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# ENVIRONMENTAL, SOCIAL AND GOVERNANCE FACTURES: A STUDY OF THE EUROPEAN OECD COUNTRIES WITH THE HIGHEST CO<sub>2</sub> EMISSIONS

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## **ENVIRONMENTAL, SOCIAL AND GOVERNANCE FACTURES: A STUDY OF THE EUROPEAN OECD COUNTRIES WITH THE HIGHEST CO<sub>2</sub> EMISSIONS**

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## **ABSTRACT**

This article analyzes the factors related to environmental, social, and governance (ESG) disclosure in the most polluting European OECD countries. The quantitative and descriptive research method employs documentary research for data collection. The analysis covers ten years (2010–2019) and includes an unbalanced sample of companies from five European countries. The results indicate that the impact of ESG disclosure varies depending on company characteristics and differs across countries and pillars. Notably, company size is positively related to ESG disclosure in all countries. These findings have implications for business management, suggesting that strategies should consider company size, profitability, financial leverage, market performance, and sector to enhance ESG disclosure, improve stakeholder perception, and address agency issues.

**Keywords:** Environmental, Social and Governance (ESG) Disclosure, Organization for Economic Cooperation and Development (OECD), European Countries.

## **FATORES AMBIENTAL, SOCIAL E DE GOVERNANÇA: UM ESTUDO DOS PAÍSES EUROPEUS DA OCDE COM MAIORES EMISSÕES DE CO<sub>2</sub>**

## **RESUMO**

Este artigo analisa os fatores que se relacionam com a divulgação ambiental, social e de governança (ESG) nos países europeus da OCDE mais poluentes. O método de pesquisa quantitativa e descritiva utiliza pesquisa documental para coleta de dados. A análise abrange dez anos (2010-2019) e inclui uma amostra desbalanceada de empresas de cinco países europeus. Os resultados indicam que o impacto da divulgação ESG varia de acordo com as características da empresa e difere entre países e pilares. Em particular, o tamanho da empresa se relaciona positivamente com a divulgação de dados ESG entre países. Estas descobertas têm implicações para a gestão corporativa, sugerindo que as estratégias devem considerar o tamanho da empresa, a rentabilidade, a alavancagem financeira, o desempenho do mercado e do setor para melhorar a divulgação ESG, melhorar a percepção dos stakeholders e resolver os problemas de agência.

**Palavras-chave:** Divulgação Ambiental, Social e de Governança (ESG), Organização para a Cooperação e Desenvolvimento Económico (OCDE), Países europeus.

## **FACTORES AMBIENTAL, SOCIAL Y DE GOBERNANZA: UN ESTUDIO DE LOS PAÍSES EUROPEOS DE LA OCDE CON LAS MAYORES EMISIONES DE CO<sub>2</sub>**

### **RESUMEN**

Este artículo analiza los factores relacionados con la divulgación ambiental, social y de gobernanza (ESG) en los países europeos de la OCDE más contaminantes. El método de investigación cuantitativa y descriptiva emplea la investigación documental para la recolección de datos. El análisis abarca diez años (2010-2019) e incluye una muestra desequilibrada de empresas de cinco países europeos. Los resultados indican que el impacto de la divulgación de ESG varía según las características de la empresa y difiere entre países y pilares. En particular, el tamaño de la empresa está relacionado positivamente con la divulgación de datos ESG en todos los países. Estos hallazgos tienen implicaciones para la gestión empresarial, lo que sugiere que las estrategias deben considerar el tamaño de la empresa, la rentabilidad, el apalancamiento financiero, el desempeño del mercado y el sector para mejorar la divulgación de ESG, mejorar la percepción de las partes interesadas y abordar los problemas de las agencias.

**Palabras clave:** Divulgación ambiental, social y de gobernanza (ESG), Organización para la Cooperación y el Desarrollo Económico (OCDE), Países europeos.

### **1 INTRODUCTION**

The benefits of shared value for the company and society, obtained through effective Corporate Social Responsibility (CSR) management (Taliento et al., 2019), include operational efficiency, competitive advantage, and improved performance (Ashraf et al., 2021). ESG reporting is a way to disclose socially responsible investments and communicate with investors, customers, and other stakeholders about companies' environmental, social, and governance issues, ethical practices, consumer focus, and respect for human rights in their business strategies and operations (Rahman & Alsayegh, 2021).

The prioritization of financial returns over the environment and society can generate significant debate (Modugu, 2020), as can the trade-off between ESG investments and financial returns. Questions may arise about whether a company discloses and invests in ESG aspects to legitimize itself in the market (Modugu, 2020), to mitigate informational asymmetries (Ashraf et al., 2021), or even as a practice of “greenwashing,” where the company highlights ESG investments to disguise harmful corporate actions (Fatemi et al., 2018; Yildirim, 2023).

There is a growing awareness of the importance of ESG disclosure, which drives academic research into the motivations and determinants of companies' engagement in environmental, social, and governance reporting (Rahman & Alsayegh, 2021). This is important, for example, to assess how organizations are progressing toward the United Nations' Sustainable Development Goals (SDGs) for the 2030 Agenda through their ESG disclosures (Khaled et al., 2021). Company size (Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Modugu, 2020; Rahman & Alsayegh, 2021), return on assets (Rahman & Alsayegh, 2021; Sharma et al., 2020), financial leverage (Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Modugu, 2020; Rahman & Alsayegh, 2021), market performance (Sharma et al., 2020), and industry sensitivity (Modugu, 2020; Sharma et al., 2020) may be associated factors for ESG disclosure, which motivates the development of this research. The literature shows that larger companies tend to disclose more about sustainability practices, particularly companies with high water consumption and environmental efforts (Gnanaweera & Kunori, 2016). Similarly, companies in the industrial sector, with greater financial leverage, liquidity, and company value, are more likely to engage in sustainability reporting (Kuzey & Uyar, 2017). Studies indicate that organizations that have been in the market longer and have greater financial leverage have a positive influence on CSR and environmental and social disclosure but a negative influence on governance (Fahad & Nidheesh, 2018).

Characteristics such as industry sensitivity, liquidity (Modugu, 2020), and financial and market performance (Sharma et al., 2020) are also significant variables related to ESG disclosure. The location where companies operate is also important, as factors such as profitability and the economic and social development of the location contribute to ESG scores (Crespi & Migliavacca, 2020). Companies from countries with greater socioeconomic freedom and Human Development Index tend to have higher ESG disclosures (Ashraf et al., 2021).

Companies in more polluting countries may have to comply with stricter legislation to improve sustainability practices and disclosures, thereby facing greater pressure from laws and society to legitimize themselves on these issues (Baldini et al., 2018; Hahn & Kühnen, 2013; Khamisu & Paluri, 2024; Modugu, 2020; Patten, 1991; 1992; Seow, 2024). Additionally, the diverse results of research investigating the determinants of ESG disclosure have informed this study (Ashraf et al., 2021; Alsayegh et al., 2020; Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Gnanaweera & Kunori, 2016; Kuzey & Uyar, 2017; Modugu, 2020; Rahman & Alsayegh, 2021; Sharma et al., 2020).

The Global Carbon Atlas ranks European countries according to annual greenhouse gas (CO<sub>2</sub>) emissions. Germany, the United Kingdom, Italy, France, and Poland are the five most polluting European countries. Given this context, this study aims to analyze the factors associated with the environmental, social, and governance (ESG) disclosure of the most polluting European OECD countries. To achieve this objective, we specifically investigated the direct impact of company size, profitability, financial leverage, market performance, and industry sensitivity on ESG disclosure.

The Legitimacy Theory and the Agency Theory were utilized to conduct this study. Both theories complement each other and support the framework proposed in this research. According to the Legitimacy Theory, companies utilize ESG disclosures to showcase the legitimacy of their actions and alignment with societal expectations. This, in turn, fosters trust and ensures organizational continuity (Modugu, 2020). These factors can be associated with characteristics such as company size (Baldini et al., 2018; Patten, 1991; 1992), profitability (Legendre & Coderre, 2013), market performance (Sharma et al., 2020), and industry sensitivity (Rahman & Alsayegh, 2021).

