. A. (2000). The Corporate Governance Agenda. *Corporate Governance: An International Review*, *8*(1), 7-15. https://doi.org/https://doi.org/10.1111/1467-8683.00175 .

annual growth rate (CAGR) of 14% since 1995 (US SIF Foundation, 2020). This movement highlights that money managers and institutional investors are identifying responsible, well-managed companies that will be resilient over the long term, by assessing their environmental, social and governance (ESG) factors (US SIF Foundation, 2020).

The trend of socially responsible investing strategies drove the growth of SRI funds, which stimulated the creation of indicators to assess companies' CSR and evaluate the performance of these funds (Orsato et al., 2015). From this perspective, using ESG as a proxy for CSR performance became a common practice worldwide (Birindelli et al., 2018). The establishment of ESG metrics gave legitimacy to SRI markets, and the emergence of new measurements was frequently followed by relevant growth in transactions and investors (Widyawati, 2020).

Garcia and Orsato (2020) highlight that academic research in the field in the past 40 years has focused on examining the relationship between corporate sustainability performance and corporate financial performance in developed countries, whilst there is no consensus regarding the relationship in emerging markets. For Daugaard (2020), despite the number of studies analysing SRI financial performance in developed countries, the literature in emerging markets is still scarce and this underrepresentation 'is a practical concern to investors seeking to diversify their portfolio risk'.

In the Brazilian market, for example, Santis et al. (2016) affirm that 'within this field of study, there is still no absolute convergence of findings'. For Miralles-Quirós, Miralles-Quirós and Valente Gonçalves (2018) the shortage of evidence in developing countries like Brazil is due to a deficit of reliable available data in these countries, resulting in a limited understanding of how CSR impacts asset prices in these markets.

The topic is, however, expected to be especially important to emerging countries, in so far as an economy's sustainable development can be promoted by rewarding companies whose corporate sustainability standards are higher and withdrawing investments from companies considered to be "socially irresponsible" (Tripathi & Kaur, 2020). Thus, this study aims to contribute to the SRI literature and to the development of socially responsible investing in emerging markets by answering the following question: 'how does corporate sustainability impact the financial performance of Brazilian public companies?'.

Given this research question, the objective of this research is to examine the core element that supports SRI: the relationship between corporate sustainability performance (CSP) and corporate financial performance (CFP). The research will assess the impact CSP have on CFP using financial metrics and ESG (Environmental, Social and Governance) scores, which will be analysed both as aggregate variables and distinct individual variables. That is, whilst the ESG scores will be used as a proxy for CSP, accounting and market-based financial metrics will be used as a proxy for CFP. All the data was extracted from the Refinitiv Eikon database, and the study will explore these relationships in an emergent market by analysing Brazilian companies listed on B3 (Brazil Stock Exchange and Over-the-Counter Market).

It is believed that the study has implications for investors and asset managers since its findings enable a greater practical understanding of a relevant emerging market. The study is also expected to contribute to the academic body as it adds up to the scarce literature on SRI in this market type and to the ongoing debate on CSP impacts on CFP.

2. LITERATURE REVIEW

In this section, corporate social responsibility (CSR), corporate sustainability (CS), environmental, social and governance (ESG), socially responsible investing (SRI), corporate sustainability performance (CSP) and corporate financial performance (CFP) will be defined. Additionally, the relationship between them will be clarified to support the research and to explain the choice of the research method.

2.1 Corporate Social Responsibility (CSR), Corporate Sustainability (CS) and ESG

Corporate social responsibility and corporate sustainability are terms often used interchangeably to refer to the notion that organisations are not only expected to commit to their financial and legal obligations but also to expand their efforts to have a positive impact in the environmental and social spheres (Ashrafi et al., 2018).

Examining the evolution of the concept, Carroll (2015, p. 87) defines corporate social responsibility (CSR) as “the benchmark and centrepiece of the socially conscious business movement”. In the literature, it is common to define CSR as a response to social, environmental and/or stakeholders’ pressures, created by these three dimensions’ demands and expectations (Wood, 1991; Prahalad and Hamel, 1994; Cochran, 2007; Dahlsrud, 2008; Crowther and Aras, 2008, as cited in Crisóstomo et al., 2011). For instance, Yoon et al. (2018, p. 1) define CSR as “a function of a firm’s behaviour toward its different stakeholders”.

Following similar definitions to the CSR concept, Sobrosa et al. (2020) understand corporate sustainability (CS) as the pursuit of sustainable development goals that can increase the company’s value in the future. Lourenço and Branco (2013,

p. 135) affirm that CS is the most used concept to refer to “companies’ impacts on, relationships with, and responsibilities to society”.

Despite CS and CSR receiving similar definitions in the literature, Ashrafi et al. (2018) review the trends in the development of the two constructs and the relationship between them and clarify that CSR started as a social/philanthropic perspective and developed to a holistic approach that includes in the business strategy of the corporation its commitment with social, environmental, and economic dimensions. Similarly, Latapí Agudelo et al. (2019) demonstrate how CSR evolved from a focus on generating profit to generating shared value due to the academic development in the field and to a change in what society expects from companies’ corporate behaviour. Nevertheless, for Alshehhi et al. (2018) the concept still has a larger focus on the social factor and lacks attention to the environmental and economic dimensions.

On the other hand, the origins of corporate sustainability are strongly linked with sustainable development and its long-term perspective (Ashrafi et al., 2018). In the 1990s, Elkington (1998) introduced the concept of the triple bottom line, “the simultaneous pursuit of economic prosperity, environmental quality and social equity”. This new theory explicitly linked corporate social responsibility to sustainable development (Ashrafi et al., 2020) and the term corporate sustainability emerged as “the application of sustainable development at micro level, i.e. the corporate level; including the short-term and long-term economic, environmental and social performance of a corporation” (Steurer et al. 2005; Baumgartner and Ebner 2010; Lozano 2011; Dyllick and Muff 2015; Hahn et al. 2017, as cited in Ashrafi et al., 2018, p. 675). For Ashrafi et al. (2018), CS supports a greater responsibility but can be integrated into CSR when CSR is perceived as a transitional stage towards sustainable development or as an ultimate goal (when the organisation includes the triple bottom

line in every aspect of its activities and long-term goals – in which case CSR and CS are equivalents).

Therefore, for the purpose of this research, we will consider CSR and CS equivalent and use the terms interchangeably. This can be justified by the long-term perspective of the analysis conducted in the study, which according to Ashrafi et al. (2018) suggests an equivalence between the concepts. In the corporate world, Carroll (2015) highlights how other terms are also used interchangeably with CSR, such as 'business ethics', 'stakeholder management', 'sustainability' and 'corporate citizenship' since they interrelate and overlap with CSR.

ESG (environmental, social and governance) is another term used as an equivalent of the aforementioned terms in the analysed literature. For instance, testing the impact of the composition of the board of directors from European public banks, Birindelli et al. (2018) opt for the terms 'sustainability', CSR and ESG interchangeably. Examining ESG performance of sensitive industries[2] in emerging countries, Garcia et al. (2017) also chose to use CSR and ESG as equivalent.

For Vives and Wadhwa (2012), whilst CSR is the corporate strategy used to achieve sustainability, ESG is the criteria used to measure the adoption of these strategies. But whilst some authors make a distinction between ESG performance and ESG itself as Velte (2017), other authors define ESG as a performance indicator in and of itself, as Yoon et al. (2018, p. 3) –"ESG essentially evaluates a firm's environmental, social, and corporate governance practices and combines the performances of these practices".

[2] Sensitive industries correspond to "those subject to systematic social taboos, moral debates, and political pressures and those that are more likely to cause social and environmental damage". Garcia, A. S., Mendes-da-Silva, W., & Orsato, R. J. (2017). Sensitive industries produce better ESG performance: Evidence from emerging markets. *Journal of Cleaner Production*, *150*, 135-147. https://doi.org/https://doi.org/10.1016/j.jclepro.2017.02.180

Due to the scope of this study and in accordance with the literature, ESG will not be differentiated from CSR and CS but will be interpreted as the three main factors that can orientate the measurement of corporate sustainability performance (CSP). CSP corresponds to how organisations consider and incorporate in their way of operating economic, environmental, social, and governance factors and their impacts on firms and society (Sobrosa et al., 2020). In this context, ESG scores are the variables that will be used to represent corporate sustainability performance. ESG scores correspond to the added value of CSP generated by ESG practices (Duque-Grisales & Aguilera-Caracuel, 2021) and are used by market players –such as investors and consulting firms— as a measure of CSP (Yoon et al., 2018). Following this trend, ESG scores will be used as a proxy for corporate sustainability performance in this study.

2.2 Socially responsible investing (SRI)

The most influential articles on SRI are dated from 1991 to 2011 (Widyawati, 2020), even though the first high in publications occurred in 2014, followed by a decline in 2015 and a steady increase in the next years, underlining that the research field is still young and the debate is not saturated (Losse & Geissdoerfer, 2021). SRI can be traced back to different religious movements (Camilleri, 2020; Renneboog et al., 2008). Already in medieval times, banking and interest-driven activities had begun to be prohibited in Islamic law, and in the pre-modern era The Quakers movement impeded investment into specific sectors, such as in the armament and tobacco industry (Tripathi & Kaur, 2020). In modern times, the Methodist movement in the U.S. was also against investment in ‘sinful activities’ (like the aforementioned industries) in accordance with the tenets of one of its founders, John Wesley (Yan et al., 2019).

Finally, in 1971, United Methodist ministers, opposing Vietnam War profiting activities, created the PAX World Balance Fund, the world's first SRI mutual fund (Yan et al., 2019).

In the 1990s, "the divestment movement to oppose apartheid in South Africa made people reconsider how social justice issues can be financialized" (Nath, 2021, p. 183). The movement marked the use of SRI screens by more Western investment funds (Losse & Geissdoerfer, 2021). Nowadays, Tripathi and Kaur (2020, p. 526) accredit the current spotlight on SRI to issues like "global warming, corporate social responsibility, labour welfare, equity of pay and standards, war and nuclear armaments". Widyawati (2020), through a systemic literature review, identified three main research foci in the field: (1) the investor behaviour, exploring the perspective of individual and institutional investors; (2) the development of SRI, studying its mainstreaming and its mechanisms' heterogeneity; and (3) the performance of SRI, which despite being the dominant theme in the literature, was still left unresolved the debate on SRI's impact on financial performance. This research will mainly explore this third factor.

As SRI applications in the market evolved, the literature followed similar trends. Talan and Sharma (2019, p. 2) elucidate that in the 1980s and 1990s the publications on SRI were mainly theoretical articles, incorporating "sacrifice, morality, and religion", whilst in the 2000s the focus shifted to empirical articles on "performance, activism, sustainability, stakeholders, and financial performance".

The evolution of SRI through time added complexity to the concept that now presents a variety of definitions and terms to describe it (Nath, 2021). Several terms describe similar concepts to SRI, such as "responsible investment, sustainable investment, ethical investment, green investment, environmental, social and

governance (ESG) investment, value-based investment, or socially conscious investment", but there is no consensus on their similarities or differences (Losse & Geissdoerfer, 2021, p. 2), even though in some cases the terms are used interchangeably (Nath, 2021). Cunha and Samanez (2013) assert that the different expressions share a focus on incorporating ESG factors into investment activities.

Following Losse and Geissdoerfer (2021) findings, most of the literature analysed in this research does not differentiate between the terms as they are used synonymously. Almost two decades ago, Schueth (2003) stated that the different terms refer to the same general process and are used interchangeably. Today, the literature still does not distinguish between the different terminologies, but SRI is the term most adopted to address the investment process that integrates ESG factors into its decision making (Losse & Geissdoerfer, 2021). Thus, this study will use the term 'socially responsible investing (SRI)' to refer to this investment trend and will consider it equivalent to the other terms mentioned before (e.g., sustainable investment, responsible investment, ESG investment).

In a bibliometric analysis considering more than 2,000 articles, Losse and Geissdoerfer (2021) identify that the most widely accepted definition of SRI in the literature is from Renneboog et al. (2008). Since it is not the scope of this study to clarify the ambiguity of the concept, this research follows the majority academic opinion and adopts the SRI definition from Renneboog et al. (2008, p. 1723):

> SRI is an investment process that integrates social, environmental, and ethical considerations into investment decision making. Unlike conventional types of investments, SRI apply a set of investment screens to select or exclude assets based on ecological, social, corporate governance or ethical criteria, and

often engages in the local communities and in shareholder activism to further corporate strategies towards the above aims.

2.3 Corporate Sustainability Performance (CSP) and Corporate Financial Performance (CFP)

In order to understand SRI performance, it is essential to explore the relationship between corporate sustainability performance and corporate financial performance. The discussion regarding the impact of CSP on CFP can be traced back to the debate between shareholder theory and stakeholder theory (Alshehhi et al., 2018). Both theories focus their efforts on explaining what an organisation should pursue as its main objective (Shi-Min et al., 2019). While the shareholder theory argues that managers should guide their decision-making process to maximise shareholders' wealth, stakeholder theory claims that decision making should be focused on creating value for stakeholders through improving fairness and living conditions, for example (Shi-Min et al., 2019).

Similarly, there are two competing theories regarding the impact of CSP on CFP: value-destroying and value-creating (Yu & Zhao, 2015). Supported by shareholder theory, the first affirms that investing in sustainability destroys value for the shareholders since the company would lose focus on profitability by pleasing stakeholders at the expense of shareholders, whilst the second, supported by stakeholder theory, defends that investing in sustainability creates value in the long-term and reduces the firm risk (Alshehhi et al., 2018). The literature supporting the value-creating theory is also based on the resource-based theory, which establishes that "a firm can only achieve sustained competitive advantage and maintain its long-term profitability by strategically developing these resources and capabilities", implying

that CSR could result in tangible and intangible benefits (Haffar & Searcy, 2017, p. 514).

Despite the lack of consensus in the literature regarding SRI performance, some recent studies attempt to find a general relationship between investing in sustainability and financial performance. Alshehhi et al. (2018) examine 132 papers from top-tier journals and find that 78% of publications report a positive relationship between CSP and CFP, but stress that studies in emerging countries are still scarce. Friede et al. (2015) find a higher proportion of papers reporting a positive relationship between ESG factors and CFP. For the authors, the ESG-CFP relationship is positively correlated on average and stable over time, since 90% of the 2200 studies analysed from the 1970s to 2015 reported a positive relation (Friede et al., 2015).

The positive relation holds across various approaches and regions including emerging markets, however, portfolio studies[3] represent an outlier that could be the reason for the aforementioned lack of consensus in the literature (Friede et al., 2015). The different results involving portfolio studies could be explained by (1) "various overlapping market and nonmarket factors" that tend to cover potentially extra returns from ESG in a portfolio and (2) the consideration of performance and management fees in these studies (Friede et al., 2015, pp. 225-226). The authors also consider that the use of positive and negative screens[4] "could result in distortion and cancellation of any remaining effects" (Derwall et al., 2011, as cited in Friede et al., 2015, p. 226). For this reason, this study analyses companies' performances individually.

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[3] An investment portfolio is formed by a selection of a set of investments, as highlighted by Sharpe, W. F. (1967). Portfolio Analysis. *Journal of Financial and Quantitative Analysis*, *2*(2), 76-84. https://doi.org/10.2307/2329895

An ESG portfolio is a collection of financial assets selected based in their ESG performance.

[4] The PRI defines screening as the action of "applying filters to lists of potential investments to rule companies in or out of contention for investment, based on an investor's preferences, values or ethics". PRI. (2020). *An introduction to responsible investment: Screening*. Retrieved 25/04/2022 from https://www.unpri.org/an-introduction-to-responsible-investment/an-introduction-to-responsible-investment-screening/5834.article

In the Brazilian case, there is no clear agreement in the literature regarding the SRI's financial performance and studies attempting to do so remain a rarity (Santis et al., 2016). However, the analysed literature appears to support either the value-creation theory (except during 2008's financial crisis) or a neutral relationship between CSP and CFP.

