



UNIONE EUROPEA
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PON
RICERCA
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REACT EU



UNIVERSITÀ
DEGLI STUDI
DI TRIESTE

UNIVERSITÀ DEGLI STUDI DI TRIESTE

XXXVII CICLO DEL DOTTORATO DI RICERCA IN

CIRCULAR ECONOMY

Risultati conseguiti con il finanziamento ottenuto a valere
sull'Asse IV del PON Ricerca e Innovazione 2014-2020 "Istruzione e ricerca per il recupero – REACT-EU"

Exploring ESG Reporting: Theoretical Perspective and Practical Evidence

Settore scientifico-disciplinare: SECS-P/07 ECONOMIA AZIENDALE

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*To my dear parents,
whose love and unwavering trust
have supported and inspired me
through these challenging and fulfilling years.*

Acknowledgments

Throughout this journey, I have been blessed to meet many people who have given me their valuable time, offered me selfless advice, and guided me in finding the answers to my questions. To all of them goes my gratitude. Special recognition goes to my supervisor, Professor Paola Rossi, whose unwavering trust in me has been a constant source of motivation. Her encouragement, attentive listening to my uncertainties, and support in facing challenges with determination have been invaluable. My sincere gratitude goes to Amin Gino Fabbrucci Barbagli and Domenico Denis Angarano who shared valuable insights with me and supported me in enriching my dissertation. Heartfelt thanks also go to Professor Valentino Pediroda, who gave me the opportunity to apply the knowledge gained during this doctoral program to the professional world, with the generous support of Professor Giorgio Valentinuz. I am equally grateful to Stefania, whose professionalism and dedication continue to be an inspiration. To my colleagues in the XXXVII cycle, in particular Marco and Nicola, my teammates in every challenge, as well as Lorenza, Giovanni, and all those I have had the pleasure of meeting both professionally and personally: your presence has been fundamental. You have seen me grow, struggle, and celebrate, always standing by my side. My deepest gratitude goes to my parents, whose admirable harmony and unconditional love have always inspired me to believe in myself, and to Gianluca, for always supporting my choices over the years and for helping me face each challenge, day by day.

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List of abbreviations and acronyms

CDSB - Climate Disclosure Standards Board

CSR- Corporate Social Responsibility

CSRD – Corporate Sustainability Reporting Directive (2022/2464/EU)

COP26- 26th Conference of the Parties on Climate Change

EC - European Commission

ED - environmental disclosure

EP - environmental performance

EFRAG – European Financial Reporting Advisory Group

ESG - Environmental, Social and Governance

ESRS – European Sustainability Reporting Standards

EU - European Union

GRI – Global Reporting Initiative

IFRS - International Financial Reporting Standards

IIRC - International Integrated Reporting Council

ISSB –International Sustainability Standards Board

NFRD - Non-Financial Reporting Directive (2014/95/EU)

NOP - National Operational Plan (Piano Operativo Nazionale)

NLP - Natural language processing

OECD - Organisation for Economic Co-operation and Development

PNR- Programma Nazionale per la Ricerca (National Research Programme)

SASB - Sustainability Accounting and Standard Board

SDGs- Sustainable Development Goals

SMEs - Small and Medium Enterprises

TCFD- Task Force on Climate-Related Financial Disclosures

VSMEs- Voluntary reporting standard for non-listed SMEs

FIRST CHAPTER

Introduction

This thesis aims to provide a broader understanding of corporate reporting practices by exploring how companies of all sizes disclose information about their commitment to environmental, social, and governance (hereinafter, ESG) issues. Nearly a decade has passed since nations across the globe adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) at the United Nations General Assembly. This global commitment, while inherently part of a political initiative, has undoubtedly had an impact on the business dynamics. Individuals, along with large companies and less structured businesses, are called upon to work in concert to help achieve these established goals. Nevertheless, the issue of corporate responsibility had already been the subject of debate at an earlier point in time. If historically the focus of companies was exclusively on profit maximization for shareholder satisfaction, this traditional goal has increasingly been considered insufficient. This paradigm shift led to the emergence of Corporate Social Responsibility (hereinafter, CSR). This concept, which has gained considerable importance in recent times, has a long and distinguished history (Carroll, 1999). It first emerged in the 1950s with the publication of Bowen's (1953) seminal book "Social Responsibilities of the Businessman". In his work, the author underscored "the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society" (Bowen, 1953, p. 6). Carroll (1991) subsequently expanded upon this concept through his renowned CSR pyramid, identifying four distinct categories of corporate responsibility: economic, legal, ethical, and discretionary. The propagation of this notion, however, was in direct opposition to the economic perspective espoused by Milton Friedman. Indeed, in a now-famous essay published in the New York Times Magazine in 1970, the Nobel Prize-winning economist argued that corporations have no social responsibility beyond profit, leaving social issues to the public sector. Thus, according to this perspective, pursuing objectives beyond profit can lead management to interfere in an area outside its domain, thereby losing the core focus (Friedman, 1970). Although the concept of CSR has gradually diffused throughout the business sector during the early years of the third millennium, the topic remains complex, even after decades of renewed academic research. This complexity stems from the multitude of definitions concerning the issue and its remarkable multifaceted nature (Carroll & Brown, 2018). Nevertheless, a definition that facilitates comprehension of the CSR concept is that provided by the European Union, which conceives it as "the responsibility of enterprises for their impacts on society" (European Commission, 2011, p. 6). While CSR refers to corporate engagement in socially responsible