Agency Theory, on the other hand, reveals that companies increase information disclosure to minimize the problem between agent and principal and reduce agency problems and costs using transparency (Dyduch & Krasodomska, 2017; Jensen & Meckling, 1976). Additional disclosure provides clarity about future risks and opportunities and provides confidence in investing in the organization (Ashraf et al., 2021). From this perspective, ESG disclosure would reduce the informational asymmetry between creditors and other stakeholders of financially leveraged companies (Kuzey & Uyar, 2017).

This study analyzes the factors associated with ESG disclosure from a different perspective than previous research (Ashraf et al., 2021; Alsayegh et al., 2020; Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Gnanaweera & Kunori, 2016; Kuzey & Uyar, 2017; Modugu, 2020; Rahman & Alsayegh, 2021; Sharma et al., 2020), by looking at European companies belonging to the OECD and with higher CO2 emissions.

The study theoretically contributes by analyzing the factors associated with ESG disclosure, bringing new conclusions, and confirming previous results for a sample of relevant countries due to their high potential for air pollution. This allows the literature on the subject to advance and encourages further research to explore new variables related to ESG disclosure in other economies and countries. In the social field, the study provides innovative insights for public policy makers, as it shows that certain characteristics of companies significantly impact ESG disclosure. This contributes to a more comprehensive achievement of social and environmental objectives when defining a regulatory framework for sustainability. The study also encourages companies to invest in environmental, social, and governance issues, benefiting the community.

The findings of this study have practical implications for managers. They can use the information to evaluate their company's sustainability reports and ESG actions, which company characteristics can influence. The findings can also help guide managers and owners of companies to improve their ESG disclosure levels, making them more legitimate in society and reducing their agency problems—factors related to company size, profitability, financial leverage, market performance, and industry sensitivity can all play a role in this improvement.

## **2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

The concept of ESG or CSR has gained attention in various business sectors due to its impact on social welfare (Gillan et al., 2021). ESG is a more comprehensive term that includes governance explicitly, while CSR has implicit governance. The term ESG emerged in 2004 as an acronym developed in a report by 20 financial institutions in response to a call by the Secretary-General of the United Nations. It refers to how companies and investors integrate environmental, social, and governance issues into their business models (Gillan et al., 2021).

Stakeholders are recommended to pay attention to the individual E, S, and G rankings in their investment strategies rather than solely relying on the overall ESG score (Díaz et al., 2021). The environmental pillar of ESG encompasses three aspects: efficient resource use, including water and energy policies and environmental management systems; emissions and waste reduction, including emission policies, targets, total CO2 emissions, and waste management; and environmental innovation, including environmental projects and clean energy products (Bătae et al., 2021; Refinitiv, 2021).

The social pillar covers four aspects: workforce, human rights, community, and product responsibility. The workforce aspect includes employee turnover, diversity, and health and safety policies. Human rights refer to data such as child labor. The community aspect covers corruption, corporate ethics, and community involvement. The product responsibility factor includes indicators such as data privacy and customer satisfaction (Bătae et al., 2021; Refinitiv, 2021). The governance pillar is divided into management, CSR strategies, and shareholders. The management aspect addresses structure-related issues, including independence, diversity, committees, and compensation. The CSR strategy factor addresses issues such as strategies and transparency. On the other hand, the shareholder aspect covers points such as shareholder rights (Bătae et al., 2021; Refinitiv, 2021).

The literature has explored the benefits of ESG disclosures. Higher quality of disclosures, increased transparency, and stakeholder trust resulting from better ESG ratings may lead to decreased risk, reduced information asymmetry, and a lower cost of equity capital for firms, thereby maintaining market efficiency and decreasing risks and volatility (Lopez-de-Silanes et al., 2020; Tanjung, 2021).

Companies have adopted ESG practices, disclosures, and scores to support sustainable measures. In this regard, countries, governments, and corporations must make joint and practical efforts to contribute to sustainable economic development and financing (Tanjung, 2021). ESG-compliant companies tend to have better governance, prioritize sustainable development and the environment, exhibit lower earnings volatility, and access lower-cost funds (Mohammad & Wasiuzzaman, 2021).

Better ESG disclosures enable tracking organizations' progress and impact on the SDGs. The 2030 agenda encompasses 17 SDGs and 169 targets addressing social inequality, environmental degradation, and climate change. The UN

established these SDGs in 2015 to guide global initiatives for sustainable development (Khaled et al., 2021). However, companies in emerging countries, such as the BRICS (Brazil, Russia, India, China, and South Africa), are implementing sustainable actions at a slow pace (Wall & Thijssens, 2020). Companies in sectors sensitive to society's social and cultural norms tend to outperform those in non-sensitive sectors in these countries (Garcia et al., 2017). Studies of variables related to ESG factors typically consider four main categories: firm, country, industry, and time factors (Crespi & Migliavacca, 2020). This study focused on firm characteristics and industry sensitivity, controlling for temporal factors to enhance the robustness of the analyses.

## **Company and ESG Characteristics**

### **Company size**

Large companies have greater ESG disclosure and seek to establish a legitimate societal status. However, companies also seek to communicate and convince stakeholders of their social expectations to avoid liability and social pressure (Rahman & Alsayegh, 2021). According to Legitimacy Theory, larger companies are more visible to the public and, therefore, are more accountable and disclose more information about their ESG practices (Baldini et al., 2018; Patten, 1991; 1992).

Companies also face demands from economic agents, who are more likely to disengage if they perceive a lack of legitimacy, which poses greater risks for larger companies than smaller ones (Modugu, 2020). In addition, larger companies have more resources to devote to ESG disclosures, benefiting from economies of scale (Kuzey & Uyar, 2017; Dyduch & Krasodomska, 2017; Modugu, 2020).

Firm size is a key factor in ESG disclosure, as larger firms generally have higher ESG scores, while smaller firms aim to follow this trend (Ashraf et al., 2021; Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Gnanaweera & Kunori, 2016; Kuzey & Uyar, 2017; Modugu, 2020; Nicolò et al., 2022; Rahman & Alsayegh, 2021). Hence, the following hypothesis is proposed: H1: There is a positive relationship between firm size and ESG disclosure.

## **Profitability: ROA**

Social expectations significantly impact companies with higher profitability, as society imposes greater restrictions and pressures on organizations to demonstrate their legitimate activities (Rahman & Alsayegh, 2021). Legitimacy Theory (Patten, 1991; 1992) argues that profitability is a significant factor, as higher profitability will lead companies to disclose more information about ESG to legitimize their actions (Legendre & Coderre, 2013). Moreover, ignoring stakeholders' interest in organizational sustainability can harm performance (Kuzey & Uyar, 2017).

Higher profitability enables companies to signal good news to the public, leading to greater disclosures and aiming to enhance reputation, among other factors (Modugu, 2020). In addition, companies with higher profitability can allocate more resources to ESG initiatives due to positive cash flows and fewer resource constraints (Ashraf et al., 2021). Similar to Rahman and Alsayegh (2021), profitability will be measured by return on assets (ROA), which assesses an organization's profitability relative to its total assets. Previous studies analyzing the relationship between profitability and social and environmental disclosures showed mixed results, with some studies finding a positive relationship (Crespi & Migliavacca, 2020; Menassa & Dagher, 2019; Rahman & Alsayegh, 2021; Sharma et al., 2020), others finding negative relationship (Gnanaweera & Kunori, 2016; Kuzey & Uyar, 2017), and some finding no significant relationship (Dyduch & Krasodomska, 2017; Modugu, 2020). Despite these mixed results, this study proposes the hypothesis that there is a positive relationship between firm profitability and ESG disclosure based on the precepts of the Legitimacy Theory, which suggests that companies with higher profitability tend to disclose more ESG information in order to legitimize their actions (H2).

## **Financial leverage**

The relationship between financial leverage and ESG disclosure has been discussed widely in the context of Agency Theory (Modugu, 2020). According to this theory, more leveraged firms disclose more information voluntarily to minimize agency costs and the cost of capital (Dyduch & Krasodomska, 2017; Jensen & Meckling, 1976). Firms with lower levels of leverage, on the other hand, may

experience less pressure from stakeholders to disclose information on sustainability, as their focus is on the financial success of the organization, and increasing leverage enhances external intervention and diminishes managers' decision-making power (Fahad & Nidheesh, 2018).