Analysing ESG portfolios, Tripathi and Kaur (2020) stress that SRI in emerging countries does not harm investors' earnings, since the SRI indices of BRICS countries – Brazil, Russia, India, China and South Africa – studied (Morgan Stanley Capital International – MSCI – ESG Index) outperformed their benchmark in terms of risk-return during the 12 years analysed. Specifically, the MSCI ESG Index of Brazil secured for the country a consistently top-ranked position, due to its higher excess return than the market and lower risk, except during the global financial crisis, when India took the lead position (Tripathi & Kaur, 2020). Also analysing MSCI ESG Indexes, Sherwood and Pollard (2018) confirm that Brazil leads emerging markets in the development of SRI options, together with India and Taiwan, stating that the integration of ESG factors in the investment process in emerging markets can provide significant portfolio outperformance compared to non-ESG equity investments.

Investigating how the three ESG factors affect the firm's values individually and overall, Miralles-Quirós, Miralles-Quirós and Gonçalves (2018) find evidence that supports the value-creating theory overall between 2010 and 2015, observing that environmental and governance performance scores are positively and significantly valued by investors, while social performance score does not present a statistically significant relationship with the share prices. The authors also found that sensitive industries' investors are especially concerned about environmental factors, which is incorporated in the share prices, but the significant added value is created by

unexpected information from the other two factors (Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018). Following the same trend, Garcia et al. (2017) study the association between firms' financial profile and their ESG performance from 2010 to 2012 in the BRICS countries, and find evidence that just the environmental factor -i.e. environmental performance score - is associated with profitability of the firm's assets and that the relationship systematic risk-ESG performance can be represented by an inverted U-shaped curve.

There are a variety of indicators that can be used to measure corporate sustainability performance (CSP), such as CSR reporting, CSR ratings or charitable giving (Velte, 2017). But using ESG scores as a proxy for CSP avoids self-reporting or generation bias that is intrinsic to firms' self-reports and own surveys (Yoon et al., 2018). ESG scores rate firms according to their CSR quality and provides investors complementary information to the company's corporate financial performance (CFP) (Birindelli et al., 2018). For Miralles-Quirós, Miralles-Quirós and Gonçalves (2018) the main advantages of using this measure are: (1) it substitutes the use of binary variables used in previous studies to score variables, and (2) it distinguishes the three main pillars of social responsibility (i.e. the ESG factors).

The firm's financial performance (referred to in this study as CFP) can also be assessed by a variety of metrics, which are usually divided into accounting-based variables or market-based items (Velte, 2017), the first being calculated from the organisation's financial data– e.g. Return on Investment (ROI) or Return on Equity (ROE) –and the second calculated from the stock market information –e.g. market-price or share-value. This study will incorporate both accounting-based and market in formation.

Additionally, it is worth to mention that previous studies also explored the bidirectional relationship between CSP and CFP. For instance, Garcia and Orsato (2020) compared the relationship between them by analysing how ESG scores impacted the ROA and discounted cash flow from 2,165 companies from emerging and developed markets; but also investigated how these CFP metrics impacted the ESG Scores (i.e., the CSP). This study will, however, follow the majority of the literature and explore only how CSP impacts CFP.

Finally, it is important to highlight that despite the aforementioned studies, the relationship between CSP and CFP remains unclear, due to controversial results (Garcia & Orsato, 2020), and research in emerging countries is still scarce (Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018). Hence, this study contributes to bridging this gap.

3. METHODS

In this section, the methods used in this study will be described. Firstly, the database and sample selection will be justified. Secondly, the main variables and their theoretical foundation will be explained. Finally, the models used to fit the data, and the tests performed will be clarified.

3.1 Database and sample selection

Aiming to assess whether the corporate financial performance can be explained by corporate sustainability performance (CSP), this study uses ESG scores as proxies for CSP and, similarly, financial metrics for corporate financial performance (CFP), with both metrics provided by the Refinitiv Eikon database. In accordance with what has been done by other scholars, this study relies on standardized ESG scores provided by the external rating agency Refinitiv Eikon – also known as Thompson Reuters Eikon -, making sure the ESG scores used do not suffer from measurement bias due to its nonfinancial attributes (Yoon et al., 2018). The Eikon platform was chosen for being widely used in the literature (De Lucia et al., 2020; Duque-Grisales & Aguilera-Caracuel, 2021; Garcia et al., 2017; Garcia & Orsato, 2020; Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018; Velte, 2017), indicating its reliability as a source. Its availability and access via the University of Brasilia was also considered for its selection. It is worth mentioning that, specifically for the *Price* variable, the database Economatica was used as reference to input the missing values found in the Eikon database into the final database used in this study, which corresponded to 1.63% of all the sample values for *Price*. The overall Price values extracted from Economatica had a simple average difference of negative 1.54% in relation to the values extracted from Eikon. In total, 14 values were imputed across 6 companies. For that, the average

difference between the values reported by both databases were considered by each specific company and used to adjust the original value extracted from Economatica. No other variable had missing values imputed.

Since CS activities are viewed to promote the creation of long-term shareholder value under the value-enhanced theory (Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018), this research time period was selected to enable the comparison of a ten year time series. If the previous years from 2011 were considered, the sample size would reduce significantly. Thus, to preserve the statistical significance of the sample whilst considering the long-term investment perspective – characteristic of Socially Responsible Investing -, the period between 2011 and 2020 was chosen to compose this study's timeframe. In addition, to the author's best knowledge, no other study analysed the post-2015 relationship between corporate sustainability and corporate financial performance in Brazil.

The choice of evaluating companies listed on the Brazilian Stock Exchange (B3) is explained by the quality and availability of financial and ESG data of these firms. Companies that did not disclose corporate sustainability information for more than four periods between 2011 and 2020 on Eikon's database were excluded from the final sample. The final database analysed presented 5.73% of missing values corresponding to the ESG scores. The overall sample missing data corresponds to 1.51% of all the observations. Since the proportion is not considered large (less than 5%), the results of the statistical analysis are not expected to be biased by the missing values present according to Schafer (1999). Further, the Ahrens and Pincus (1981) index indicates a light degree of unbalancedness (γ and v approximately to 0.99).

The empirical analysis presented in this study comprises 84 companies, distributed into 22 business sectors following The Refinitiv Business Classifications, as

presented in Table 1. The five sectors that appear most often are utilities, real estate, banking and investment services, mineral resources, and food and beverages. Despite the variety of business sectors considered in the sample, these five sectors comprise together 51.19% of the sample.

By the date this study was conducted, 480 companies had their shares listed on B3 across the different segments the stock exchange offers: New Market, Company Level 1, Company Level 2, Bovespa Plus, and Bovespa Plus Level 2. The special segments bind companies by different requirements of corporate governance, extras to the legal obligations public organisations already have according to the Brazilian Corporations Law (B3, 2021). In this study, the companies that had ESG scores calculated by Eikon were only part of the segments New Market, Company Level 1, and Company Level 2. The three segments cover larger companies, underlying how the organisation's size – in terms of market capitalisation – affects the disclosure of corporate sustainability information. It is also important to mention that these segments face more rigorous participation criteria.

Table 1: *Sample Business Sector Classification*

Companies' Segments	Full Sample	
	n	%
TRBC [a] Sector Classification		
Utilities	16	19.05%
Real Estate	8	9.52%
Banking and Investment Services	7	8.33%
Mineral Resources	6	7.14%
Food and Beverages	6	7.14%
Transportation	5	5.95%
Energy - Fossil Fuels	4	4.76%
Retailers	4	4.76%
Insurance	4	4.76%
Industrial Goods	3	3.57%
Telecommunications Services	3	3.57%
Applied Resources	3	3.57%
Food and Drug Retailing	2	2.38%
Industrial and Commercial Services	2	2.38%
Academic and Educational Services	2	2.38%
Cyclical Consumer Products	2	2.38%
Healthcare Services and Equipment	2	2.38%
Chemicals	1	1.19%
Investment Holding Companies	1	1.19%
Software and IT Services	1	1.19%
Personal and Household Products and Services	1	1.19%
Pharmaceuticals and Medical Research	1	1.19%
Special listing segments of B3		
New Market	56	66.67%
Level 1 Company	19	22.62%
Level 2 Company	9	10.71%
Total	84	100%

[a] The Refinitiv Business Classifications

Source: elaborated by the author

3.2 Main Variables

The independent variables of this study are ESG scores, which assess Corporate Sustainability Performance. Each ESG factor evaluation corresponds to a

different score (i.e., Environmental Score, Social Score or Governance Score) and is calculated using a set of KPIs (key performance indicators). For instance, the Environmental Score (*EScore*) is a result from 68 KPIs distributed in three categories: resource use, emissions, and innovation; the Social Score (*SScore*) evaluates metrics in the workforce, human rights, community and product responsibility categories; the Governance Score (*GScore*) assess KPIs in management, shareholders, and CSR strategy (Refinitiv, 2021). Finally, the overall ESG score (*ESGScore*) is an aggregate variable calculated by the assessment of these many environmental, social and governance items.

Following what has been done in the literature (Dalal & Thaker, 2019; Velte, 2017, 2020; Wang & Sarkis, 2017), this research will use ROA (Return over Assets), and Share Price as dependent variables. Thus, this study integrates both market and accounting-based variables. Being the most famous accounting-based variable of CFP, ROA evaluates the firms' profitability (Velte, 2017). The other CFP variable analysed in this study is the share price (*Price*), another classic financial performance metric according to Yoon et al. (2018). It is important to notice that one of the models proposed and tested in this study will also use book value per share and earnings per share as independents variables to explain the share price. Further explanation of the models will be given in the next section.

Further, in line with Choi and Wang (2009) and Velte (2017), taking into account the long-term perspective of CS, this study examined models where the variables assessing CS were lagged (i.e. CSP at time *t* compared with CFP at time *t+1*).

The study uses three control variables frequently used in the field that can affect CFP or CSP. First, this research controls for the firm's size, once there is evidence of the relationship between the variable and both CSP (Drempetic et al., 2020;

Safaeianpoor & Shoorvarzy, 2017) and CFP (Dogan, 2013; Ibhagui & Olokoyo, 2018). The influence of the firm's size on CSP can be explained by organizational legitimacy, the approach of the neo-institutional theory that recognizes how larger companies can be submitted to more pressure regarding their corporate sustainability performance (Drempetic et al., 2020). Larger companies can also be linked to economies of scale, which are difficult to replicate, and which may explain how a firm's size can impact CFP (Dogan, 2013).

Secondly, the study controls for indebtedness. Commonly calculated by the leverage ratio, previous studies found that it affects negatively the company's ROA (Garcia et al., 2017; Ibhagui & Olokoyo, 2018). Additionally, the literature highlights how size and indebtedness can shape a firm's share price (Yoon et al., 2018), the reason for both of the control variables being present in all models proposed by this study. Thirdly, the models analysing ROA will also control the companies' business sector, once different industries can implicate in different sustainability management and financial performance (Velte, 2017). All the variables considered in this study are listed in Table 2.

Table 2: *Variables Description*

Variable	Explanation	Theoretical Foundation
	Dependent Variables	
ROA	Accounting measurement of the company's profitability, calculated by the ratio of profit by assets.	Velte (2017); Garcia and Orsato (2020); Duque-Grisales and Aguilera-Caracuel (2021).
Price	Share price quoted in the capital market.	Ohlson (1995); Barth and Clinch (2009); Miralles-Quirós, Miralles-Quirós

Variable	Explanation	Theoretical Foundation
		and Gonçalves (2018); Yoon et al. (2018).
	Independent Variables	
ESGScore	Measurement of corporate sustainability (here called ESG Score) ranging from 0% to 100% based on verifiable reported information on environmental, social and governance (ESG) pillars. (Refinitiv, 2021).	
EScore	Measurement of the environmental factor ranging from 0% to 100% based on 68 KPIs calculated based on information of the firm's resource use, emissions reduction, and innovation (Refinitiv, 2021).	Velte (2017); Miralles-Quirós, Miralles-Quirós and Gonçalves (2018); Yoon et al. (2018); Garcia and Orsato (2020); Duque-Grisales and Aguilera-Caracuel (2021)
SScore	Measurement of the social factor ranged from 0% to 100% based on 62 KPIs calculated based on information of the firm's workforce, respect to human rights, commitment to the community, and product responsibility (Refinitiv, 2021).	
GScore	Measurement of the governance factor ranged from 0% to 100% based on 56 KPIs calculated based on information of the firm's management practices, CSR strategy, and shareholding (Refinitiv, 2021).	
BVPS	Book value per share, calculated by the ratio of the common shareholders' equity by the number of outstanding shares.	Ohlson (1995); Barth and Clinch (2009); Miralles-Quirós, Miralles-Quirós and Gonçalves (2018); Yoon et al. (2018).
EPS	Earnings per share, calculated by the ratio of the company's profit by the number of outstanding shares.	
	Control Variables	
SIZE	Calculated by: (1) natural logarithm of the company's total assets for model explaining *Price*; (2) natural logarithm of the firm's market capitalisation for model explaining ROA.	Velte (2017); Garcia et al. (2017); Garcia and Orsato (2020); Duque-Grisales and Aguilera-Caracuel (2021)

Variable	Explanation	Theoretical Foundation
LEV	Firm's indebtedness level, calculated by the ratio of total liabilities over total assets.	Garcia et al. (2017); Garcia and Orsato (2020).
BSEC	Firm's business' sector following The Refinitiv Business Classification (TBRC).	Velte (2017).

Source: elaborated by the author.

3.3 Regression models

Considering the objective of this research, the analysis should consider both the time series and cross-sectional dimensions. Hence, this study will use linear regressions with panel data to explore the relationship between Corporate Sustainability Performance (ESG scores) and Corporate Financial Performance (ROA and Share Price) of companies listed on the Brazilian stock exchange (B3).