Moreover, creditors have concerns about the financial health of companies and demand risk prevention. Firms are expected to address these concerns in their disclosures (Kuzey & Uyar, 2017). The negative or insignificant relationship between leverage and ESG disclosure in highly leveraged firms may be explained by the lower concern of creditors about sustainable issues or the use of other ways to disclose this information (Modugu, 2020; Nicolò et al., 2022).

However, leveraged firms may disclose information in order to meet creditor expectations, thereby reducing asymmetries and agency costs (Kuzey & Uyar, 2017). Previous studies have found diverging results on the relationship between leverage and ESG disclosure, with some studies finding a positive relationship (Ashraf et al., 2021; Baldini et al., 2018; Dyduch & Krasodomska, 2017; Fahad & Nidheesh, 2018; Rahman & Alsayegh, 2021), others finding a negative relationship (Crespi & Migliavacca, 2020; Kuzey & Uyar, 2017; Modugu, 2020; Sharma et al., 2020), and some finding no significant relationship (Mia & Al Mamun, 2011). Despite the inconclusive results of previous studies, this study proposes a hypothesis of a positive relationship between a firm's financial leverage and ESG disclosure based on the precepts of Agency Theory, which suggests that leveraged companies tend to have greater external intervention and increasing ESG disclosures would reduce information asymmetry (H3).

### **Market performance: market to book**

Disclosures of sustainable practices demonstrate organizational legitimacy by showing that the company's products and services benefit various stakeholders without compromising the organization's continuity (Rahman & Alsayegh, 2021). Legitimacy Theory (Patten, 1991; 1992) suggests that disclosing ESG reports under pressure and scrutiny brings business benefits such as transparency, improved reputation, and company value (Hahn & Kühnen, 2013). According to Sharma et al. (2020), organizations with high market performance are more likely to have higher levels of ESG disclosure.

Positive impacts on stock prices reflect investors' connection to published ESG information, suggesting lower risk and greater future company goodwill (Sahut & Pasquini-Descomps, 2015). ESG disclosures are related to improved market performance (Sahut & Pasquini-Descomps, 2015; Sharma et al., 2020; Taliento et al., 2019; Tseng et al., 2019). However, Kuzey and Uyar (2017) found no significant relationship between market-to-book effects on sustainable reporting disclosure. Despite mixed results from previous studies, a positive relationship is expected based on the principles of Legitimacy Theory, as companies increase their disclosures to convey lower market risk and greater future goodwill. Thus, the fourth hypothesis is H4: A positive relationship exists between a firm's market-to-book performance and ESG disclosure.

### **Industry sensitivity**

Organizations engaging in activities that pose risks to people's safety, health, and the environment increase their disclosures to avoid penalties from regulators and society (Modugu, 2020), and they tend to receive higher ESG scores compared to organizations with less impact (Garcia et al., 2017). This can be explained by Legitimacy Theory (Patten, 1991; 1992), as industries facing sensitivity issues experience greater pressures from stakeholders (Baldini et al., 2018) and have stricter regulations to justify that their activities are beneficial and aligned with imposed and expected standards (Rahman & Alsayegh, 2021).

Manufacturing companies are considered "industry sensitive" due to the adverse effects of their processes on the environment and society. These companies often prioritize environmental, health, and safety concerns (Modugu, 2020). Sensitive industries encompass energy industries such as oil and gas, pulp and paper, chemicals, mining, and steel companies, all of which have significant social and environmental impacts (Garcia et al., 2017). To alleviate these pressures, companies choose to provide more disclosures to justify their actions (Braam et al., 2016; Legendre & Coderre, 2013). Baldini et al. (2018) assert that industry sensitivity affects each pillar and ESG disclosure differently. Previous studies demonstrate divergent impacts of industry sensitivity on ESG practices, including positive relationships (Garcia et al., 2017; Ibrahim, 2014; Kuzey & Uyar, 2017; Legendre & Coderre, 2013), negligible relationships (Usman et al., 2020), and negative relationships (Braam et al., 2016; Modugu, 2020). Baldini et al. (2018) found mixed

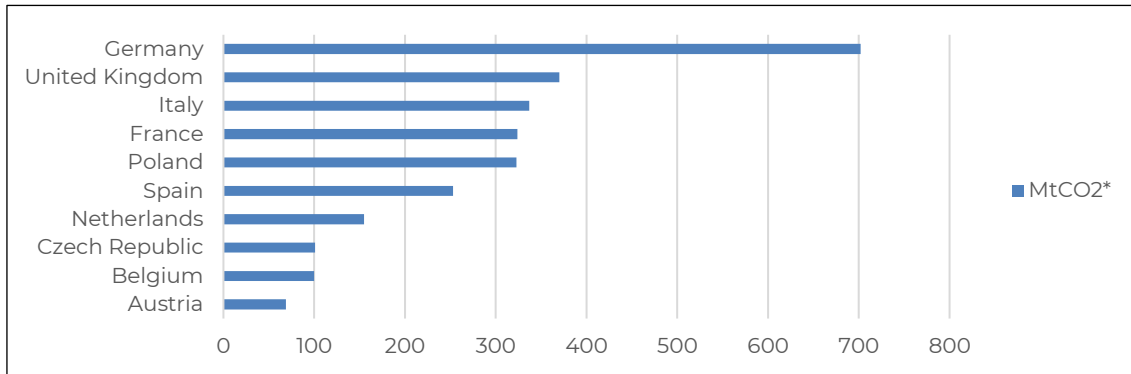
results, with the industry's impact on the governance pillar being negative and insignificant in relation to overall ESG and the other pillars. Despite these mixed findings, a positive relationship is proposed based on Legitimacy Theory: sensitive industries tend to face greater pressure from stakeholders and thus choose to provide more disclosures to justify their actions. Therefore, the fifth hypothesis is H5: There is a positive relationship between industry sensitivity and ESG disclosure.

### **3 METHOD**

This study investigates the factors impacting the disclosure of environmental, social, and governance information in the most polluting European OECD countries. It utilizes a quantitative-descriptive approach, gathering data via desk research using a validated structured protocol. The analysis covers the period from 2010 to 2019, consistent with previous sustainability studies (Alsayegh et al., 2020; Fahad & Nidheesh, 2018; Rahman & Alsayegh, 2021), which provides a basis for analysis and comparisons. This period was chosen because it allowed us to verify a time interval prior to Covid-19 and avoid the impact of changes in markets and ESG disclosures brought about by the pandemic (Hoang et al., 2020; Jin et al., 2023; Ogundana et al., 2024; Wang et al., 2025; Zahid et al., 2023; Zhang et al., 2020), thus avoiding possible distortions caused by this fact.

To determine the countries analyzed, data from the Global Carbon Atlas was employed to rank them based on annual greenhouse gas (CO<sub>2</sub>) emissions. According to this report, the top five most polluting European countries in the OECD are Germany, the United Kingdom, Italy, France, and Poland. Figure 1 illustrates the CO<sub>2</sub> emission levels of the ten most polluting European countries. Companies from these countries were chosen because companies in more polluting countries may be subject to stricter legislation aimed at improving sustainability practices and disclosures, facing greater pressure from laws and society to legitimize their actions (Baldini et al., 2018; Hahn & Kühnen, 2013; Khamisu & Paluri, 2024; Modugu, 2020; Patten, 1991; 1992; Seow, 2024).

Figure 1: Ranking of the ten most polluting European countries belonging to the OECD



Source: Adapted from Global Carbon Atlas (2019). \*MtCO2 = 1 million tons of CO2.

Certain exclusions were applied in selecting the sample, such as excluding financial sector companies, companies with negative equity and net income, companies without the necessary data for variable calculation, companies that did not disclose ESG information, and companies that were outliers (defined as two standard deviations from the overall average). Consistent with previous studies (Baldini et al., 2018; Crespi & Migliavacca, 2020), an unbalanced sample was chosen due to limited ESG disclosure in all years. Table 1 presents the sample composition by year and country during the study period.

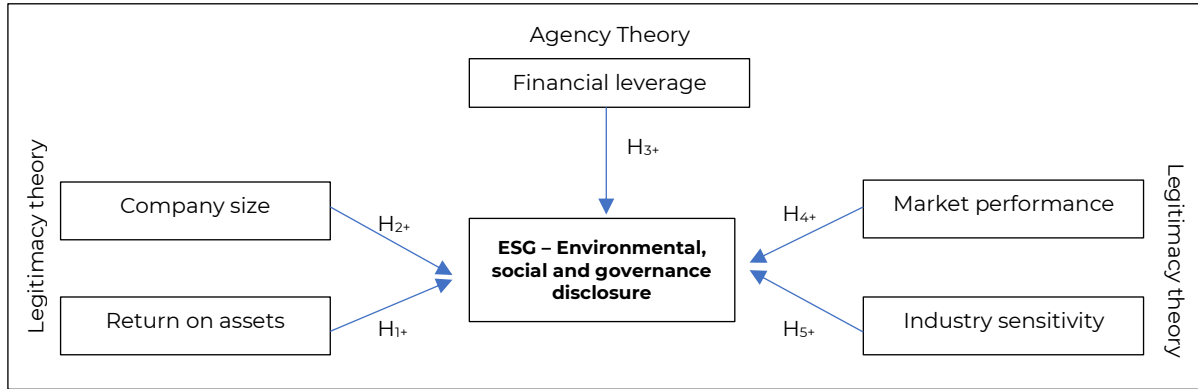
Table 1 – Distribution of companies by year and country

Country/ Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Germany</b>	52	55	55	59	61	64	67	84	124	133
<b>United Kingdom</b>	159	178	184	185	192	211	221	230	272	291
<b>Italy</b>	17	17	16	15	18	18	20	28	55	61
<b>France</b>	65	68	70	68	67	69	75	81	106	120
<b>Poland</b>	9	10	12	14	12	16	17	17	20	24
<b>Total</b>	<b>302</b>	<b>328</b>	<b>337</b>	<b>341</b>	<b>350</b>	<b>378</b>	<b>400</b>	<b>440</b>	<b>577</b>	<b>629</b>

Source: Survey data.

Based on the literature and the main studies conducted, particularly Alsayegh et al. (2020), Ashraf et al. (2021), Crespi and Migliavacca (2020), Fahad and Nidheesh (2018), Modugu (2020), Rahman and Alsayegh (2021), and Sharma et al. (2020), the theoretical model of analysis and the hypotheses established for the research were developed, as shown in Figure 2.

Figure 2: Theoretical model of analysis



Source: elaborated by the authors.

Table 2 presents the research construct, its operationalization, and conceptual basis. The source used for data collection was the Refinitiv Eikon® database.

Table 2: Variable definitions

Variables	Operationalization	Authors
<b>Dependent Variables</b>		
ESG	The ESG score is an overall company score based on self-reported information in the environmental, social, and corporate governance pillars.	Alsayegh et al. (2020); Crespi and Migliavacca (2020); Rahman and Alsayegh (2021); Sharma et al. (2020)
Environmental - ENV	It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities to generate long-term shareholder value.	Bătae et al. (2021); Crespi and Migliavacca (2020)
Social - SOC	Measures a company's ability to build trust and loyalty among employees, customers, and society using best management practices.	Bătae et al. (2021); Crespi and Migliavacca (2020)
Governance - GOV	Measures the systems and processes, which ensure that directors and executives act in the best long-term interests of shareholders.	Bătae et al. (2021); Crespi and Migliavacca (2020)
<b>Independent Variables</b>		
Company size - CS	Natural logarithm of total assets.	Crespi and Migliavacca (2020); Fahad and Nidheesh (2018); Modugu (2020); Rahman and Alsayegh (2021)
Return on assets - ROA	Net Income/Total Assets	Rahman and Alsayegh (2021); Sharma et al. (2020)
Financial leverage - FL	Debt ratio: ratio of total debt to total assets ((PC + PNC)/AT)	Crespi and Migliavacca (2020); Fahad and Nidheesh (2018); Modugu (2020); Rahman and Alsayegh (2021)
Market-to-book Performance - MTBP	Market-to-book is one of the main proxies used for growth opportunities. Calculated by the value of the share	Sharma et al. (2020)

	price by the number of shares over the net equity.	
Industry sensitivity - INDS	Dummy variable: '1' for manufacturing companies, '0' for others.	Modugu (2020); Sharma et al. (2020)
<b>Control Variables</b>		
Fixed-year effects - FYE	Year dummies to control fixed-year effects (2010-2019).	Crespi and Migliavacca (2020)

Source: elaborated by the authors.

The panel data regression equations considered in the study are:

$$ESG = \beta_0 + \beta_1CS + \beta_2ROA + \beta_3FL + \beta_4 MTBP + \beta_5INDS + FYE + \varepsilon \quad (1)$$

$$ENV = \beta_0 + \beta_1CS + \beta_2ROA + \beta_3FL + \beta_4 MTBP + \beta_5INDS + FYE + \varepsilon \quad (2)$$

$$SOC = \beta_0 + \beta_1CS + \beta_2ROA + \beta_3FL + \beta_4 MTBP + \beta_5INDS + FYE + \varepsilon \quad (3)$$

$$GOV = \beta_0 + \beta_1CS + \beta_2ROA + \beta_3FL + \beta_4 MTBP + \beta_5INDS + FYE + \varepsilon \quad (4)$$

Equation 1 was used to analyze the results in the five countries studied. Equations 2, 3, and 4 were used for further analysis in section 4.3. The regressions were conducted using the Stata® software, with fixed years to account for factors that may impact the findings.

#### 4 ANALYSIS AND DISCUSSION OF THE RESULTS

This section presents the description and analysis of the study's findings. Before analyzing the variables related to ESG disclosure in the most polluting European OECD countries using panel data regression, we performed descriptive statistics, tested the data's normality, and conducted correlation and VIF tests.

##### Descriptive statistics

Table 3 shows the descriptive statistics of the variables analyzed in the study. It is important to note that this analysis only considered continuous variables, so the industry sensitivity variable was excluded.

Table 3: The variables' descriptive statistics

<b>Country</b>	<b>Germany</b>				
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
ESG	55.53	56.65	3.03	94.52	22.14
AMB	53.35	56.38	0.67	98.28	27.78
SOC	60.01	63.00	2.13	98.24	24.57
GOV	50.31	50.47	1.67	96.02	23.51
CS	8.88	8.73	4.55	13.10	1.58
ROA	0.056	0.047	0.0004	0.32	0.042
FL	0.58	0.59	0.0086	0.94	0.16
MTBP	2.90	2.09	0.0098	19.62	3.53
N. obs.	754				
<b>Country</b>	<b>United Kingdom</b>				
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
ESG	51.56	51.44	1.69	94.25	18.48
AMB	47.00	45.89	0.48	97.09	25.02
SOC	52.44	53.18	1.92	97.96	21.44
GOV	54.26	55.73	0.57	98.05	21.49
CS	7.84	7.64	3.83	12.48	1.52
ROA	0.086	0.066	0.0003	2.70	0.14
FL	0.55	0.54	0.028	0.99	0.18
MTBP	5.75	2.27	0.05	21.30	6.32
N. obs.	2.123				
<b>Country</b>	<b>Italy</b>				
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
ESG	60.71	62.47	7.98	90.92	17.84
AMB	57.48	62.35	0.41	97.47	25.83
SOC	65.06	68.42	7.67	94.73	18.68
GOV	54.79	54.96	7.31	97.28	20.13
CS	8.74	8.67	5.56	12.05	1.51
ROA	0.046	0.033	0.0004	0.37	0.042
FL	0.64	0.68	0.19	0.91	0.14
MTBP	2.65	1.87	0.28	15.72	3.69
N. obs.	265				
<b>Country</b>	<b>France</b>				
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
ESG	61.06	63.72	4.49	93.13	17.85
AMB	66.97	71.64	0.85	98.44	21.32
SOC	65.60	70.58	2.52	98.09	21.48
GOV	49.12	50.49	4.50	97.73	23.08
CS	9.31	9.27	5.43	12.62	1.36
ROA	0.047	0.039	0.0015	0.411	0.036
FL	0.61	0.60	0.22	0.94	0.14
MTBP	2.48	1.77	0.32	15.65	5.34
N. obs.	789				
<b>Country</b>	<b>Poland</b>				
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
ESG	37.46	33.84	6.61	76.85	16.13
AMB	32.01	25.92	1.47	87.05	21.85
SOC	35.17	33.12	1.13	87.83	20.95
GOV	45.48	44.98	7.55	82.25	17.73
CS	8.22	8.42	5.54	9.81	1.00
ROA	0.051	0.040	0.0004	0.30	0.042
FL	0.49	0.47	0.11	0.88	0.16
MTBP	1.92	0.95	0.15	24.29	3.00
N. obs.	151				

Legend: SD: standard deviation; N. obs.: Number of observations. Source: Survey data.