The regression models will analyse the corporate sustainability performance firstly using the overall ESG score – Equations *1* and *5* -, analysing the aggregate variable, and then as individual variables of each ESG factor (i.e., environmental score, social score, and governance score – Equations *2*, *3*, *4*, *6*, *7*, and *8*). The models are described as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 ESGScore_{(i,t-1)} + \beta_2 SIZE_{1_{(i,t)}} + \beta_3 LEV_{(i,t)} + \beta_4 BSEC_{(i,t)} + \varepsilon_{(i,t)} \quad \textit{Model 1}$$

$$ROA_{i,t} = \beta_0 + \beta_1 EScore_{(i,t-1)} + \beta_2 SIZE_{1_{(i,t)}} + \beta_3 LEV_{(i,t)} + \beta_4 BSEC_{(i,t)} + \varepsilon_{(i,t)} \quad \textit{Model 2}$$

$$ROA_{i,t} = \beta_0 + \beta_1 SScore_{(i,t-1)} + \beta_2 SIZE_{1_{(i,t)}} + \beta_3 LEV_{(i,t)} + \beta_4 BSEC_{(i,t)} + \varepsilon_{(i,t)} \quad \textit{Model 3}$$

$$ROA_{i,t} = \beta_0 + \beta_1 GScore_{(i,t-1)} + \beta_2 SIZE_{1_{(i,t)}} + \beta_3 LEV_{(i,t)} + \beta_4 BSEC_{(i,t)} + \varepsilon_{(i,t)} \qquad \textit{Model 4}$$

For *Price*, this study will apply a modified version of Ohlson's accounting-based valuation model (Ohlson, 1995) proposed by Barth and Clinch (2009): the share-price specification. Investigating scale-related effects based on Ohlson's model, Barth and Clinch (2009) evaluate different regression models regarding the effectiveness at mitigating these effects. From the proposed regressions, Barth and Clinch (2009) identify that the share price specification is the model tested that mitigates the most the scale effects. The model uses book-value per share (*BVPS*) and earnings per share (*EPS*) to explain the share price (*Price*), and it is expressed by the following equation:

$$P_{(i,t)} = \alpha + \beta_1 BVPS_{(i,t)} + \beta_1 EPS_{(i,t)} + \varepsilon_{(i,t)} \qquad \textit{Ohlson's Model (1)}$$

The model associates market and accounting-based information, proposing that the market value of listed companies is a function of both the firm's financial and non-financial relevant information (Ohlson, 1995). However, it does not specify what the 'non-financial relevant information' would be. Thus, several studies analysing the CS (or CSR) value relevance have been applying the model, by considering the CS information as the non-financial information present in the model (Kaspereit & Lopatta, 2016; Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018; Yoon et al., 2018). Following the literature trend, this study will also investigate the following models:

$$P_{(i,t)} = \alpha + \beta_1 BVPS_{(i,t)} + \beta_2 EPS_{(i,t)} + \beta_3 ESGScore_{(i,t-1)} + \beta_4 SIZE_{2(i,t)} + \beta_5 LEV_{(i,t)} + \beta_6 BSEC_{(i,t)} + \varepsilon_{(i,t)}$$ *Model 5*

$$P_{(i,t)} = \alpha + \beta_1 BVPS_{(i,t)} + \beta_2 EPS_{(i,t)} + \beta_3 EScore_{(i,t-1)} + \beta_4 SIZE_{2(i,t)} + \beta_5 LEV_{(i,t)} + \beta_6 BSEC_{(i,t)} + \varepsilon_{(i,t)}$$ *Model 6*

$$P_{(i,t)} = \alpha + \beta_1 BVPS_{(i,t)} + \beta_2 EPS_{(i,t)} + \beta_3 SScore_{(i,t-1)} + \beta_4 SIZE_{2(i,t)} + \beta_5 LEV_{(i,t)} + \beta_6 BSEC_{(i,t)} + \varepsilon_{(i,t)}$$ *Model 7*

$$P_{(i,t)} = \alpha + \beta_1 BVPS_{(i,t)} + \beta_2 EPS_{(i,t)} + \beta_3 GScore_{(i,t-1)} + \beta_4 SIZE_{2(i,t)} + \beta_5 LEV_{(i,t)} + \beta_6 BSEC_{(i,t)} + \varepsilon_{(i,t)}$$ *Model 8*

For Zhao et al. (2018), panel data is an alternative for the common bias 'omitted variable', especially if the heterogeneity –or individual difference –is time-invariant. The authors explain that the problem of missing variables would not be solved by a technique considering the cross-section and time dimensions separately. By considering both dimensions, panel data frequently analyse a larger sample than these other techniques, improving the evaluation accuracy. Following Garcia and Orsato (2020), the panel data is unbalanced – i.e. not all panel members are observed in every period.

Additionally, it is worth mentioning this study used three different methods for estimating the models: pooled, fixed effects and random effects. The pooled regression model assumes constant coefficients, that is, the intercept and inclinations do not vary across the model (Garcia et al., 2017). On the other hand, fixed and random effects presuppose that the inclinations are constant, but the intercepts can differ either for each individual (individual effects) or for each unit of time (time effects).

The main difference between the random effect model and the fixed effect model is that the latter assumes that factors not included in the model are exogenous and not correlated with the regressors, whilst the fixed-effect model presupposes that the effects are normally correlated with the regressors, and can be either observable or not (Garcia et al., 2017). In other words, if the $Cov(\alpha_i, X_{it}) = 0$ –where α_i is the intercept for individual i and X_{it} is the value of the dependent variable for individual i in period t –, random effects is more efficient, and if $Cov(\alpha_i, X_{it}) \neq 0$, random effects is biased and fixed effects is more efficient (Zhao et al., 2018).

All linearity assumptions (linearity, homoscedasticity of residue, error term normal distribution, multicollinearity) were tested during the model diagnosis, following Kutner et al. (2004). Pearson correlation and adjusted R-squared were also calculated to measure the linear relationship between all variables and to evaluate how well the dependent variable variance can be explained by the variance in the independent variable, respectively. All the procedures were run in RStudio.

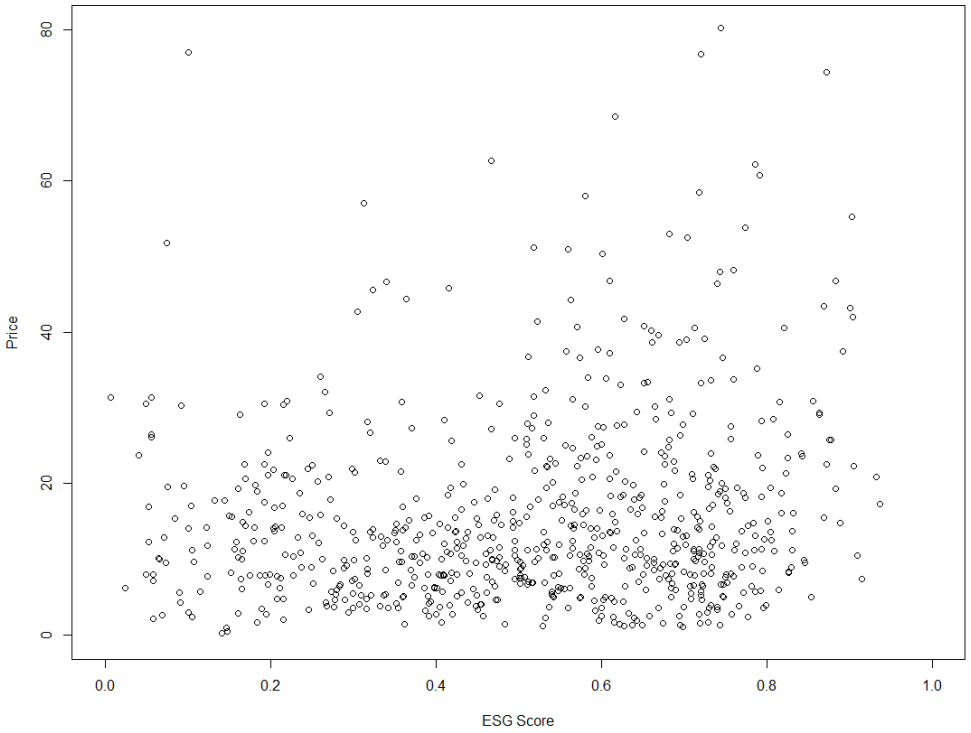
4. RESULTS AND DISCUSSION

In this section, the model's results will be presented and compared, considering the different estimation methods. Firstly, the model assumptions will be tested. Secondly, the descriptive statistics will be analysed. Finally, the regression results and statistic tests will be discussed.

4.1 Model assumptions

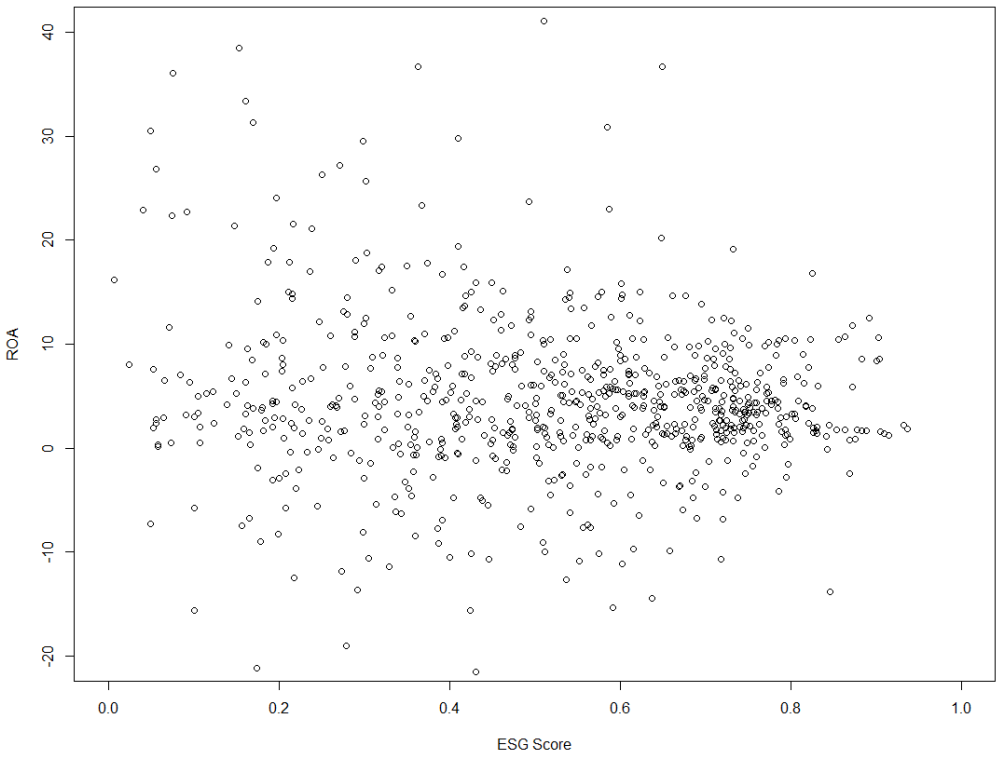
Plotting the dependent variables (*Price* and *ROA*) against the aggregate ESG Score, as in Figure 1 and 2, one does not see a clear linear relationship between the variables, as it is assumed to exist between the dependent and the independent variables in a linear regression. However, the relationship shown in the figures below does not account for the control variables and data format (panel data) that this study is analysing. Thus, the linear regression analysis is required for further understanding of the variables' relationship.

Figure 1*: Price vs ESG Score*



Source: elaborate by the author

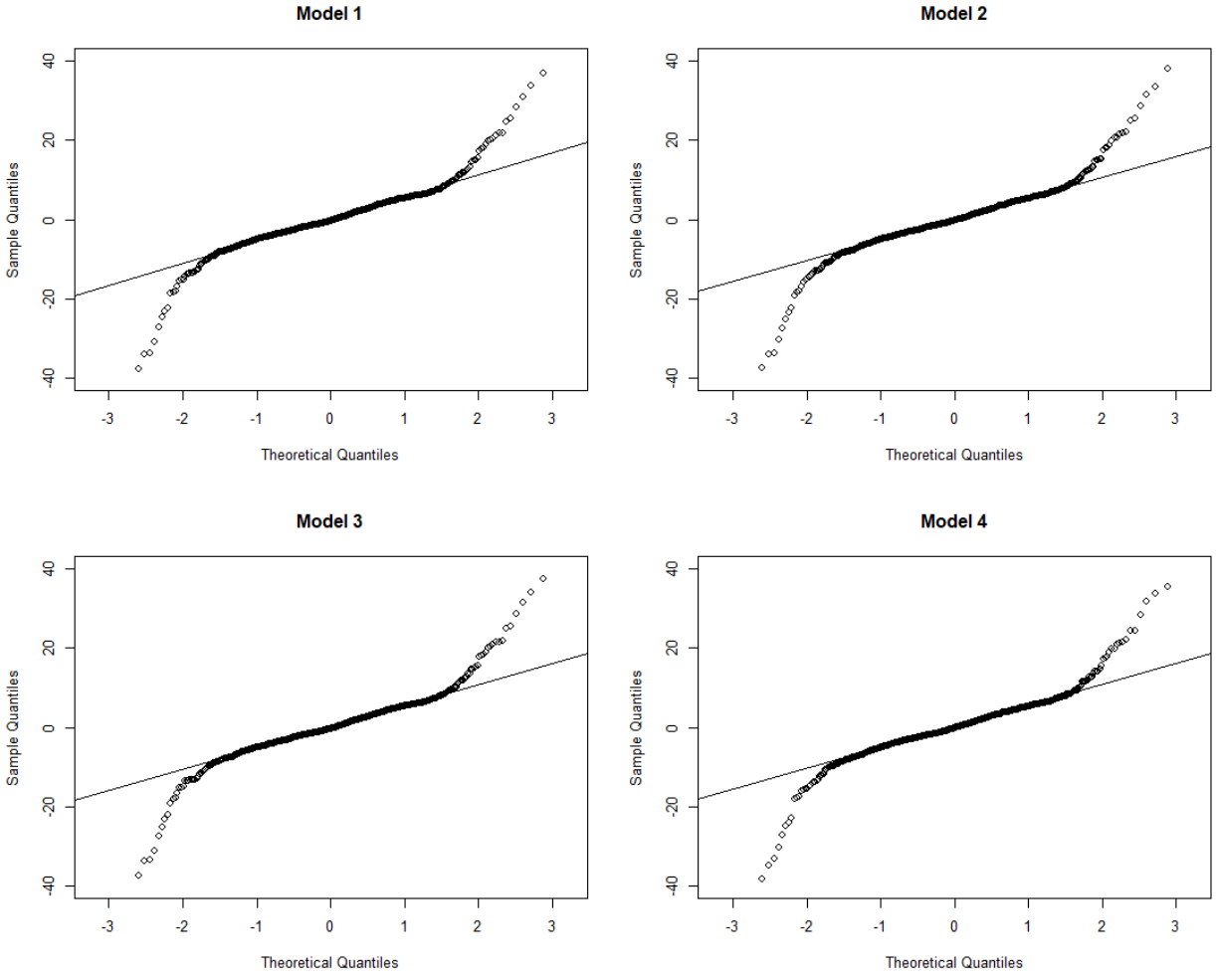
Figure 2: *ROA vs ESG Score*



Source: elaborate by the author

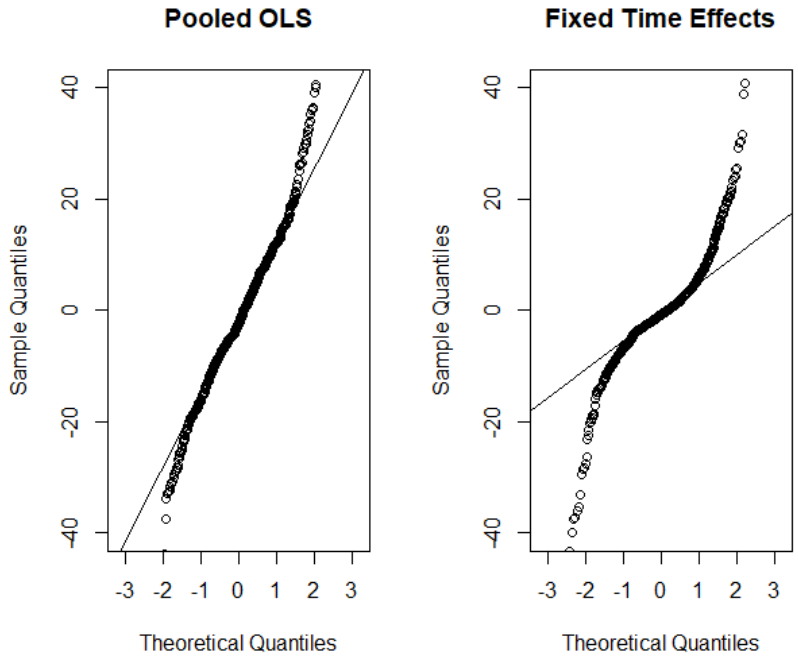
Testing for the normal distribution of the residuals, all the models being assessed presented heavy-tailed errors in their Normal Q-Q Plots, as highlighted in Figure 3 to Figure 7. Thus, this study accepts the non-normality of the models' residuals and will base the inference on the assumption of a different distribution.