The results of the Durbin-Watson test indicated that the regression model's residuals were independent, as the values were close to 2 in all models analyzed. The Pesaran-Pesaran test did not show significant heteroscedasticity in the model residuals at a 5% level for all regression models (ESG, ENV, SOC, and GOV). Therefore, the assumptions of the regression model have been validated.

The normality test results revealed that the analyzed data is not normal, as the Kolmogorov-Smirnov test was significant at a 5% level. Consequently, we used Spearman's correlation (Table 4) to identify correlations between variables and potential multicollinearity issues in each country's data.

Table 4: Correlation matrix

<b>Country</b>	<b>Germany</b>					
<b>Variable</b>	<b>ESG</b>	<b>CS</b>	<b>ROA</b>	<b>FL</b>	<b>MTBP</b>	<b>INDS</b>
ESG	1	0.642**	-0.076*	0.221**	-0.027	-0.059
CS		1	-0.270**	0.378**	-0.264**	-0.110**
ROA			1	-0.399**	0.599**	-0.159**
FL				1	-0.056	0.243**
MTBP					1	0.022
INDS						1
<b>Country</b>	<b>United Kingdom</b>					
<b>Variable</b>	<b>ESG</b>	<b>CS</b>	<b>ROA</b>	<b>FL</b>	<b>MTBP</b>	<b>INDS</b>
ESG	1	0.640**	-0.151**	0.206**	-0.051*	-0.111**
CS		1	-0.319**	0.266**	-0.208**	-0.104**
ROA			1	-0.116**	0.670**	0.047*
FL				1	0.322**	0.171**
MTBP					1	0.092**
INDS						1
<b>Country</b>	<b>Italy</b>					
<b>Variable</b>	<b>ESG</b>	<b>CS</b>	<b>ROA</b>	<b>FL</b>	<b>MTBP</b>	<b>INDS</b>
ESG	1	0.691**	-0.349**	0.323**	-0.315**	-0.002
CS		1	-0.459**	0.379**	-0.443**	0.070
ROA			1	-0.424**	0.684**	-0.094
FL				1	-0.034	0.293**
MTBP					1	0.077
INDS						1
<b>Country</b>	<b>France</b>					
<b>Variable</b>	<b>ESG</b>	<b>CS</b>	<b>ROA</b>	<b>FL</b>	<b>MTBP</b>	<b>INDS</b>
ESG	1	0.572**	-0.138**	0.074*	-0.116**	-0.091*
CS		1	-0.314**	0.293**	-0.201**	-0.016
ROA			1	-0.540**	0.594**	-0.173**
FL				1	-0.082*	0.313**
MTBP					1	0.020
INDS						1
<b>Country</b>	<b>Poland</b>					
<b>Variable</b>	<b>ESG</b>	<b>CS</b>	<b>ROA</b>	<b>FL</b>	<b>MTBP</b>	<b>INDS</b>
ESG	1	0.454**	-0.169*	-0.029	-0.066	-0.157
CS		1	-0.047	-0.422**	-0.398**	-0.320**
ROA			1	-0.309**	0.392**	-0.160*
FL				1	0.244**	0.320**
MTBP					1	-0.093
INDS						1

Legend: \* Correlation is significant at the 5% level. \*\*Correlation is significant at the 1% level. Source: Survey data.

Spearman's correlation revealed the existence of a correlation between the dependent variable (ESG) and the independent variables in all the countries analyzed. The correlation makes it possible to identify multicollinearity problems in the data. According to Hair et al. (2005), these problems are identified when coefficients above 0.70 are presented. The variables did not reveal values above 0.70, not expressing multicollinearity problems and, consequently, were all considered in the regression.

The results show that the ESG variable correlated positively and statistically with company size in all countries, which means that the larger the company size, the greater the propensity to have superior ESG disclosure. A similar result was found for Germany, the UK, Italy, and France regarding the financial leverage variable since the results showed a positive and significant relationship between ESG disclosures and this variable. These findings reveal that higher debt ratios tend to correspond to higher investments in ESG practices.

ESG disclosures correlated negatively and statistically with ROA and market performance measured by the market-to-book of companies in the UK, Italy, and France. From these results, the higher the return on assets and growth opportunities of the companies analyzed, the lower the ESG scores. Thus, it is suggested that accounting performance (ROA) and market performance (market-to-book) tend not to contribute effectively to the ESG practices of companies in the UK, Italy, and France. Only ROA correlated negatively and significantly with ESG disclosures in German and Polish companies.

Regarding the industry sensitivity variable, the results also revealed a negative and significant correlation with ESG disclosure in firms from the UK and France. Such results suggest that the more environmentally sensitive companies in these countries are, the lower their engagement in ESG issues tends to be. These results reinforce the need for companies that harm the environment through their activities to develop activities aimed at minimizing the impacts caused.

Following the data analysis, the VIF test was applied to verify multicollinearity problems among all model explanatory variables (independent). The results revealed an average VIF of 1.44 for the independent variables in Germany, 1.62 in the UK, 1.54 in Italy, 1.31 in France, and an average VIF of 1.57 in Poland. According to Gujarati and Porter (2011), VIF values above 10 indicate multicollinearity problems between the independent variables. Therefore, none of the variables presented multicollinearity problems and thus were retained for the proceeding analysis.

The results of the Durbin-Watson test showed values close to 2 in all the regression models analyzed, which indicates the independence of the regression model's residuals. In addition, the Pesaran-Pesaran test was not significant at 5% in all the regression models (ESG, ENV, SOC, and GOV), which shows no heteroscedasticity in the model residuals. The assumptions of the regression model have, therefore, been validated.

It should be noted that in the subsequent analyses, we disregard any concerns about reverse causality, but we cannot exclude broader issues of endogeneity due to characteristics of the companies that were not observed. Therefore, it is suggested that other researchers use this limitation and resort, for example, to an experimental approach, as well as using independent variables lagged by one period to try to partially solve the problems that may exist due to potential endogeneity (Crespi & Migliavacca, 2020).

### Firm characteristics and ESG disclosure

Table 5 presents the regression analysis results for all countries, considering the overall ESG score as the model's dependent variable. The fixed effects model was chosen for the sample of companies from the countries of Germany, the United Kingdom, France and Poland, as the Bresch Pagan and Hausman tests showed statistical significance at the 5% level. On the other hand, the panel data regression model operationalized for companies in Italy was Pols, as the Bresch Pagan and Chow test did not show statistical significance.