Figure 3: *Normal Q-Q Plots of Models 1, 2, 3, and 4 using pooled OLS*



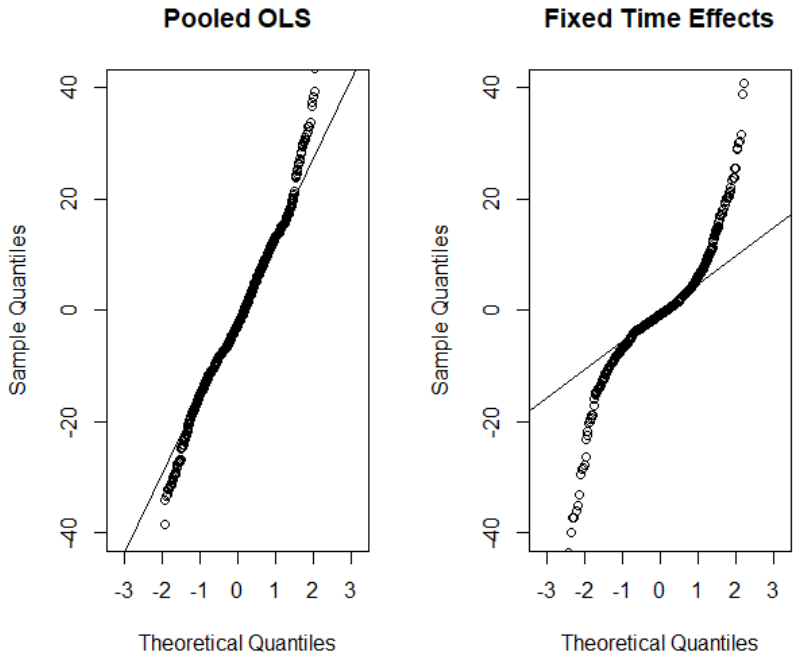
Source: elaborate by the author

Figure 4: *Normal Q-Q Plots of Models 5*



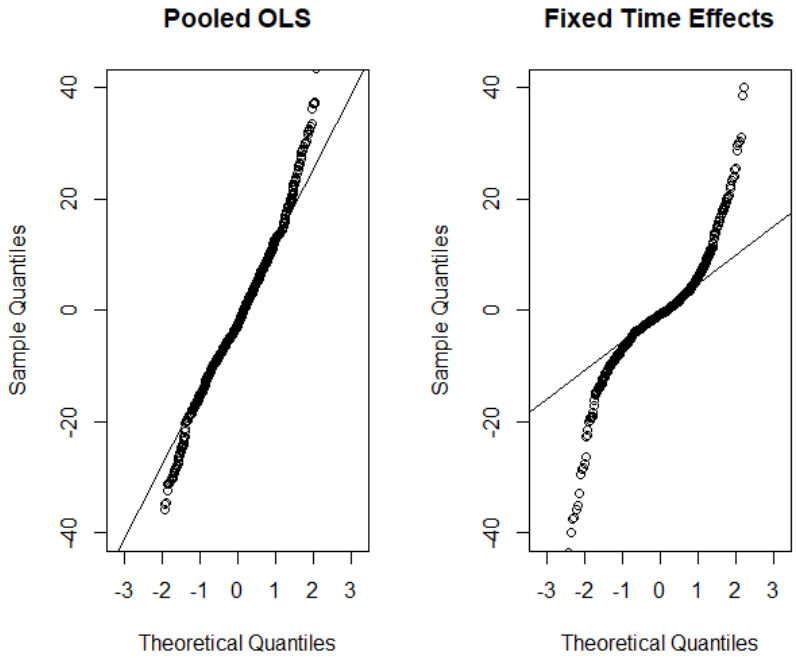
Source: elaborate by the author

Figure 5: *Normal Q-Q Plots of Models 6*



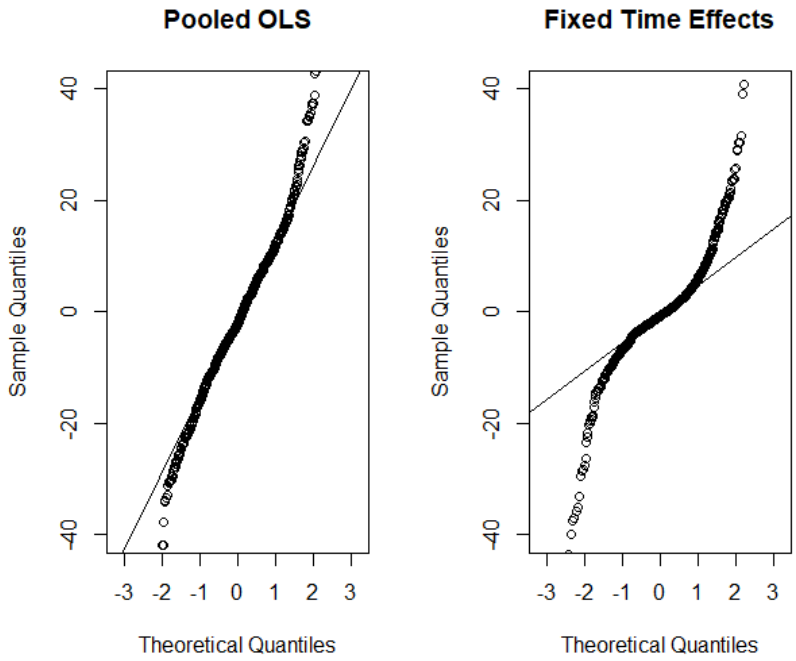
Source: elaborate by the author

Figure 6: *Normal Q-Q Plots of Models 7*



Source: elaborate by the author

Figure 7: *Normal Q-Q Plots of Models 8*



Source: elaborate by the author

Additionally, all the models yielded residuals whose means were approximately zero. The constant variance assumption will be tested in section 4.3, using the Breusch-Pagan Heteroscedasticity test.

4.2 Descriptive statistics and correlations results

Table 3 demonstrates the descriptive statistics of, and correlations results between, the independent, dependent, and control variables of this study. The descriptive statistics show a high variability for the variables *Price*, *BVPS*, and *EPS*, highlighted by their variance, standard deviation, and confidence interval's mean, a factor that will need to be taken into consideration when analysing the regression results. Similar results of variability are also found by Yoon et al. (2018). It is also worth mentioning that, differently from the literature analysed, this study works with data from a 10-year period (2011 to 2020), which explains the high volatility of the CFP metrics.

The correlations matrix offers a good indicator of how the regression models will perform. This study uses a conventional approach to Interpreting Pearson's Correlation Coefficient as described by Schober et al. (2018). Considering the models using *ROA*, the dependable variable *ROA* and the control variable *LEV* present a moderate and negative correlation. However, the correlations between *ROA* and the other model variables are weak, indicating models 1 to 4 might not represent significant strong relationships. Similar results are found in Yilmaz (2021), a study that analyses the relationship between ESG scores extracted from the Sustainalytics database and financial metrics, such as ROA, and which considers the BRICS countries from 2014 to 2018. In the study, the aggregate ESG Score presents a weak correlation with ROA, whilst the control variable leverage shows a correlation of −0.443 (Yilmaz, 2021), very similar to the −0.454 found in this study. Furthermore, the weak correlation between

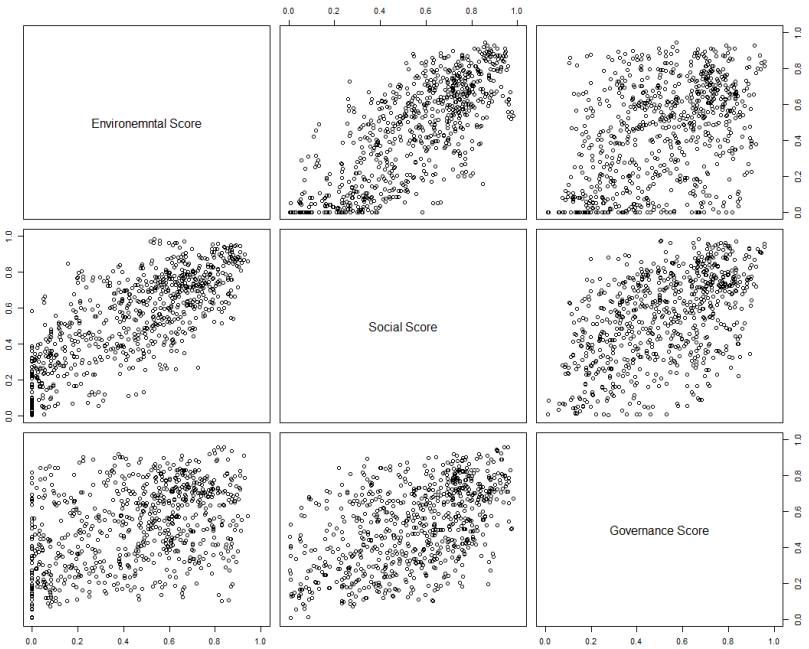
the individual ESG Scores and the aggregate ESG Scores is in agreement with the results of previous studies (Duque-Grisales & Aguilera-Caracuel, 2021; Velte, 2017).

The strong correlation between *Price* and *BVPS* indicates models 5 to 8 will generate statistically significant regression results. The correlation results, however, contradict the findings of Miralles-Quirós, Miralles-Quirós and Gonçalves (2018). The study analysed companies listed on the Brazilian Stock Exchange (B3) between 2010 and 2015 and, similarly to this study, used Ohlson's model (1995) proposed by Barth and Clinch (2009) and Eikon's database (Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018).

Despite the similarity between the studies' design, the 2018 paper presented weak correlations between the dependable variable Price and all the other variables used in the model (Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018). The difference in the results could be attributed to the smaller period analysed in the previous study or to the non-maturity of the Brazilian market for ESG practices during the period analysed. On the other hand, a study analysing the emerging market of Korea from 2010 to 2015 found a strong correlation (r=0.77) between the dependent variable Price and the independent variable BVPS (Yoon et al., 2018), corroborating the results shown in Table 3 and indicating the Korean market might have maturated first for ESG practices when compared to the Brazilian one.

Naturally, the *EScore, SScore*, and *GScore* present strong correlations with *ESGScore*, since the latter is an aggregate variable from these scores calculated separately. The strong correlation is also present in the literature (Duque-Grisales & Aguilera-Caracuel, 2021).

Figure 8: *Plot of Environmental, Social, and Governance Scores*



Source: elaborate by the author.

The correlation between individual ESG Scores has mixed results in the literature. Analysing German companies, Velte (2017) finds weak correlations between the variables (>0.5). Yoon et al. (2018), analysing the Korean market, and Miralles-Quirós, Miralles-Quirós and Gonçalves (2018), analysing the Brazilian market from a different period, all find a strong correlation between the Environmental and Social Scores, whilst the correlations between the other individual scores are found to be weak. On the other hand, analysing the BRICS countries, Yilmaz (2021) find moderate correlations between all the individual ESG Scores. In this study, as observed in Figure 8, there is a clear positive linear relationship between the Environment and the Social Score, as well as between the Social and Governance *SScore*. This relationship is confirmed by the Pearson correlation between *EScore* and *SScore* (r = 0.759) which is considered strong, and between *SScore* and *GScore* (r = 0.518), considered moderate. Thus, to avoid multicollinearity and satisfy the linear regression assumption

that the independent variables are linearly independent of each other (Poole & O'Farrell, 1971), this study assesses each score separately.

Table 3*:* *Descriptive Statistics and Correlations for Study Variables*

Panel A: Descriptive Statistics											
	n	*Min*	*Max*	*Median*	*Mean*	*1st Qu*	*3rd Qu*	*Var*	*SD*	*SE Mean*	*CI Mean*
(1) ROA	835	-98.357	139.571	3.889	4.028	0.923	7.804	143.203	11.967	0.414	0.813
(2) Price	806	0.245	2,585.966	12.472	25.655	7.387	21.499	13,838.407	117.637	4.144	8.133
(3) ESGScore	846	0.006	0.937	0.537	0.511	0.352	0.692	0.046	0.215	0.007	0.015
(4) EScore	850	0.000	0.943	0.489	0.450	0.202	0.669	0.075	0.274	0.009	0.018
(5) SScore	850	0.005	0.984	0.584	0.547	0.365	0.747	0.060	0.244	0.008	0.016
(6) GScore	850	0.009	0.958	0.530	0.519	0.337	0.707	0.050	0.224	0.008	0.015
(7) Ln (Total Assets)	837	18.336	28.334	23.527	23.672	22.800	24.430	2.372	1.540	0.053	0.104
(8) Ln (MCap)	819	16.453	26.733	23.068	22.992	22.330	23.970	2.776	1.666	0.058	0.114
(9) LEV	837	0.004	7.355	0.630	0.666	0.467	0.779	0.247	0.496	0.017	0.034
(10) BVPS	836	-761.009	2,591.502	8.585	19.713	3.992	16.451	22,018.768	148.387	5.132	10.073
(11) EPS	837	-1,073.151	285.802	0.705	-4.092	0.146	1.602	3,217.658	56.724	1.961	3.848

Panel B: Correlations											
	1	2	3	4	5	6	7	8	9	10	11
(1) ROA	1.000										
(2) Price	-0.036	1.000									
(3) ESGScore	0.034	-0.087	1.000								
(4) EScore	0.027	-0.096	0.855	1.000							
(5) SScore	0.047	-0.083	0.911	0.759	1.000						
(6) GScore	-0.037	-0.028	0.721	0.411	0.518	1.000					
(7) Ln (Total Assets)	-0.038	-0.005	0.542	0.569	0.556	0.214	1.000				
(8) Ln (MCap)	0.296	-0.048	0.379	0.364	0.375	0.164	0.549	1.000			
(9) LEV	-0.454	-0.006	-0.048	-0.009	-0.073	0.003	-0.095	-0.276	1.000		

(10) BVPS	0.037	0.863	-0.063	-0.078	-0.055	-0.021	0.056	-0.007	-0.170	1.000	
(11) EPS	0.321	-0.127	0.129	0.133	0.106	0.083	0.066	0.222	-0.109	-0.086	1.000

Note. Panel A shows the following descriptive statistics of the sample: sample size (n), minimum (min), maximum (max), median, mean, first quartile (1st Qu), third quartile (3rd Qu), variance (var), standard deviation (SD), standard error on the mean (SE mean), and confidence interval of the mean at 5% level (CI Mean). Panel B shows the s the correlation coefficients between the corporate sustainability performance (ESG Scores), corporate financial performance (ROA and Price), and control variables for the whole sample. The variables are defined in Table 2.

Source: elaborated by the author

4.3 Regression results and statistic tests

As mentioned previously, the models analysed are estimated by: (1) simple pooled OLS, (2) fixed individual effect, (3) fixed time effect, (4), random individual effect, and (5) random time effect. Thus, Table 4 and Table 5 demonstrate the panel regression results of Model 1 and Model 5, whilst Table 6, and Table 7 demonstrate the results of Models 2, 3, 4, 6, 7, and 8, highlighting the estimated coefficients, and their standard error, t-value or z-value, and p-value. Further, Table 8 presents the models' Adjusted $R^{2,}$ F-statistic, degrees of freedom, and p-value.

Table 4: *Estimated coefficients for panel data regression: Model 1*

Variable	Est.	SE	t-value z-value	p
Pooled OLS				
Intercept	-24.914	7.428	-3.354	0.001***
ESG Score	4.785	2.032	2.355	0.019*
Ln (MCap)	1.470	0.298	4.937	0.000***
LEV	-9.451	0.817	-11.567	0.000***
Applied Resources	-4.150	3.119	-1.331	0.184
Banking and Investment Services	-3.270	2.795	-1.170	0.242
Chemicals	-4.992	4.091	-1.220	0.223
Cyclical Consumer Products	3.624	3.512	1.032	0.303
Energy - Fossil Fuels	-5.840	3.004	-1.944	0.052
Food and Beverages	-3.098	2.837	-1.092	0.275
Food and Drug Retailing	-1.778	3.488	-0.510	0.610
Healthcare Services and Equipment	3.467	3.324	1.043	0.297
Industrial and Commercial Services	13.369	3.677	3.636	0.000***
Industrial Goods	-0.660	3.205	-0.206	0.837
Insurance	6.390	3.010	2.123	0.034*
Investment Holding Companies	-5.132	4.648	-1.104	0.270
Mineral Resources	-0.060	2.847	-0.021	0.983
Personal and Household Products and Services	-3.779	7.735	-0.489	0.625
Pharmaceuticals and Medical Research	-3.295	4.208	-0.783	0.434
Real Estate	-2.800	2.714	-1.032	0.303
Retailers	-2.105	2.924	-0.720	0.472

Variable	Est.	SE	t-value z-value	p
Software and IT Services	1.774	4.060	0.437	0.662
Telecommunications Services	-0.247	3.198	-0.077	0.938
Transportation	-2.477	2.845	-0.871	0.384
Utilities	-0.971	2.531	-0.384	0.701
Individual Fixed Effect				
ESG Score	4.980	2.051	2.428	0.015*
Ln (MCap)	1.468	0.312	4.709	0.000***
LEV	-9.348	0.841	-11.115	0.000***
Applied Resources	-4.329	3.130	-1.383	0.167
Banking and Investment Services	-3.358	2.810	-1.195	0.233
Chemicals	-5.160	4.106	-1.257	0.209
Cyclical Consumer Products	3.629	3.525	1.030	0.304
Energy - Fossil Fuels	-5.868	3.012	-1.948	0.052
Food and Beverages	-3.157	2.844	-1.110	0.267
Food and Drug Retailing	-1.863	3.500	-0.532	0.595
Healthcare Services and Equipment	3.385	3.332	1.016	0.310
Industrial and Commercial Services	13.201	3.687	3.580	0.000***
Industrial Goods	-0.863	3.217	-0.268	0.789
Insurance	6.470	3.017	2.144	0.032*
Investment Holding Companies	-4.916	4.671	-1.053	0.293
Mineral Resources	-0.191	2.856	-0.067	0.947
Personal and Household Products and Services	-3.478	7.779	-0.447	0.655
Pharmaceuticals and Medical Research	-3.439	4.220	-0.815	0.415
Real Estate	-2.882	2.723	-1.058	0.290
Retailers	-2.271	2.934	-0.774	0.439
Software and IT Services	1.662	4.070	0.408	0.683
Telecommunications Services	-0.268	3.207	-0.084	0.933
Transportation	-2.577	2.853	-0.903	0.367
Utilities	-1.060	2.538	-0.418	0.676
Individual Random Effect				
Intercept	-21.022	5.963	-3.526	0.000***
ESG Score	4.182	1.799	2.325	0.020*
Ln (MCap)	1.275	0.248	5.132	0.000***
LEV	-9.807	0.789	-12.424	0.000***
Fixed Time Effect				
ESG Score	0.868	4.416	0.197	0.844
Ln (MCap)	1.829	0.531	3.447	0.001**
LEV	-11.095	1.233	-8.999	0.000***

Variable	Est.	SE	t-value z-value	p
Random Time Effect				
Intercept	-22.363	7.900	-2.831	0.005**
ESG Score	3.837	2.518	1.524	0.128
Ln (MCap)	1.355	0.334	4.061	0.000***
LEV	-10.167	0.951	-10.695	0.000***

Note. This table shows the results obtained for estimates of the panel data regression parameters in (i) Ordinary Least Squares (pooled OLS), (ii) one way individual fixed- effects, (iii) one way individual random- effects, (iv) one-way time fixed-effects, and (v) one-way time random- effects. Total of 752 observations of 84 companies over a period of 10 years. Est. = Estimate. SE = Standard error. The column "t-value z-value" shows the t-value for pooled OLS and fixed-effects models, and z-values for random-effects models.

*p ≤ .05. **p < .01. ***p < 0.001.

Source: elaborated by the author.

Table 5: *Estimated coefficients for panel data regression: Model 5*

Variable	Est.	SE	t-value z-value	p
Pooled OLS				
Intercept	6.432	43.933	0.146	0.884
ESG Score	27.511	11.218	2.453	0.014*
BVPS	0.657	0.014	48.060	0.000***
EPS	-0.038	0.035	-1.088	0.277
Ln (Total Assets)	-1.123	1.865	-0.602	0.547
LEV	33.977	4.386	7.747	0.000***
Applied Resources	-6.947	17.556	-0.396	0.692
Banking and Investment Services	-9.749	16.135	-0.604	0.546
Chemicals	-12.377	21.981	-0.563	0.574
Cyclical Consumer Products	-7.090	18.343	-0.387	0.699
Energy - Fossil Fuels	-2.710	16.105	-0.168	0.866
Food and Beverages	-3.525	15.007	-0.235	0.814
Food and Drug Retailing	18.217	18.477	0.986	0.325
Healthcare Services and Equipment	2.845	17.536	0.162	0.871
Industrial and Commercial Services	-1.779	18.342	-0.097	0.923
Industrial Goods	-15.932	16.690	-0.955	0.340
Insurance	5.233	16.085	0.325	0.745
Investment Holding Companies	15.492	24.639	0.629	0.530

Variable	Est.	SE	t-value z-value	p
Mineral Resources	-19.505	15.325	-1.273	0.204
Personal and Household Products and Services	-6.026	22.283	-0.270	0.787
Pharmaceuticals and Medical Research	6.944	22.281	0.312	0.755
Real Estate	12.176	14.153	0.860	0.390
Retailers	-12.743	15.383	-0.828	0.408
Software and IT Services	-5.806	21.535	-0.270	0.788
Telecommunications Services	-6.389	17.598	-0.363	0.717
Transportation	-9.409	14.970	-0.629	0.530
Utilities	-11.227	13.458	-0.834	0.404
Fixed Individual Effects				
ESG Score	25.728	11.239	2.289	0.022*
BVPS	0.658	0.014	47.915	0.000***
EPS	-0.048	0.035	-1.364	0.173
Ln (Total Assets)	-1.425	1.884	-0.756	0.450
LEV	32.771	4.443	7.375	0.000***
Applied Resources	-6.672	17.497	-0.381	0.703
Banking and Investment Services	-8.130	16.127	-0.504	0.614
Chemicals	-10.824	21.925	-0.494	0.622
Cyclical Consumer Products	-6.474	18.280	-0.354	0.723
Energy - Fossil Fuels	-1.500	16.050	-0.093	0.926
Food and Beverages	-2.765	14.949	-0.185	0.853
Food and Drug Retailing	19.862	18.428	1.078	0.281
Healthcare Services and Equipment	2.591	17.464	0.148	0.882
Industrial and Commercial Services	-0.271	18.276	-0.015	0.988
Industrial Goods	-14.090	16.660	-0.846	0.398
Insurance	4.940	16.025	0.308	0.758
Investment Holding Companies	15.413	24.596	0.627	0.531
Mineral Resources	-18.038	15.297	-1.179	0.239
Personal and Household Products and Services	-4.886	22.216	-0.220	0.826
Pharmaceuticals and Medical Research	7.422	22.199	0.334	0.738
Real Estate	12.113	14.094	0.859	0.390
Retailers	-11.764	15.337	-0.767	0.443
Software and IT Services	-5.822	21.444	-0.272	0.786
Telecommunications Services	-5.455	17.539	-0.311	0.756
Transportation	-8.715	14.919	-0.584	0.559
Utilities	-10.566	13.411	-0.788	0.431
Random Individual Effects				
Intercept	47.974	31.724	1.512	0.130

Variable	Est.	SE	t-value z-value	p
ESG Score	18.374	9.373	1.960	0.050*
BVPS	0.663	0.013	49.188	0.000***
EPS	-0.058	0.034	-1.703	0.089
Ln (Total Assets)	-2.815	1.301	-2.163	0.031*
LEV	30.612	3.989	7.674	0.000***
Fixed Time Effects				
ESG Score	-0.012	23.537	-0.001	1.000
BVPS	0.584	0.015	38.438	0.000***
EPS	0.232	0.041	5.637	0.000***
Ln (Total Assets)	4.805	5.423	0.886	0.376
LEV	18.618	7.843	2.374	0.018*
Random Time Effects				
Intercept	45.472	31.724	1.433	0.152
ESG Score	19.161	9.396	2.039	0.041*
BVPS	0.662	0.013	49.078	0.000***
EPS	-0.055	0.034	-1.594	0.111
Ln (Total Assets)	-2.742	1.304	-2.103	0.035*
LEV	31.071	3.992	7.783	0.000***

Note. This table shows the results obtained for estimates of the panel data regression parameters in (i) Ordinary Least Squares (pooled OLS), (ii) one way individual fixed- effects, (iii) one way individual random- effects, (iv) one-way time fixed-effects, and (v) one-way time random- effects. Total of 752 observations of 84 companies over a period of 10 years. Est. = Estimate. SE = Standard error. The column “t-value z-value” shows the t-value for pooled OLS and fixed-effects models, and z-values for random-effects models.

*p ≤ .05. **p < .01. $^{***}p < 0.001$.

Source: elaborated by the author.

Table 6: *Estimated coefficients for panel data regression: Models 2, 3, and 4*

Variable	Model 2 (EScore)				Model 3 (SScore)				Model 4 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
Pooled OLS												
Intercept	-23.92	7.41	-3.23	0.00*	-24.36	7.43	-3.28	0.00**	-25.00	7.43	-3.37	0.00***
E/S/G Scores	3.04	1.57	1.94	0.05·	3.27	1.78	1.84	0.07	4.49	1.87	2.41	0.02*
Ln (MCap)	1.46	0.30	4.90	0.00***	1.48	0.30	4.95	0.00***	1.52	0.30	5.10	0.00***
LEV	-9.46	0.82	-11.54	0.00***	-9.38	0.82	-11.48	0.00***	-9.41	0.82	-11.53	0.00***
Applied Resources	-4.04	3.13	-1.29	0.20	-4.01	3.13	-1.28	0.20	-5.08	3.12	-1.63	0.10
Banking and Investment Services	-3.01	2.83	-1.06	0.29	-3.42	2.80	-1.22	0.22	-4.38	2.78	-1.58	0.12
Chemicals	-4.48	4.09	-1.10	0.27	-4.64	4.09	-1.13	0.26	-5.70	4.12	-1.38	0.17
Cyclical Consumer Products	3.74	3.52	1.06	0.29	3.78	3.53	1.07	0.28	2.34	3.52	0.66	0.51
Energy - Fossil Fuels	-5.45	3.06	-1.78	0.07	-6.35	2.99	-2.12	0.03	-7.00	2.98	-2.35	0.02*
Food and Beverages	-2.81	2.86	-0.98	0.33	-3.27	2.84	-1.15	0.25	-4.28	2.84	-1.51	0.13
Food and Drug Retailing	-1.48	3.52	-0.42	0.67	-2.05	3.49	-0.59	0.56	-2.36	3.47	-0.68	0.50
Healthcare Services and Equipment	3.89	3.34	1.16	0.24	3.33	3.33	1.00	0.32	2.71	3.33	0.81	0.42
Industrial and Commercial Services	13.45	3.69	3.65	0.00***	12.94	3.68	3.52	0.00***	13.17	3.67	3.59	0.00***
Industrial Goods	0.18	3.20	0.06	0.95	-0.78	3.23	-0.24	0.81	-1.18	3.23	-0.36	0.72
Insurance	6.35	3.03	2.09	0.04*	6.11	3.01	2.03	0.04*	5.16	2.96	1.74	0.08
Investment Holding Companies	-5.19	4.67	-1.11	0.27	-5.81	4.63	-1.25	0.21	-5.76	4.61	-1.25	0.21
Mineral Resources	0.17	2.87	0.06	0.95	-0.15	2.85	-0.05	0.96	-1.35	2.85	-0.48	0.63
Personal and Household Products [a]	-3.63	7.75	-0.47	0.64	-3.71	7.75	-0.48	0.63	-4.64	7.74	-0.60	0.55
Pharmaceuticals and Medical Research	-3.02	4.23	-0.71	0.48	-3.49	4.21	-0.83	0.41	-4.18	4.20	-1.00	0.32
Real Estate	-2.46	2.73	-0.90	0.37	-2.93	2.72	-1.08	0.28	-3.74	2.72	-1.37	0.17
Retailers	-1.72	2.92	-0.59	0.56	-1.93	2.93	-0.66	0.51	-2.50	2.94	-0.85	0.40
Software and IT Services	1.97	4.06	0.48	0.63	2.06	4.06	0.51	0.61	1.40	4.07	0.34	0.73
Telecommunications Services	-0.57	3.20	-0.18	0.86	-0.58	3.20	-0.18	0.86	-1.24	3.14	-0.39	0.69
Transportation	-2.32	2.86	-0.81	0.42	-2.61	2.85	-0.92	0.36	-3.28	2.84	-1.16	0.25
Utilities	-0.56	2.54	-0.22	0.83	-0.86	2.53	-0.34	0.74	-1.77	2.56	-0.69	0.49
Individual Fixed Effect												
E/S/G Scores	3.12	1.58	1.98	0.05*	3.37	1.79	1.88	0.06	4.71	1.89	2.49	0.01*
Ln (MCap)	1.45	0.31	4.63	0.00***	1.46	0.31	4.69	0.00***	1.52	0.31	4.88	0.00***

Variable	Model 2 (EScore)				Model 3 (SScore)				Model 4 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
LEV	-9.38	0.84	-11.12	0.00***	-9.30	0.84	-11.05	0.00***	-9.29	0.84	-11.06	0.00***
Applied Resources	-4.20	3.14	-1.34	0.18	-4.17	3.15	-1.32	0.19	-5.31	3.13	-1.69	0.09
Banking and Investment Services	-3.07	2.85	-1.08	0.28	-3.49	2.82	-1.24	0.22	-4.53	2.80	-1.62	0.11
Chemicals	-4.61	4.10	-1.12	0.26	-4.77	4.10	-1.16	0.25	-5.91	4.14	-1.43	0.15
Cyclical Consumer Products	3.73	3.54	1.05	0.29	3.77	3.54	1.06	0.29	2.29	3.53	0.65	0.52
Energy - Fossil Fuels	-5.47	3.06	-1.78	0.07	-6.40	3.00	-2.13	0.03	-7.09	2.99	-2.37	0.02*
Food and Beverages	-2.86	2.87	-0.99	0.32	-3.33	2.85	-1.17	0.24	-4.40	2.85	-1.54	0.12
Food and Drug Retailing	-1.54	3.53	-0.44	0.66	-2.13	3.50	-0.61	0.54	-2.48	3.49	-0.71	0.48
Healthcare Services and Equipment	3.81	3.35	1.14	0.26	3.25	3.34	0.97	0.33	2.60	3.34	0.78	0.44
Industrial and Commercial Services	13.29	3.70	3.59	0.00***	12.77	3.69	3.46	0.00***	12.99	3.68	3.53	0.00***
Industrial Goods	0.03	3.21	0.01	0.99	-0.96	3.24	-0.30	0.77	-1.42	3.24	-0.44	0.66
Insurance	6.41	3.04	2.11	0.04*	6.17	3.02	2.04	0.04*	5.19	2.97	1.75	0.08
Investment Holding Companies	-5.02	4.70	-1.07	0.29	-5.66	4.65	-1.22	0.22	-5.55	4.63	-1.20	0.23
Mineral Resources	0.04	2.88	0.01	0.99	-0.29	2.86	-0.10	0.92	-1.54	2.86	-0.54	0.59
Personal and Household Products [a]	-3.35	7.79	-0.43	0.67	-3.45	7.79	-0.44	0.66	-4.36	7.78	-0.56	0.58
Pharmaceuticals and Medical Research	-3.15	4.25	-0.74	0.46	-3.63	4.23	-0.86	0.39	-4.37	4.21	-1.04	0.30
Real Estate	-2.55	2.74	-0.93	0.35	-3.02	2.73	-1.11	0.27	-3.86	2.73	-1.41	0.16
Retailers	-1.86	2.93	-0.64	0.53	-2.07	2.94	-0.71	0.48	-2.69	2.95	-0.91	0.36
Software and IT Services	1.86	4.07	0.46	0.65	1.97	4.07	0.48	0.63	1.27	4.08	0.31	0.76
Telecommunications Services	-0.62	3.20	-0.19	0.85	-0.64	3.21	-0.20	0.84	-1.29	3.15	-0.41	0.68
Transportation	-2.41	2.87	-0.84	0.40	-2.71	2.86	-0.95	0.34	-3.42	2.85	-1.20	0.23
Utilities	-0.63	2.55	-0.25	0.81	-0.93	2.54	-0.37	0.71	-1.90	2.56	-0.74	0.46
Individual Random Effect												
Intercept	-20.20	5.91	-3.42	0.00***	-20.47	5.96	-3.44	0.00***	-21.36	6.05	-3.53	0.00***
E/S/G Scores	3.45	1.41	2.45	0.01*	3.00	1.59	1.89	0.06	3.27	1.75	1.86	0.06
Ln (MCap)	1.27	0.25	5.09	0.00***	1.27	0.25	5.11	0.00***	1.31	0.25	5.25	0.00***
LEV	-9.83	0.79	-12.45	0.00***	-9.74	0.79	-12.34	0.00***	-9.80	0.79	-12.39	0.00***
Fixed Time Effect												
E/S/G Scores	0.73	3.17	0.23	0.82	1.48	3.35	0.44	0.66	-1.03	3.79	-0.27	0.79
Ln (MCap)	1.83	0.53	3.45	0.00***	1.83	0.53	3.47	0.00***	1.86	0.53	3.50	0.00***
LEV	-11.10	1.23	-8.99	0.00***	-11.10	1.23	-9.04	0.00***	-11.04	1.23	-8.99	0.00***