Table 5: Results of Equation 1 - ESG

Country	Germany		United Kingdom		Italy		France		Poland	
	Fixed		Fixed		Pols		Fixed		Fixed	
	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.
Intercept	-48.00	0.000*	-16.27	0.000*	30.90	0.000*	-14.65	0.003*	69.36	0.000*
CS	9.83	0.000*	7.93	0.000*	7.53	0.000*	8.48	0.000*	10.47	0.000*
ROA	61.78	0.008*	11.08	0.001*	36.07	0.176	-24.52	0.192	12.08	0.666
FL	16.37	0.003*	3.64	0.048**	33.27	0.000*	-9.03	0.044**	29.63	0.000*
MTBP	0.14	0.682	0.00	0.674	-0.80	0.003*	0.22	0.016**	0.55	0.250
INDS	0.31	0.870	-1.62	0.030**	-3.57	0.099***	-2.82	0.033**	10.98	0.091***
Within R <sup>2</sup>	0.4121		0.4343		-		0.4695		0.4896	
R <sup>2</sup>	-		-		0.5109		-		-	

Adjusted R <sup>2</sup>	-	-	0.4835	-	-
F-test	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*
B-P	Sig X <sup>2</sup> 1.0000	Sig X <sup>2</sup> 0.0000*	Sig X <sup>2</sup> 1.0000	Sig X <sup>2</sup> 0.0000*	Sig X <sup>2</sup> 0.0000*
Chow test	Sig. F 0.0096*	Sig. F 0.0000*	Sig. F 0.0834	Sig. F 0.0000*	Sig. F 0.0000*
TH	Sig. X <sup>2</sup> 0.0000*	Sig. X <sup>2</sup> 0.0000*	Sig. X <sup>2</sup> 0.0005*	Sig. X <sup>2</sup> 0.000*	Sig. X <sup>2</sup> 0.0000*
N obs.	754	2.123	265	789	151

Legend: B-P: Breusch-Pagan; TH: Hausman test; N obs.: Number of observations. \*Significance at 1% level; \*\*Significance at 5% level. \*\*\* 10% significance level. Source: Survey data.

Based on the findings in Table 5, company size was positively related to ESG disclosure across all countries, supporting previous studies (Ashraf et al., 2021; Crespi & Migliavacca, 2020; Fahad & Nidheesh, 2018; Kuzey & Uyar, 2017; Modugu, 2020; Nicolò et al., 2022; Rahman & Alsayegh, 2021). This aligns with the notion that larger companies have the resources and economies of scale and face higher pressures to disclose ESG information (Kuzey & Uyar, 2017; Dyduch & Krasodomska, 2017; Modugu, 2020; Baldini et al., 2018). Therefore, H1 is confirmed in all countries.

The ROA variable only demonstrated a positive and significant correlation in Germany and the UK. This result is consistent with the studies conducted by Crespi and Migliavacca (2020), Menassa and Dagher (2019), Rahman and Alsayegh (2021), and Sharma et al. (2020) and can be attributed to the fact that higher profitability allows for more financial flexibility in ESG investments (Ashraf et al., 2021). Additionally, more profitable companies tend to provide more disclosures and improve their reputation (Modugu, 2020). Thus, H2 is confirmed in Germany and the United Kingdom, while it is rejected in other countries, which supports the findings of Dyduch and Krasodomska (2017) and Modugu (2020). The concept of Legitimacy Theory (Patten, 1991; 1992) further supports these findings by highlighting that more profitable companies face greater pressures and restrictions and, therefore, disclose ESG actions more extensively (Rahman & Alsayegh, 2021; Legendre & Coderre, 2013). Variations in data restrictions or measurement may explain the differences in results (Li et al., 2018).

A positive relationship with ESG disclosure was found for the financial leverage variable in Germany, the UK, Italy, and Poland. This indicates that organizations with higher financial leverage are more likely to engage in ESG aspects. These findings are consistent with previous studies (Ashraf et al., 2021; Baldini et al., 2018; Dyduch & Krasodomska, 2017; Fahad & Nidheesh, 2018; Rahman & Alsayegh, 2021). Thus, H3 is confirmed in these countries. Agency Theory justifies

this result by revealing that voluntary ESG disclosure aims to mitigate agency and capital costs in more leveraged firms (Dyduch & Krasodomska, 2017; Jensen & Meckling, 1976). These costs arise due to potential external intervention and reductions in CEOs' power (Fahad & Nidheesh, 2018), as higher debt levels are associated with these firms.

Different results were found for firms in France, where financial leverage is negatively related to ESG scores. Lower financial leverage ratios tend to reflect lower ESG scores. This conclusion is supported by Crespi and Migliavacca (2020), Kuzey and Uyar (2017), Modugu (2020), and Sharma et al. (2020). In leveraged companies, creditors appear to be disinterested in sustainable initiatives and smaller ESG information disclosure in other reports (Modugu, 2020), which suggests that this is the reality in France. Therefore, H3 is rejected in this country.

Another explanation for the result obtained for companies in France is that ESG disclosure tends to contribute to reducing information asymmetry, concerns about legitimacy, helps investors to better assess companies' political and social risks, reflects long-term prospects and helps companies to build a favorable reputation in a stakeholder-oriented environment, as is the case in France (Hamrouni et al., 2020). Furthermore, France is considered one of the largest economies in the world and therefore, its economic structure is different from that of Anglo-Saxon countries (Hamrouni et al., 2020), which may have influenced the results.

The market performance variable presented divergent results in the surveyed countries. Positive results were observed in the context of companies in France, negative results in Italy, and insignificant results in Germany, the United Kingdom, and Poland. Kuzey and Uyar (2017) also found non-significant effects of growth opportunities (market to book) on sustainable reporting disclosure. The positive result can be attributed to the higher levels of ESG disclosure in companies with high market performance (Sharma et al., 2020). Another explanation stems from the Legitimacy Theory (Patten, 1991; 1992), which links the generation of benefits to business value through ESG scoring (Hahn & Kühnen, 2013). Thus, H4 is confirmed only in France, where the findings align with the research of Sahut and Pasquini-Descomps (2015), Sharma et al. (2020), Taliento et al. (2019), and Tseng et al. (2019).

Regarding the industry sensitivity variable, there was a negative and significant relationship with ESG disclosure in the UK, Italy, France, and Poland,

indicating that sensitive industries tend to be less engaged in ESG issues. These findings were corroborated by Braam et al. (2016) and Modugu (2020). Furthermore, an insignificant association was found in the context of Germany, similar to the study by Usman et al. (2020) and diverging from the positive findings in the literature (Garcia et al., 2017; Ibrahim, 2014; Kuzey & Uyar, 2017; Legendre & Coderre, 2013).

The results show that industry sensitivity associates with ESG scores differently in emerging countries like the BRICS. In these countries, companies in sensitive sectors tend to have higher ESG scores than those with lower social and environmental impacts (Garcia et al., 2017). This contradicts the assumptions of the Legitimacy Theory (Patten, 1991; 1992) and goes against Modugu's (2020) argument that sensitive companies disclose more to avoid penalties. Therefore, H5 is rejected for all countries in the sample.

Another reason for these results is that the disclosure of ESG information is influenced by various pressures within the system where the company operates. These pressures come from stakeholders, regulatory bodies, institutional and market groups. Hence, a country's ESG framework depends on multiple factors, including political governance, culture, corruption, and economic development. These factors should be considered in future studies (Saini et al., 2022). Table 6 highlights a summary of the results of the study's hypotheses.

Table 6: Summary of the results of the research hypotheses

Hypothesis	Results				
	Germany	United Kingdom	Italy	France	Poland
H <sub>1</sub> : There is a positive relationship between firm size and ESG disclosure.	Confirmed	Confirmed	Confirmed	Confirmed	Confirmed
H <sub>2</sub> : There is a positive relationship between firm profitability and ESG disclosure.	Confirmed	Confirmed	Rejected $\emptyset$	Rejected $\emptyset$	Rejected $\emptyset$
H <sub>3</sub> : There is a positive relationship between firm's financial leverage and ESG disclosure.	Confirmed	Confirmed	Confirmed	Rejected (-)	Confirmed
H <sub>4</sub> : There is a positive relationship between the firm's market performance and ESG disclosure.	Rejected $\emptyset$	Rejected $\emptyset$	Rejected (-)	Confirmed	Rejected $\emptyset$
H <sub>5</sub> : There is a positive relationship between industry sensitivity and ESG disclosure.	Rejected $\emptyset$	Rejected (-)	Rejected (-)	Rejected (-)	Rejected (-)

Legend:  $\emptyset$  insignificant relationship; (-) significant and negative relationship.

Source: Survey data.

The results for the tested hypotheses vary in each country context, except for company size. Further studies are needed to examine the relationships between profitability, financial leverage, market performance, and industry sensitivity with ESG disclosure, as the results are inconsistent.

## Further analysis

To assess the relationship of company characteristics on the ESG pillars, we conducted a detailed analysis of each component to identify any consistent patterns and the factors driving them. Table 7 displays the results for environmental disclosure.