Variable	Model 2 (EScore)				Model 3 (SScore)				Model 4 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
Random Time Effect												
Intercept	-21.60	7.85	-2.75	0.01**	-22.22	7.92	-2.81	0.01**	-22.25	7.97	-2.79	0.01**
E/S/G Scores	3.04	1.93	1.57	0.12	2.89	2.14	1.35	0.18	2.40	2.38	1.01	0.31
Ln (MCap)	1.35	0.33	4.04	0.00***	1.36	0.33	4.08	0.00***	1.38	0.33	4.13	0.00***
LEV	-10.19	0.95	-10.71	0.00***	-10.11	0.95	-10.64	0.00***	-10.13	0.95	-10.64	0.00***

Note. This table shows the results obtained for estimates of the panel data regression parameters in (i) Ordinary Least Squares (pooled OLS), (ii) one way individual fixed- effects, (iii) one way individual random- effects, (iv) one-way time fixed-effects, and (v) one-way time random- effects. Total of 752 observations of 84 companies over a period of 10 years. Est. = Estimate. SE = Standard error. The column “t-value z-value” shows the t-value for pooled OLS and fixed-effects models, and z-values for random-effects models.

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***p < 0.001.

Source: elaborated by the author.

Table 7: *Estimated coefficients for panel data regression: Models 6, 7, and 8*

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
Pooled OLS												
Intercept	11.50	44.04	0.26	0.79	7.66	44.00	0.17	0.86	-4.89	44.33	-0.11	0.91
E/S/G Scores	16.74	8.54	1.96	0.05*	18.93	9.79	1.93	0.05*	22.59	10.33	2.19	0.03*
BVPS	0.66	0.01	48.11	0.00***	0.66	0.01	48.09	0.00***	0.66	0.01	47.94	0.00***
EPS	-0.04	0.03	-1.17	0.24	-0.04	0.03	-1.15	0.25	-0.04	0.04	-1.07	0.29
Ln (Total Assets)	-1.12	1.88	-0.60	0.55	-1.01	1.87	-0.54	0.59	-0.33	1.85	-0.18	0.86
LEV	34.09	4.40	7.75	0.00***	34.47	4.38	7.87	0.00***	34.54	4.37	7.90	0.00***

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
Applied Resources	-8.22	17.57	-0.47	0.64	-6.66	17.68	-0.38	0.71	-12.47	17.45	-0.71	0.48
Banking and Investment Services	-8.75	16.40	-0.53	0.59	-10.87	16.19	-0.67	0.50	-18.31	15.94	-1.15	0.25
Chemicals	-9.60	21.98	-0.44	0.66	-10.54	21.99	-0.48	0.63	-16.85	22.23	-0.76	0.45
Cyclical Consumer Products	-6.63	18.40	-0.36	0.72	-6.06	18.44	-0.33	0.74	-13.45	18.41	-0.73	0.47
Energy - Fossil Fuels	-0.98	16.43	-0.06	0.95	-5.75	16.02	-0.36	0.72	-10.22	15.94	-0.64	0.52
Food and Beverages	-2.23	15.18	-0.15	0.88	-4.53	15.02	-0.30	0.76	-10.49	15.00	-0.70	0.48
Food and Drug Retailing	19.46	18.67	1.04	0.30	16.65	18.48	0.90	0.37	14.24	18.38	0.77	0.44
Healthcare Services and Equipment	5.01	17.60	0.28	0.78	2.25	17.57	0.13	0.90	-0.32	17.60	-0.02	0.99
Industrial and Commercial Services	-1.32	18.40	-0.07	0.94	-3.86	18.34	-0.21	0.83	-3.72	18.33	-0.20	0.84
Industrial Goods	-11.39	16.67	-0.68	0.49	-16.63	16.79	-0.99	0.32	-18.34	16.86	-1.09	0.28
Insurance	4.71	16.21	0.29	0.77	3.74	16.12	0.23	0.82	-2.12	15.82	-0.13	0.89
Investment Holding Companies	14.64	24.78	0.59	0.55	11.68	24.55	0.48	0.63	10.90	24.44	0.45	0.66
Mineral Resources	-18.56	15.52	-1.20	0.23	-20.26	15.37	-1.32	0.19	-28.16	15.28	-1.84	0.07
Personal and Household Products [a]	-5.77	22.33	-0.26	0.80	-6.25	22.32	-0.28	0.78	-9.41	22.30	-0.42	0.67
Pharmaceuticals and Medical Research	8.15	22.43	0.36	0.72	5.86	22.31	0.26	0.79	1.71	22.22	0.08	0.94
Real Estate	13.65	14.29	0.96	0.34	11.27	14.16	0.80	0.43	6.71	14.18	0.47	0.64
Retailers	-10.64	15.37	-0.69	0.49	-11.77	15.39	-0.76	0.44	-14.88	15.51	-0.96	0.34
Software and IT Services	-4.70	21.56	-0.22	0.83	-3.97	21.54	-0.18	0.85	-6.41	21.59	-0.30	0.77
Telecommunications Services	-8.77	17.58	-0.50	0.62	-8.47	17.63	-0.48	0.63	-14.38	17.14	-0.84	0.40
Transportation	-8.92	15.07	-0.59	0.55	-10.25	14.99	-0.68	0.49	-14.41	14.92	-0.97	0.33
Utilities	-8.81	13.53	-0.65	0.52	-10.44	13.49	-0.77	0.44	-16.08	13.65	-1.18	0.24
Fixed Individual Effects												
E/S/G Scores	15.89	8.53	1.86	0.06	17.65	9.78	1.81	0.07	20.64	10.40	1.98	0.05*

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
BVPS	0.66	0.01	47.99	0.00***	0.66	0.01	47.98	0.00***	0.66	0.01	47.78	0.00***
EPS	-0.05	0.04	-1.44	0.15	-0.05	0.04	-1.43	0.15	-0.05	0.04	-1.34	0.18
Ln (Total Assets)	-1.47	1.90	-0.78	0.44	-1.36	1.89	-0.72	0.47	-0.67	1.88	-0.36	0.72
LEV	32.75	4.46	7.35	0.00***	33.12	4.44	7.46	0.00***	33.35	4.43	7.52	0.00***
Applied Resources	-7.70	17.51	-0.44	0.66	-6.33	17.62	-0.36	0.72	-11.88	17.40	-0.68	0.50
Banking and Investment Services	-6.87	16.39	-0.42	0.68	-8.99	16.18	-0.56	0.58	-16.17	15.98	-1.01	0.31
Chemicals	-8.09	21.91	-0.37	0.71	-8.96	21.92	-0.41	0.68	-14.89	22.20	-0.67	0.50
Cyclical Consumer Products	-6.03	18.34	-0.33	0.74	-5.59	18.37	-0.30	0.76	-12.33	18.35	-0.67	0.50
Energy - Fossil Fuels	0.34	16.37	0.02	0.98	-4.28	15.96	-0.27	0.79	-8.53	15.90	-0.54	0.59
Food and Beverages	-1.41	15.12	-0.09	0.93	-3.66	14.96	-0.24	0.81	-9.24	14.96	-0.62	0.54
Food and Drug Retailing	21.26	18.62	1.14	0.25	18.47	18.43	1.00	0.32	16.05	18.34	0.88	0.38
Healthcare Services and Equipment	4.62	17.53	0.26	0.79	2.00	17.49	0.11	0.91	-0.29	17.53	-0.02	0.99
Industrial and Commercial Services	0.27	18.33	0.01	0.99	-2.18	18.28	-0.12	0.90	-2.12	18.27	-0.12	0.91
Industrial Goods	-9.69	16.62	-0.58	0.56	-14.61	16.76	-0.87	0.38	-16.27	16.85	-0.97	0.33
Insurance	4.53	16.14	0.28	0.78	3.51	16.05	0.22	0.83	-1.93	15.75	-0.12	0.90
Investment Holding Companies	14.65	24.73	0.59	0.55	11.69	24.49	0.48	0.63	11.04	24.40	0.45	0.65
Mineral Resources	-16.91	15.49	-1.09	0.28	-18.60	15.35	-1.21	0.23	-26.11	15.28	-1.71	0.09
Personal and Household Products [a]	-4.48	22.26	-0.20	0.84	-4.99	22.25	-0.22	0.82	-8.07	22.25	-0.36	0.72
Pharmaceuticals and Medical Research	8.74	22.34	0.39	0.70	6.47	22.23	0.29	0.77	2.50	22.15	0.11	0.91
Real Estate	13.58	14.23	0.95	0.34	11.28	14.10	0.80	0.42	7.05	14.12	0.50	0.62
Retailers	-9.72	15.32	-0.63	0.53	-10.77	15.34	-0.70	0.48	-13.69	15.48	-0.88	0.38
Software and IT Services	-4.86	21.46	-0.23	0.82	-4.13	21.44	-0.19	0.85	-6.27	21.50	-0.29	0.77
Telecommunications Services	-7.43	17.53	-0.42	0.67	-7.32	17.58	-0.42	0.68	-13.02	17.10	-0.76	0.45

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p	Est.	SE	t-value z-value	p
Transportation	-8.10	15.02	-0.54	0.59	-9.42	14.94	-0.63	0.53	-13.40	14.88	-0.90	0.37
Utilities	-8.21	13.48	-0.61	0.54	-9.78	13.43	-0.73	0.47	-15.02	13.62	-1.10	0.27
Random Individual Effects												
Intercept	51.51	31.49	1.64	0.10	49.24	31.72	1.55	0.12	49.31	32.04	1.54	0.12
E/S/G Scores	11.80	7.30	1.62	0.11	14.67	8.23	1.78	0.07	12.77	9.24	1.38	0.17
BVPS	0.66	0.01	49.16	0.00***	0.66	0.01	49.23	0.00***	0.66	0.01	49.05	0.00***
EPS	-0.06	0.03	-1.69	0.09	-0.06	0.03	-1.73	0.08	-0.06	0.03	-1.69	0.09
Ln (Total Assets)	-2.80	1.30	-2.15	0.03*	-2.82	1.30	-2.16	0.03*	-2.75	1.31	-2.11	0.04*
LEV	30.95	4.00	7.75	0.00***	30.87	3.99	7.75	0.00***	30.56	4.00	7.64	0.00***
Fixed Time Effects												
E/S/G Scores	0.36	16.72	0.02	0.98	-2.41	17.86	-0.14	0.89	1.59	20.03	0.08	0.94
BVPS	0.58	0.02	38.44	0.00***	0.58	0.02	38.44	0.00***	0.58	0.02	38.44	0.00***
EPS	0.23	0.04	5.64	0.00***	0.23	0.04	5.64	0.00***	0.23	0.04	5.64	0.00***
Ln (Total Assets)	4.78	5.41	0.88	0.38	4.84	5.34	0.91	0.37	4.72	5.43	0.87	0.38
LEV	18.59	7.84	2.37	0.02*	18.70	7.77	2.40	0.02*	18.54	7.81	2.37	0.02*
Random Time Effects												
Intercept	50.60	31.50	1.61	0.11	46.70	31.73	1.47	0.14	46.49	32.03	1.45	0.15
E/S/G Scores	11.99	7.31	1.64	0.10	15.20	8.26	1.84	0.07	13.66	9.25	1.48	0.14
BVPS	0.66	0.01	49.12	0.00***	0.66	0.01	49.11	0.00***	0.66	0.01	48.94	0.00***
EPS	-0.06	0.03	-1.65	0.10	-0.06	0.03	-1.62	0.10	-0.05	0.03	-1.57	0.12
Ln (Total Assets)	-2.78	1.30	-2.13	0.03*	-2.74	1.30	-2.10	0.04*	-2.67	1.31	-2.04	0.04*
LEV	31.13	4.00	7.79	0.00***	31.37	3.99	7.87	0.00***	31.03	4.01	7.75	0.00***

Note. This table shows the results obtained for estimates of the panel data regression parameters in (i) Ordinary Least Squares (pooled OLS), (ii) one way individual fixed- effects, (iii) one way individual random- effects, (iv) one-way time fixed-effects, and (v) one-way time random- effects. Total of 743 observations

of 84 companies over a period of 10 years. Est. = Estimate. SE = Standard error. The column “t-value z-value” shows the t-value for pooled OLS and fixed-effects models, and z-values for random-effects models.

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***p < 0.001.

Source: elaborated by the author.

Table 8: *Panel data regression results*

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Pooled								
Adjusted R^2	0.29	0.29	0.29	0.29	0.77	0.77	0.77	0.77
F-statistic	13.77	13.67	13.64	13.79	95.44	95.07	95.05	95.23
df	24; 727	24; 727	24; 727	24; 727	26; 716	26; 716	26; 716	26; 716
p-value	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Fixed Individual Effects								
Adjusted R^2	0.28	0.28	0.28	0.28	0.77	0.77	0.77	0.77
F-statistic	13.54	13.43	13.40	13.56	95.31	95.00	94.97	95.08
df	24; 718	24; 718	24; 718	24; 718	26; 707	26; 707	26; 707	26; 707
p-value	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Random Individual Effects								
Adjusted R^2	0.24	0.24	0.24	0.24	0.77	0.77	0.77	0.77
Chi^2	239.26	240.04	236.84	236.72	2,483.39	2,469.30	2,480.80	2,475.58
df	3.00	3.00	3.00	3.00	5.00	5.00	5.00	5.00
p-value	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Fixed Time Effects								
Adjusted R^2	0.02	0.02	0.02	0.02	0.73	0.73	0.73	0.73

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
F-statistic	32.93	32.94	32.99	32.94	417.03	417.03	417.04	417.03
df	3; 666	3; 666	3; 666	3; 666	5; 655	5; 655	5; 655	5; 655
p-value	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Random Time Effects								
Adjusted R^2	0.17	0.17	0.17	0.17	0.77	0.77	0.77	0.77
Chi^2	158.90	159.24	157.82	157.01	2,470.46	2,464.12	2,467.11	2,461.90
df	3.00	3.00	3.00	3.00	5.00	5.00	5.00	5.00
p-value	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***

Note. This table shows the results obtained for estimates of the unbalanced panel data regression parameters in (i) Ordinary Least Squares (pooled OLS), (ii) one way individual fixed- effects, (iii) one way individual random- effects, (iv) one-way time fixed- effects, and (v) one-way time random- effects. Total of 752 observations for models 1, 2, 3, and 4, and 743 for models 5,6, 7, and 8.

$^{***}p < 0.001$.

Source: elaborated by the author

For assessing the estimation models, this study used: (i) the F test and the Breusch-Pagan Lagrange Multiplier Test to assess the significance of individual and time effects in the model; (ii) the Hausman Test to evaluate the consistency of random effects models and fixed effects models; and (iii) the Breusch-Pagan Lagrange Multiplier Test to assess the significance of random effects and pooled OLS. Table 9 presents the results from these tests and a brief interpretation of each result.

As demonstrated in Table 9, according to the tests performed, the four models using *ROA* as an independent variable would be better estimated by a simple pooled OLS regression. Despite the indication of a significant time effect by the F-test and Lagrange Multiplier Test (Breusch-Pagan) for time effects, the Hausman Test indicated the fixed effect model was inconsistent, highlighting the unobservable effects were not correlated with the included variables in the model. Following the Hausman Test, the Breusch-Pagan Lagrange Multiplier Test for random effects did not detect significant random effects in the model, concluding the pooled regression would be the best fit for the model.

Similarly to what happened in the models using *ROA*, the models using Price as an independent variable did not present significant individual effect but demonstrated significant time effect based on the F-tests and Breusch-Pagan Lagrange Multiplier Tests performed. Differently from the previous models, models 5, 6, 7, and 8 could be consistently estimated by the fixed time effect model, according to the Hausman test. Further, the Hausman test applied to the Price models considering individual effects ruled out the use of the fixed-effect model, and the Breusch-Pagan Lagrange Multiplier Test for random effects did not detect significant random effects in the model.

Table 9*: Tests*

Test	F value / Chi sq	df	p-value	Result interpretation
Panel A: Model 1				
F test for individual effects	0.633	9 and 718	0.769	No evidence of significant individual effects
F test for time effects	2.603	61 and 666	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	0.877	1.000	0.349	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	23.049	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	3.218	3.000	0.359	Fixed effects model is inconsistent
Hausman Test using time effects	3.267	3.000	0.352	Fixed effects model is inconsistent
Lagrange Multiplier Test (Breusch-Pagan) for random effects	0.877	1.000	0.349	No evidence of significant random effects
Panel A: Model 2				
F test for individual effects	0.609	9 and 718	0.790	No evidence of significant individual effects
F test for time effects	2.636	61 and 666	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	0.962	1.000	0.327	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	24.277	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	2.414	3.000	0.491	Fixed effects model is inconsistent
Hausman Test using time effects	3.475	3.000	0.324	Fixed effects model is inconsistent

Test	F value / Chi sq	df	p-value	Result interpretation
Lagrange Multiplier Test (Breusch-Pagan) for random effects	0.962	1.000	0.327	No evidence of significant random effects
Panel B: Model 3				
F test for individual effects	0.608	9 and 718	0.791	No evidence of significant individual effects
F test for time effects	2.647	61 and 666	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	0.952	1.000	0.329	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	24.695	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	2.639	3.000	0.451	Fixed effects model is inconsistent
Hausman Test using time effects	3.106	3.000	0.376	Fixed effects model is inconsistent
Lagrange Multiplier Test (Breusch-Pagan) for random effects	0.952	1.000	0.329	No evidence of significant random effects
Panel D: Model 4				
F test for individual effects	0.642	9 and 718	0.762	No evidence of significant individual effects
F test for time effects	2.600	61 and 666	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	0.841	1.000	0.359	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	21.756	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	5.985	3.000	0.112	Fixed effects model is inconsistent
Hausman Test using time effects	3.659	3.000	0.301	Fixed effects model is inconsistent

Test	F value / Chi sq	df	p-value	Result interpretation
Lagrange Multiplier Test (Breusch-Pagan) for random effects	0.841	1.000	0.359	No evidence of significant random effects
Panel E: Model 5				
F test for individual effects	1.401	11 and 705	0.168	No evidence of significant individual effects
F test for time effects	3.153	63 and 653	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	1.429	1.000	0.232	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	17.631	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	5.712	5.000	0.335	Fixed effects model is inconsistent
Hausman Test using time effects	346.850	5.000	0.000**	Random effects model is inconsistent
Lagrange Multiplier Test (Breusch-Pagan) for random effects	1.429	1.000	0.232	No evidence of significant random effects
Panel F: Model 6				
F test for individual effects	1.724	9 and 707	0.080	No evidence of significant individual effects
F test for time effects	3.308	61 and 655	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	1.630	1.000	0.202	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	18.211	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	4.486	5.000	0.482	Fixed effects model is inconsistent
Hausman Test using time effects	291.570	5.000	0.000**	Random effects model is inconsistent

Test	F value / Chi sq	df	p-value	Result interpretation
Lagrange Multiplier Test (Breusch-Pagan) for random effects	1.630	1.000	0.202**	No evidence of significant random effects
Panel G: Model 7				
F test for individual effects	1.712	9 and 707	0.083	No evidence of significant individual effects
F test for time effects	3.146	70 and 646	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	1.591	1.000	0.207	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	18.112	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	4.422	5.000	0.490	Fixed effects model is inconsistent
Hausman Test using time effects	289.100	5.000	0.000**	Random effects model is inconsistent
Lagrange Multiplier Test (Breusch-Pagan) for random effects	1.591	1.000	0.207	No evidence of significant random effects
Panel H: Model 8				
F test for individual effects	1.672	9 and 707	0.092	No evidence of significant individual effects
F test for time effects	3.290	61 and 655	0.000**	Evidence of significant time effects
Lagrange Multiplier Test (Breusch-Pagan) for individual effects	1.396	1.000	0.238	No evidence of significant individual effects
Lagrange Multiplier Test (Breusch-Pagan) for time effects	18.462	1.000	0.000**	Evidence of significant time effects
Hausman Test using individual effects	6.703	5.000	0.244	Fixed effects model is inconsistent
Hausman Test using time effects	355.930	5.000	0.000**	Random effects model is inconsistent

Test	F value / Chi sq	df	p-value	Result interpretation
Lagrange Multiplier Test (Breusch-Pagan) for random effects	1.396	1.000	0.238	No evidence of significant random effects

[a] For F tests, consider F value. For all the other tests (Lagrange Multiplier Tests and Hausman Test) consider chi squared.

[**]$p < 0.01$.

Source: elaborated by the author.

Therefore, this study will focus on analysing models 1, 2, 3, and 4 estimated by pooled OLS and models 5, 6, 7, and 8 estimated by pooled and fixed time effects. For the models explaining *ROA* and estimated by pooled OLS, Model 2 and Model 3 presented similar results. Despite the models not demonstrating significance for their individual ESG Score (*EScore* and *SScore*, respectively), their *Intercept, Ln (MCap),* and *LEV*, were statistically significant, as well as the business sectors *Industrial and Commercial Services*, and *Insurance*.

Model 1 also presented significance for all these variables, but this time, contributing to the finding of Velte (2017) and Yilmaz (2021), the aggregate variable ESG Score was positively significant related to *ROA*. Model 4 also had a significant ESG Score (specifically, the Governance Score) accompanied by *Ln (MCap)*, LEV, and *Industrial and Commercial Services*. The model also presented significance for the business sector *Energy - Fossil Fuels*. Additionally, from all the significant coefficients, the estimated Intercept and *LEV* were the only ones negatively related to *ROA* in all four models.

On the other hand, all the models estimated by pooled OLS with *Price* as their dependent variable presented significant ESG Scores (both as an aggregate score and individually), besides also being significant for *BVPS* and *LEV*, as already predicted by the Correlation Matrix in the previous section. These same models estimated by fixed time effects were significant for *BVPS*, *EPS*, and *LEV*. All the significant coefficients estimated are positively related to Price in models 5 to 6. The positive relationship between the ESG Scores and Price follows the literature findings of Miralles-Quirós, Miralles-Quirós and Gonçalves (2018) and Yoon et al. (2018).

The models with the dependent variable *ROA* presented a small adjusted R squared (0.29 estimated by OLS), indicating the model cannot explain more than 29%

of ROA's variability. The result corroborates the findings of Yilmaz (2021) ($R^2_{Adjusted}$ = 0.2872), and for the author the result did indicate that the ESG Score has a significant and positive impact on the profitability metric (i.e., ROA). Also examining the relationship between ROA and ESG Score, Velte (2020) reported an adjusted R squared of 0.217 and postulated a positively and significantly relationship. Similarly, other authors report a positively and significantly relationship between ROA and the total ESG Score with adjusted R squared smaller or equal to 31% (Bahaaeddin Ahmed & Hamdan, 2020; Brogi & Lagasio, 2019; Buallay, 2019). Following the literature, this study confirms the positive relationship between ESG and ROA, whilst acknowledging the room for improvement in Models 1 to 4.

On the other hand, the models explaining the variable Price were strongly statistically significant, presenting an adjusted R squared of 0.77 when estimated by OLS and 0.73 when estimated by time fixed effects. It is worth mentioning that the adjusted R squared for the models explaining *Price* obtained in this study is superior to previous studies using the Ohlson (1995) modified model (Ionescu et al., 2019; Miralles-Quirós, Miralles-Quirós, & Gonçalves, 2018; Yoon et al., 2018), which could be explained by the long term approach used in this study that lead to the analysis of a period of 10 years.

The absence of significant ESG Scores in the models 5 to 8 estimated by time fixed effects, highlights that the CSRP would not be linked to the Corporate Financial Performance in this case. However, the higher adjusted R squared obtained when the same models were estimated by a simple pooled regression indicates that the ESG Scores (and thus, the Corporate Sustainability Performance) are indeed linked to the company's financial performance in the stock market.

The tests' results shown in Table 9 together with the higher adjusted R squared indicate the pooled OLS should also be more appropriate for the models explaining *Price* in this study. This means the variables used in Models 5, 6, 7, and 8 are comprehensive enough to capture all relevant characteristics of the individuals analysed, which makes it possible to ignore the explanatory variables unobserved in the models.

Following the analysis of the results presented, all the variables used in the models were tested with the Augmented Dickey-Fuller Test, which produced in all cases a p-value smaller than 0.01, indicating the panel data is stationary, and confirming the assumption of time constant attributes for the models estimated in OLS.

Additionally, this study used the Pesaran (2021) test to examine cross-sectional dependence in the panel data. The test is adaptable to unbalanced panels and fits samples with large N and small T, characteristics that match this study's sample. As seen in Table 10, all the models estimated by pooled OLS present cross-sectional dependence, once the p-value is <0.001, and the null hypothesis (cross-sectional independence) is rejected. This can be attributed to common factors that affect all the variables and are not accounted for in the models (Henningsen & Henningsen, 2019), and indicates the estimated standard error for those models might not be consistent. Furthermore, the present cross-sectional dependence is aligned with the partial correlation previously described in section 4.2 and should be considered for further studies. However, models 5 to 8 when estimated by fixed time effects do not present cross-sectional dependence.

Table 10: *Pesaran cross-sectional dependence test*

Models	z	p-value
Pooled OLS		
Model 1	10.94	0.00***
Model 2	11.05	0.00***
Model 3	11.14	0.00***
Model 4	10.81	0.00***
Model 5	7.08	0.00***
Model 6	7.03	0.00***
Model 7	7.04	0.00***
Model 8	7.16	0.00***
Fixed time effects		
Model 5	-1.31	0.19
Model 6	-1.30	0.19
Model 7	-1.32	0.19
Model 8	-1.30	0.20

***p < 0.001.

Source: elaborated by the author.

Table 11: *Breusch-Godfrey/Wooldridge test for serial correlation in panel models*

Models	Chi sq	p-value
Pooled OLS		
Model 1	49.06	0.82
Model 2	50.48	0.78
Model 3	50.53	0.78
Model 4	46.83	0.87
Model 5	23.31	1.00
Model 6	22.39	1.00
Model 7	23.03	1.00
Model 8	22.55	1.00
Fixed Time Effects		
Model 5	18.44	1.00
Model 6	18.43	1.00
Model 7	18.35	1.00
Model 8	18.46	1.00

Note. For models 1, 2, 3, and 4, df = 59. For models 5, 6, 7, and 8, df = 58.

Source: elaborated by the author.

For testing serial correlation, the Breusch-Godfrey/Wooldridge test (Breusch, 1978; Godfrey, 1978; Wooldridge, 2010) was used, as demonstrated in Table 11. Since all the p-values are larger than 0.05, the null hypothesis is adopted, that is, no serial correlation is present in the models analysed.

Testing for multicollinearity, generalized variance-inflation factors (GVIF) were calculated for all the models estimated by pooled OLS, following Fox and Monette (1992). As suggested by the authors, the test also adjusts for the dimension of the confidence ellipsoid using the equation $GVIF^{1/(2\times df)}$, resulting in GVIF approximately to 1. The biggest GVIF found after adjustment was 1.4481, referent to the variable Size of Model 6. This result indicates there is no relevant multicollinearity present in the models.

Furthermore, the Breusch and Pagan (1979) test was used to check for heteroscedasticity, as demonstrated in Table 12. Since all models reject the null hypothesis of homoscedasticity, it remains that heteroscedasticity is present across all the models, highlighting the constant variance assumption mentioned previously in section 4.1 was not satisfied in the panel models.

Table 12: *Breusch-Pagan Heteroscedasticity test*

Models	BP	p-value
Pooled OLS		
Model 1	3,696.70	0.00***
Model 2	3,653.10	0.00***
Model 3	3,650.60	0.00***
Model 4	3,734.80	0.00***
Model 5	20,594.00	0.00***
Model 6	20,390.00	0.00***
Model 7	20,421.00	0.00***
Model 8	20,513.00	0.00***
Fixed time effects		

Models	BP	p-value
Model 5	20,594.00	0.00***
Model 6	20,390.00	0.00***
Model 7	20,421.00	0.00***
Model 8	20,513.00	0.00***

***p < 0.001.

Source: elaborated by the author.

In this context, aiming to control for heteroscedasticity, the White (1980) estimator was used to generate new coefficients that considered the effect of the leverage points in the models. This was done following the Long and Ervin (2000) HC3 estimator, derived from White's.

Table 13: *Heteroskedasticity-consistent estimators for Model 1 estimated by Pooled OLS*

Variable	Est.	SE	t-value	p
Intercept	-24.914	14.749	-1.689	0.092
ESG Score	4.785	1.032	4.638	0.000***
Ln (MCap)	1.470	0.679	2.165	0.031*
LEV	-9.451	2.398	-3.941	0.000***
Applied Resources	-4.150	1.343	-3.091	0.002**
Banking and Investment Services	-3.270	2.295	-1.425	0.155
Chemicals	-4.992	1.810	-2.759	0.006*
Cyclical Consumer Products	3.624	3.389	1.069	0.285
Energy - Fossil Fuels	-5.840	4.355	-1.341	0.180
Food and Beverages	-3.098	2.070	-1.497	0.135
Food and Drug Retailing	-1.778	1.806	-0.984	0.325
Healthcare Services and Equipment	3.467	1.552	2.234	0.026*
Industrial and Commercial Services	13.369	2.301	5.811	0.000***
Industrial Goods	-0.660	1.667	-0.396	0.692
Insurance	6.390	1.957	3.265	0.001**
Investment Holding Companies	-5.132	5.722	-0.897	0.370
Mineral Resources	-0.060	2.035	-0.029	0.977
Personal and Household Products [a]	-3.779	2.549	-1.483	0.139

Variable	Est.	SE	t-value	p
Pharmaceuticals and Medical Research	-3.295	1.814	-1.816	0.070
Real Estate	-2.800	2.829	-0.990	0.323
Retailers	-2.105	1.612	-1.306	0.192
Software and IT Services	1.774	1.768	1.004	0.316
Telecommunications Services	-0.247	1.919	-0.129	0.897
Transportation	-2.477	1.637	-1.513	0.131
Utilities	-0.971	1.938	-0.501	0.616

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***p < 0.001.