Table 7: Results of Equation 2 - Environmental

Country	Germany		United Kingdom		Italy		France		Poland	
	Random		Random		Fixed		Random		Fixed	
	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.
Intercept	-54.25	0.000*	-56.15	0.002*	-92.40	0.000*	-6.73	0.609	-134.95	0.000*
CS	11.29	0.000*	10.02	0.000*	10.88	0.000*	8.76	0.000*	17.58	0.000*
ROA	25.74	0.272	5.50	0.223	79.69	0.117	-41.52	0.048**	75.33	0.062***
FL	14.65	0.013**	2.79	0.256	78.02	0.000*	-14.88	0.005*	21.55	0.062***
MTBP	-0.37	0.151	0.00	0.623	-1.81	0.000*	0.14	0.204	1.02	0.141
INDS	3.63	0.071***	-4.70	0.000*	-7.40	0.042**	-3.67	0.017**	2.17	0.815
Within R <sup>2</sup>	-		-		0.5750		-		0.4936	
Overall R <sup>2</sup>	0.4424		0.3901		-		0.3237		-	
F-test	0.0000*		0.0000*		0.0000*		0.0000*		0.0000*	
B-P	Sig X <sup>2</sup> 0.0004*		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 1.0000		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 0.0000*	
Chow test	Sig. F 0.0004*		Sig. F 0.0000*		Sig. F 0.0143*		Sig. F 0.0000*		Sig. F 0.0000*	
TH	Sig. X <sup>2</sup> 0.6976		Sig. X <sup>2</sup> -74.21		Sig. X <sup>2</sup> 0.0001*		Sig. X <sup>2</sup> 0.4894		Sig. X <sup>2</sup> 0.0000*	
N obs.	754		2.123		265		789		151	

Legend: B-P: Breusch-Pagan; TH: Hausman test; N obs.: Number of observations. \*Significance at 1% level; \*\*Significance at 5% level. Source: Survey data.

Environmental disclosure refers to an organization's implementation of policies aimed at mitigating risks and exploiting environmental opportunities (Crespi & Migliavacca, 2020; Refinitiv, 2021). Across all countries analyzed, we found a positive association between company size and environmental disclosure, indicating that larger companies tend to score higher in environmental investments. This finding aligns with the research of Nicolò et al. (2022), who also examined European Union countries. The relationship between ROA and

environmental disclosure showed a negative effect in France and a positive effect in Poland, suggesting that French companies with higher returns on investments tend to have stronger environmental policies.

Financial leverage exhibited positive behavior in German, Italian, and Polish entities while displaying negative behavior in French entities. This indicates that leveraged companies are more committed to environmental aspects when striving for positive results. Market performance showed a negative relationship with environmental disclosure, suggesting that fewer growth opportunities lead to fewer environmental disclosures. In Germany, industry sensitivity was positively associated with environmental disclosures, whereas this relationship was negative in the UK, France, and Italy. These findings suggest that sensitive companies in Germany perform better on environmental issues. Moving forward, Table 8 presents the results for social issues.

Table 8: Results of Equation 3 - Social

Country	Germany		United Kingdom		Italy		France		Poland	
	Random		Random		Fixed		Random		Fixed	
	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.
Intercept	-42.93	0.000*	-21.71	0.000*	-31.34	0.002*	-17.39	0.007*	-44.63	0.049**
CS	9.93	0.000*	8.33	0.000*	6.94	0.000*	8.55	0.000*	6.98	0.002*
ROA	66.79	0.015**	2.52	0.532	58.90	0.150	1.46	0.953	-17.09	0.695
FL	7.86	0.232	7.85	0.000*	49.70	0.000*	-7.70	0.194	33.91	0.007*
MTBP	0.41	0.336	0.00	0.714	-1.74	0.000*	0.30	0.011**	0.45	0.550
INDS	2.22	0.320	-3.41	0.000*	-7.12	0.015**	-1.96	0.259	-9.85	0.329
Within R <sup>2</sup>	0.3364		0.3959		0.4802		0.3779		0.2569	
F-test	0.0000*		0.0000*		0.0000*		0.0000*		0.0000*	
B-P	Sig X <sup>2</sup> 0.0001*		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 0.3063		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 0.0000*	
Chow test	Sig. F 0.0106**		Sig. F 0.0000*		Sig. F 0.0316**		Sig. F 0.0000*		Sig. F 0.0000*	
TH	Sig. X <sup>2</sup> 0.0018 *		Sig. X <sup>2</sup> 0.0000*		Sig. X <sup>2</sup> 0.0007*		Sig. X <sup>2</sup> 0.0000*		Sig. X <sup>2</sup> 0.0004*	
N obs.	754		2.123		265		789		151	

Legend: B-P: Breusch-Pagan; TH: Hausman test; N obs.: Number of observations. \*Significance at 1% level; \*\*Significance at 5% level. \*\*\* 10% significance level. Source: Survey data.

Social disclosure measures how effectively an organization cultivates stakeholder trust and loyalty through social practices (Crespi & Migliavacca, 2020; Refinitiv, 2021). Similar to the findings on environmental disclosure, company size was positively correlated with social disclosure across all countries, indicating that larger companies are more engaged in social policies (Nicolò et al., 2022). Additionally, we observed a positive association between ROA and social disclosure

among German organizations, suggesting that higher investment returns correspond to greater corporate social investments. Financial leverage was positively related to the social disclosure of UK, Italian, and Polish companies, indicating that increased dependence on external resources leads to higher social scores. Market performance had a positive impact on social disclosures in France and a negative impact in Italy, suggesting that a company's higher valuation in relation to its equity leads to higher social scores in France but the opposite association in Italy. Additionally, environmentally sensitive industries in the UK and Italy had a negative relationship with social investments, suggesting that these industries are less inclined to implement social policies. Table 9 presents the results for governance disclosure.

Table 9: Results of Equation 4 - Governance

Country	Germany		United Kingdom		Italy		France		Poland	
	Random		Random		Fixed		Random		Fixed	
	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.	Coefic.	Sig.
Intercept	-36.22	0.000*	6.74	0.093***	-19.87	0.056***	-10.30	0.198	-39.53	0.049**
CS	8.01	0.000*	5.33	0.000*	6.77	0.000*	7.11	0.000*	8.81	0.000*
ROA	84.50	0.003*	19.60	0.000*	54.89	0.129	5.79	0.850	-41.63	0.283
FL	20.96	0.002*	-1.65	0.538	23.05	0.020**	-12.39	0.091***	32.44	0.004*
MTBP	-0.14	0.738	-0.01	0.624	-0.48	0.175	0.16	0.275	0.54	0.413
INDS	-4.23	0.068***	5.47	0.000*	2.72	0.351	-0.03	0.988	-24.90	0.006*
Within R <sup>2</sup>	0.2563		0.1436		-		0.1631		0.3089	
R <sup>2</sup>	-		-		0.2945		-		-	
Adjusted R <sup>2</sup>	-		-		0.2549		-		-	
F-test	0.0000*		0.0000*		0.0000*		0.0000*		0.0000*	
B-P	Sig X <sup>2</sup> 1.0000		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 0.3500		Sig X <sup>2</sup> 0.0000*		Sig X <sup>2</sup> 0.0000*	
Chow test	Sig. F 0.0240**		Sig. F 0.0000*		Sig. F 0.6121		Sig. F 0.0001*		Sig. F 0.0000*	
TH	Sig. X <sup>2</sup> 0.0024*		Sig. X <sup>2</sup> 0.0068*		Sig. X <sup>2</sup> -0.76		Sig. X <sup>2</sup> 0.0001*		Sig. X <sup>2</sup> 0.0003*	
N obs.	754		2.123		265		789		151	

Legend: B-P: Breusch-Pagan; TH: Hausman test; N obs.: Number of observations. \*Significance at 1% level; \*\*Significance at 5% level. \*\*\* 10% significance level. Source: Survey data.