Source: elaborated by the author

Table 14: *Heteroskedasticity-consistent estimators for Model 5*

Variable	Est.	SE	t-value	p
Pooled OLS				
Intercept	6.432	32.678	0.197	0.844
E/S/G Scores	27.511	7.563	3.637	0.000***
BVPS	0.657	0.150	4.372	0.000***
EPS	-0.038	0.230	-0.165	0.869
Ln (Total Assets)	-1.123	1.622	-0.693	0.489
LEV	33.977	8.825	3.850	0.000***
Applied Resources	-6.947	2.946	-2.358	0.019*
Banking and Investment Services	-9.749	3.669	-2.657	0.008**
Chemicals	-12.377	2.961	-4.181	0.000***
Cyclical Consumer Products	-7.090	5.008	-1.416	0.157
Energy - Fossil Fuels	-2.710	3.124	-0.867	0.386
Food and Beverages	-3.525	2.338	-1.507	0.132
Food and Drug Retailing	18.217	3.790	4.807	0.000***
Healthcare Services and Equipment	2.845	4.539	0.627	0.531
Industrial and Commercial Services	-1.779	2.091	-0.851	0.395
Industrial Goods	-15.932	2.305	-6.912	0.000***
Insurance	5.233	1.958	2.673	0.008**
Investment Holding Companies	15.492	7.448	2.080	0.038*
Mineral Resources	-19.505	5.097	-3.827	0.000***
Personal and Household Products [a]	-6.026	3.461	-1.741	0.082
Pharmaceuticals and Medical Research	6.944	2.524	2.751	0.006**
Real Estate	12.176	12.544	0.971	0.332

Variable	Est.	SE	t-value	p
Pooled OLS				
Retailers	-12.743	3.303	-3.858	0.000***
Software and IT Services	-5.806	3.489	-1.664	0.097
Telecommunications Services	-6.389	2.820	-2.266	0.024*
Transportation	-9.409	2.070	-4.546	0.000***
Utilities	-11.227	2.070	-5.423	0.000***
Fixed Time Effects				
E/S/G Scores	-0.012	8.501	-0.002	0.999
BVPS	0.584	0.110	5.286	0.000***
EPS	0.232	0.288	0.806	0.421
Ln (Total Assets)	4.805	3.203	1.500	0.134
LEV	18.618	10.005	1.861	0.063

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***$p < 0.001$.

Source: elaborated by the author.

Table 15: *Heteroskedasticity-consistent estimators for Models 2, 3, and 4 estimated by Pooled OLS*

Variable	Model 2 (EScore)				Model 3 (SScore)				Model 4 (GScore)			
	Est.	SE	t-value	p	Est.	SE	t-value	p	Est.	SE	t-value	P
Intercept	-23.92	14.77	-1.62	0.11	-24.36	14.82	-1.64	0.10	-25.00	14.86	-1.68	0.09
ESG Score	3.04	0.67	4.58	0.00***	3.27	0.75	4.39	0.00***	4.49	1.01	4.47	0.00***
Ln (MCap)	1.46	0.67	2.17	0.03**	1.48	0.68	2.18	0.03*	1.52	0.68	2.22	0.03*
LEV	-9.46	2.40	-3.94	0.00***	-9.38	2.40	-3.90	0.00***	-9.41	2.42	-3.89	0.00***
Applied Resources	-4.04	1.32	-3.07	0.00***	-4.01	1.37	-2.92	0.00***	-5.08	1.36	-3.73	0.00***
Banking and Investment Services	-3.01	2.32	-1.30	0.20	-3.42	2.30	-1.48	0.14	-4.38	2.32	-1.88	0.06
Chemicals	-4.48	1.80	-2.49	0.01**	-4.64	1.79	-2.59	0.01**	-5.70	1.68	-3.38	0.00***
Cyclical Consumer Products	3.74	3.38	1.11	0.27	3.78	3.43	1.10	0.27	2.34	3.65	0.64	0.52
Energy - Fossil Fuels	-5.45	4.30	-1.27	0.20	-6.35	4.36	-1.46	0.15	-7.00	4.34	-1.61	0.11
Food and Beverages	-2.81	2.06	-1.37	0.17	-3.27	2.12	-1.54	0.12	-4.28	2.17	-1.97	0.05*
Food and Drug Retailing	-1.48	1.79	-0.83	0.41	-2.05	1.88	-1.09	0.28	-2.36	1.79	-1.32	0.19
Healthcare Services and Equipment	3.89	1.52	2.56	0.01**	3.33	1.57	2.13	0.03*	2.71	1.47	1.84	0.07
Industrial and Commercial Services	13.45	2.24	6.01	0.00***	12.94	2.36	5.48	0.00***	13.17	2.28	5.77	0.00***
Industrial Goods	0.18	1.53	0.12	0.91	-0.78	1.64	-0.47	0.64	-1.18	1.72	-0.69	0.49
Insurance	6.35	1.99	3.18	0.00***	6.11	2.00	3.06	0.00***	5.16	1.99	2.60	0.01**
Investment Holding Companies	-5.19	5.70	-0.91	0.36	-5.81	5.67	-1.03	0.31	-5.76	5.75	-1.00	0.32
Mineral Resources	0.17	2.00	0.09	0.93	-0.15	2.04	-0.08	0.94	-1.35	2.07	-0.65	0.51
Personal and Household Products [a]	-3.63	2.53	-1.44	0.15	-3.71	2.53	-1.47	0.14	-4.64	2.59	-1.79	0.07
Pharmaceuticals and Medical Research	-3.02	1.87	-1.62	0.11	-3.49	1.84	-1.89	0.06	-4.18	1.84	-2.27	0.02
Real Estate	-2.46	2.80	-0.88	0.38	-2.93	2.89	-1.02	0.31	-3.74	2.96	-1.26	0.21
Retailers	-1.72	1.54	-1.12	0.26	-1.93	1.58	-1.22	0.22	-2.50	1.61	-1.55	0.12
Software and IT Services	1.97	1.68	1.17	0.24	2.06	1.73	1.20	0.23	1.40	1.81	0.77	0.44

Variable	Model 2 (EScore)				Model 3 (SScore)				Model 4 (GScore)			
	Est.	SE	t-value	p	Est.	SE	t-value	p	Est.	SE	t-value	P
Telecommunications Services	-0.57	2.04	-0.28	0.78	-0.58	1.99	-0.29	0.77	-1.24	2.05	-0.60	0.55
Transportation	-2.32	1.61	-1.44	0.15	-2.61	1.69	-1.55	0.12	-3.28	1.72	-1.91	0.06
Utilities	-0.56	1.91	-0.29	0.77	-0.86	1.93	-0.44	0.66	-1.77	1.95	-0.90	0.37

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***$p < 0.001$.

Source: elaborated by the author.

Table 16: *Heteroskedasticity-consistent estimators for Models 6, 7, and 8*

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value	p	Est.	SE	t-value	p	Est.	SE	t-value	p
Pooled OLS												
Intercept	11.50	33.80	0.34	0.73	7.66	33.10	0.23	0.82	-4.89	32.54	-0.15	0.88
E/S/G Scores	16.74	4.03	4.16	0.00***	18.93	4.93	3.84	0.00***	22.59	8.74	2.58	0.01**
BVPS	0.66	0.15	4.37	0.00***	0.66	0.15	4.36	0.00***	0.66	0.15	4.37	0.00***
EPS	-0.04	0.23	-0.18	0.86	-0.04	0.23	-0.18	0.86	-0.04	0.23	-0.16	0.87
Ln (Total Assets)	-1.12	1.68	-0.67	0.50	-1.01	1.60	-0.63	0.53	-0.33	1.56	-0.21	0.83
LEV	34.09	8.88	3.84	0.00***	34.47	8.97	3.84	0.00***	34.54	8.92	3.87	0.00***
Applied Resources	-8.22	2.78	-2.96	0.00***	-6.66	2.90	-2.29	0.02*	-12.47	3.13	-3.98	0.00***
Banking and Investment Services	-8.75	3.74	-2.34	0.02**	-10.87	3.58	-3.04	0.00***	-18.31	4.15	-4.41	0.00***
Chemicals	-9.60	2.67	-3.59	0.00***	-10.54	2.65	-3.98	0.00***	-16.85	4.55	-3.71	0.00***
Cyclical Consumer Products	-6.63	4.71	-1.41	0.16	-6.06	5.08	-1.19	0.23	-13.45	4.01	-3.35	0.00***
Energy - Fossil Fuels	-0.98	3.32	-0.29	0.77	-5.75	2.69	-2.14	0.03*	-10.22	2.82	-3.62	0.00***
Food and Beverages	-2.23	2.36	-0.95	0.34	-4.53	2.53	-1.79	0.07	-10.49	4.22	-2.49	0.01**

Variable	Model 6 (EScore)				Model 7 (SScore)				Model 8 (GScore)			
	Est.	SE	t-value	p	Est.	SE	t-value	p	Est.	SE	t-value	p
Food and Drug Retailing	19.46	3.71	5.24	0.00***	16.65	3.65	4.56	0.00***	14.24	4.37	3.26	0.00***
Healthcare Services and Equipment	5.01	4.54	1.10	0.27	2.25	4.52	0.50	0.62	-0.32	3.78	-0.08	0.93
Industrial and Commercial Services	-1.32	2.35	-0.56	0.57	-3.86	2.33	-1.65	0.10	-3.72	2.70	-1.38	0.17
Industrial Goods	-11.39	1.72	-6.61	0.00***	-16.63	2.43	-6.86	0.00***	-18.34	3.54	-5.18	0.00***
Insurance	4.71	1.77	2.66	0.01**	3.74	1.74	2.15	0.03*	-2.12	2.03	-1.04	0.30
Investment Holding Companies	14.64	7.54	1.94	0.05*	11.68	6.76	1.73	0.08	10.90	7.43	1.47	0.14
Mineral Resources	-18.56	5.39	-3.44	0.00***	-20.26	5.25	-3.86	0.00***	-28.16	7.01	-4.02	0.00***
Personal and Household Products	-5.77	3.37	-1.72	0.09	-6.25	3.44	-1.82	0.07	-9.41	3.80	-2.48	0.01**
Pharmaceuticals and Medical Research	8.15	2.86	2.85	0.00***	5.86	2.35	2.49	0.01*	1.71	1.62	1.05	0.29
Real Estate	13.65	12.47	1.10	0.27	11.27	12.44	0.91	0.37	6.71	10.71	0.63	0.53
Retailers	-10.64	3.07	-3.46	0.00***	-11.77	3.13	-3.76	0.00***	-14.88	3.82	-3.89	0.00***
Software and IT Services	-4.70	3.55	-1.32	0.19	-3.97	3.48	-1.14	0.26	-6.41	3.38	-1.90	0.06
Telecommunications Services	-8.77	3.06	-2.87	0.00***	-8.47	3.23	-2.62	0.01**	-14.38	4.10	-3.51	0.00***
Transportation	-8.92	2.07	-4.31	0.00***	-10.25	2.15	-4.76	0.00***	-14.41	2.62	-5.50	0.00***
Utilities	-8.81	2.12	-4.15	0.00***	-10.44	1.95	-5.36	0.00***	-16.08	3.35	-4.80	0.00***
Fixed Time Effects												
E/S/G Scores	0.36	5.30	0.07	0.95	-2.41	6.68	-0.36	0.72	1.59	4.04	0.39	0.69
BVPS	0.58	0.11	5.29	0.00***	0.58	0.11	5.29	0.00***	0.58	0.11	5.29	0.00***
EPS	0.23	0.29	0.81	0.42	0.23	0.29	0.81	0.42	0.23	0.29	0.81	0.42
Ln (Total Assets)	4.78	3.25	1.47	0.14	4.84	3.15	1.54	0.12	4.72	3.11	1.52	0.13
LEV	18.59	9.88	1.88	0.06	18.70	10.12	1.85	0.07	18.54	10.11	1.83	0.07

[a] Short for the business sector classification named “Personal and Household Products and Services”.

*p ≤ .05. **p < .01. ***p < 0.001.

Source: elaborated by the author.

From Table 13 to Table 16, the new standard errors are calculated considering heteroskedasticity present in the models. The changes also affect the statistical significance of the variables. For Models 1, 2, 3, and 4, the *Intercept* becomes insignificant after the transformation. However, other variables become significant after the new standard errors are calculated. This was the case for the Social Score in Model 3, and for the business sectors *Applied Resources, Chemicals,* and *Healthcare Services and Equipment* for Models 1, 2, and 3. Model 4 also presented further changes in the significant business sectors, with the Energy and Fossil becoming not significant and giving place to *Applied Resources*, *Chemicals*, *Insurance*, and *Pharmaceuticals and Medical Research*. Most of the estimated coefficients were positively related to *ROA*, except for two business sectors: *Applied Resources* and *Chemicals*. The models presented a significant change in the SE for the variables *ESG Scores*, *Ln (Total Assets)*, *LEV*, and the business sectors *Industrial Goods* and *Insurance*.

Similarly, to what happened with the previous models, Models 5, 6, 7, and 8 have also seen several business sectors becoming significant after the transformation and the estimated SE was considerably changed for most variables. Additionally, when estimated by time fixed effects, the variables *EPS* and *LEV* also lost statistical significance in all the models.

5. CONCLUSION

This empirical study explores the impact of Corporate Sustainability Performance (measured by ESG Scores) on one-year lagged Corporate Financial Performance (measured by Price and ROA) of Brazilian companies listed in the stock exchange B3. To the author's best knowledge, it is the first study focusing on the Brazilian market to analyse a period larger than 5 years and to consider different CFP measures.

The study analyses 84 companies from 2011 to 2020 and corroborates the value-creating theory explored in section 2.3, by observing the positive impact the total ESG Score has on both CFP metrics. However, the regression results indicate the stock market (represented by *Price*) was more impacted by the companies' CSP than the companies' accounting results (represented by *ROA*) during the period analysed.

Moreover, whilst the companies' share price was significantly affected by all individual ESG Scores, the accounting-based CFP (*ROA*) followed the findings of Velte (2017) and was impacted mainly by the Governance Score. The result can be explained by the increased value relevance for the stakeholders (Velte, 2017) and for the strict requirements for the public listing on the Brazilian stock exchange that comprises a high level of corporate governance reporting.

The present study is relevant for researchers, managers, investors, and policymakers. Firstly, this research addresses the scarcity of studies analysing emerging countries and lays grounds for the expected increase in the research activity for this field in the Brazilian market, as ESG practices gradually consolidate in emerging markets. Secondly, this study provides relevant information about the effects of the CSP on the CFP of Brazilian public companies, useful for investment and managerial decisions. Finally, by exploring the relationship between CSP and CFP,

this research supports the development of public policies that aim to incentivise ESG practices focusing on the sustainable development of the country.

This research is limited by the unavailability of historical data, which restricts three main factors: (1) the time period of the analysis –in this case, from 2011 to 2020 -, (2) the sample size (84 companies), and (3) the sample profile since only public companies were considered.

The cross-sectional dependence of the data is also a limitation of this study. Future research is incentivised to address the cross-sectional dependence present in the model without dismissing the heteroscedasticity also present. In this context, it will be important to investigate if the cross-sectional dependence and heteroscedasticity hold when studying each business sector separately. Analysing the relationship between CFP and CSP for particular business sectors could also explore further the linear relation between the ESG Scores and CFP metrics, once the linear relationship remained unclear in this study, as observed in the model diagnosis.

Further studies are also encouraged to explore if the ESG impact on accounting-based CFP happens in a longer term than the impact on Price. For that, ROA could be lagged for larger periods than one year, unlike in this study. Additionally, considering the strong correlation between Environmental Score and Social Score, it would be interesting to assess models using a combination of two individual ESG scores, such as Social Score and Governance Score, and Environmental Score and Governance Score. Finally, future research should address the high variability of the financial metrics in the models, without compromising the long-term analysis. For that, it would be interesting to examine log transformations on variables with high variability such as *Price*, *BVPS*, and *EPS*.

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