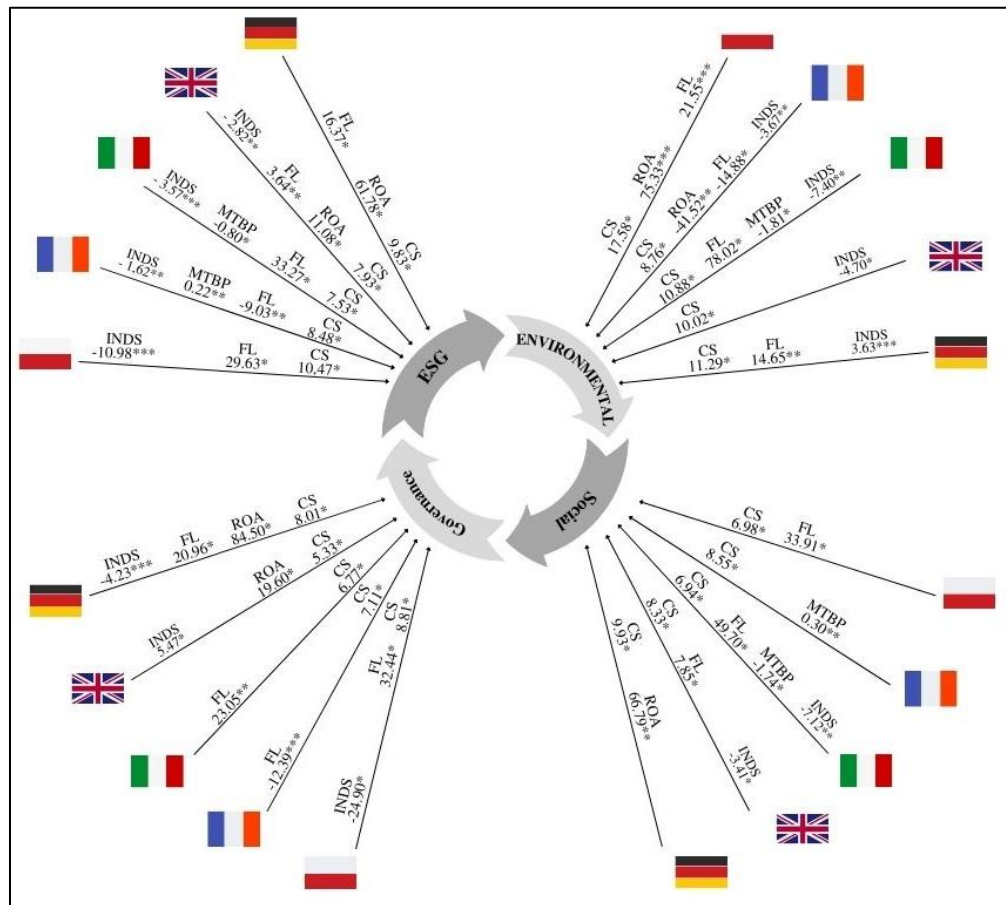
The governance pillar measures an organization's ability to adhere to corporate governance standards and practices (Crespi & Migliavacca, 2020). The results showed that firm size was positively correlated with governance disclosure in all countries, indicating that larger assets are associated with stronger governance practices (Nicolò et al., 2022). ROA also had a positive relationship with governance in German and British firms, where higher returns were linked to higher levels of governance.

Financial leverage was positively related to governance disclosure in Germany, Italy, and Poland but was negatively related in France. These findings suggest that firms with higher dependence on external resources invest more in governance policies, except in France (Nicolò et al., 2022). Industry sensitivity showed positive results in the UK and negative results concerning governance in Germany and Poland. This indicates that sensitive industries in the UK prioritize governance, while this is not the case in Germany and Poland.

Considering the results of ESG disclosure, it is important to note that European countries have been pioneers in regulating the disclosure of ESG information. Therefore, companies should focus on specific elements of ESG disclosures that create value for business, society, and shareholders (Saini et al., 2022). Furthermore, the findings indicate that the European Union has made efforts to integrate sustainability issues and stakeholder interests in creating corporate value and ensure greater accountability for the economic, social, and environmental impacts caused by companies' activities (Nicolò et al., 2022).

Therefore, analyzing the five most polluting European countries in the OECD is crucial for understanding their global environmental impact, evaluating their policies and practices, and assessing their progress towards environmental goals and international commitments (Wolde-Rufael & Mulat-Weldemeskel, 2023). Figure 3 presents a framework of the research results, showing the significant variables for overall ESG and its pillars in each country.

Figure 3: The framework of the survey results for the overall ESG and for the pillars



heterogeneity in the variables, except for company size, which had consistent results. Larger companies with better financial performance disclose more information and demonstrate superior environmental, social, and governance activities; this helps legitimize their actions.

Leveraged organizations provide more comprehensive disclosures to address information asymmetry and agency costs to meet creditor expectations. Company size emerges as one of the main factors associated with ESG disclosure, positively impacting all companies in the sample countries and across all ESG pillars. However, the industry sensitivity variable showed a significant and negative association with ESG disclosure in most companies, contrary to expectations and existing literature. This finding suggests that companies with greater environmental and social impacts disclose less ESG information. The profitability, leverage, and market performance of the variable examined in this study had a positive, negative, or neutral impact on environmental, social, and governance disclosure. These findings suggest that the factors that relate to ESG in the five countries analyzed differ from what is commonly found in the literature. These results are hoped to encourage further research, focusing on each country's specific contexts and the predictors' behaviors, as supported by Legitimacy and Agency Theories.

In summary, most analyses confirm that larger companies with strong financial and market performance are motivated to maintain or improve their reputation and legitimacy to avoid potential losses. On the other hand, companies with negative environmental and social impacts may avoid ESG disclosures to minimize attention to their problems, challenging the Legitimacy Theory.

Leveraged companies, on the other hand, disclose more detailed ESG information to reduce information asymmetries and agency costs, aligning with Agency Theory. While this study mainly focused on overall ESG, analyzing its individual pillars reveals environmental, social, and governance differences. This suggests that a tailored approach towards managers and policymakers can influence behavior in a manner similar to overall ESG. Additionally, the legal and business environment may be influenced by company size.

This research not only provides insights into how companies utilize ESG to legitimize their activities and address agency costs and information asymmetries, but it also highlights the importance of considering the specific country context and stakeholder expectations when studying ESG pillars. The practical and social

contributions guide executives in evaluating ESG reporting and actions. The results highlight the importance of considering company size, profitability, financial leverage, market performance, and sector in shaping strategies that increase ESG disclosures. This enhances companies' legitimacy in the eyes of stakeholders and reduces agency problems. The research also reveals how companies can focus on organizational practices to improve ESG disclosures. Public policies play a crucial role in providing resources for environmental and societal actions and improving corporate governance.

The findings of this research demonstrate the growing recognition of ESG disclosures in academia, leading companies, and business management (Saini et al., 2022). Regulators and policymakers also show significant interest in supporting initiatives that ensure the quality of non-financial information disclosed by companies (Saini et al., 2022). This study has particular relevance in the context of the most polluting European OECD member countries. Moreover, the study emphasizes the value that ESG disclosure transparency brings to companies, society, and shareholders (Saini et al., 2022).

It is recognized that this research is not exempt from limitations, which do not invalidate the presented findings and point to opportunities for future studies. First, the limitations related to the sample, future studies should consider analyzing other countries, comparing developed and emerging nations, and exploring additional determinants. Furthermore, the analysis period (2010-2019) is also considered a limitation, conducting a study in a post-pandemic context can evaluate temporal trends during economic recovery. Additionally, the variables used can also be considered a constraint, so including country characteristics like the Human Development Index, CO2 emissions, GDP, and urban population can offer new insights due to their influences on legal, normative, regulatory, economic, and social structures affecting companies' operations, strategies, and activities.

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### **Authors' Contribution**

Jonas Adriel dos Santos Grodt: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Software; Writing; Writing – review & editing.

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### **Conflict of interest**

The authors declare that there is no conflict of interest.

### **Research Data Availability**

The underlying content of the research text is already contained in the manuscript. Other data will be available upon request to the authors. The work did not consider specific organizations, institutions, or brands, and/or conducted research only with secondary data.

### **Declaration of Use of Artificial Intelligence (AI)**

AI tools were used to perform spelling, syntax, and APA style review.

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