practices, the more recent concept of ESG pertains to the criteria by which corporate impact is measured and evaluated, considering three dimensions: environmental, social, and governance. Both acronyms are becoming increasingly prevalent in institutional and professional contexts. Their widespread use suggests, on the one hand, the central role of the topic in economic and social progress but, on the other, underlines the risk of it gradually becoming a slogan without substantive meaning.

In response to the growing demand for accountability and transparency regarding their socially responsible behaviour, an increasing number of companies have started reporting on their commitment to social and environmental issues (Cho et al., 2015). This has led to the emergence of numerous standards and guidelines designed to support companies in this regard, driven by both voluntary initiatives and regulatory measures. The frameworks developed by the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), the Task Force on Climate-related Financial Disclosures (TCFD), and the International Integrated Reporting Council (IIRC) have gained global recognition, while the European Union has played a key role in promoting mandatory reporting, launching a busy agenda of initiatives to promote disclosure and transparency of corporate actions (Agostini et al., 2022). The first steps in this direction were taken with the Modernisation Directive (2003/51/EC), which broadened the scope of financial reporting by requiring the inclusion of environmental and employee-related issues when appropriate. The lack of clarity on this initiative led to its inconsistent adoption within the European Union (Baumüller & Sopp, 2021). Subsequently, the Non-Financial Reporting Directive (NFRD, 2014/95/EU) required larger public interest entities to mandatorily disclose information on environmental, social, employee, human rights, anti-corruption, and anti-bribery issues. However, the NFRD has also been criticised for its lack of comparability and limited scope (Dumitru et al., 2017; Hummel & Jobst, 2024). In response to these criticisms, the European Commission introduced the Corporate Sustainability Reporting Directive (CSRD, 2022/2464/EU) in 2021, approved by the European Parliament in November 2022, and entered into force in January 2023. CSRD introduces several innovations, including the concept of dual materiality, a broader scope that now includes listed small and medium-sized enterprises and non-EU companies, and the introduction of its own European Sustainability Reporting Standards (ESRS). Moreover, outside the mandatory reporting scope, a voluntary *ad hoc* standard (VSME) is created for unlisted small and medium-sized undertakings. It aims to provide an effective reporting tool for communicating and monitoring the sustainability performance of smaller companies, enabling them to respond to the growing demand for such information from their stakeholders. These regulatory advancements underscore the commitment of the European Union to enhancing transparency, comparability, and accountability in ESG reporting among companies of all sizes.

Alongside the development of global standards and the enhancement of the regulatory frameworks, scholars have been extensively engaged in the analysis of reporting practices on environmental, social, and governance aspects, examining their relationship with corporate performance as well as their

various determinants and consequences. Despite the considerable growth of academic discourse on this topic over recent decades, certain gaps in the literature remain evident. Firstly, the inconsistency of empirical findings, arising from a paucity of conceptual, operational, and theoretical uniformity on the topic, remains an ongoing challenge (Cormier et al., 2004; Hummel & Schlick, 2016). Secondly, the absence of comprehensive studies specifically focused on small and medium-sized enterprises (hereinafter, SMEs) represents a significant limitation in current research. Given the vital contribution of SMEs to economic, environmental, and social development, it is imperative to extend the academic discussion to include this specific category of enterprises, also in view of the growing regulatory framework. Notably, as early as 2011, the European Commission underscored the pivotal potential of CSR initiatives in fostering the growth of SMEs (European Commission, 2011). In more recent developments, listed SMEs are subject to the requirements of the CSRD. In addition, as anticipated, a European voluntary reporting standard has been developed specifically for unlisted SMEs. Despite the evident necessity to broaden the scope of ESG reporting practices across a more extensive range of companies, the academic discourse on this is still in its infancy.

Faced with the limitations of the literature, the present thesis seeks to achieve a more comprehensive understanding of ESG reporting practice, focusing on the strategic importance of extending the debate to smaller companies. This thesis consists of two primary studies, which are reported in the following two chapters. The first study explores the association between environmental disclosure and environmental performance in companies worldwide, emphasising the impact of diverse institutional characteristics in shaping this relationship. More in detail, a meta-analysis and a meta-regression are conducted to clarify the discrepancy of evidence regarding the topic. This study addresses the divergence between different theories and suggests how the varying degrees of explicitness of institutional characteristics may explain the heterogeneity of the results that emerged from empirical research. The second study investigates the current state of environmental, social, and governance reporting by SMEs. Automated textual analysis is employed to examine several standalone ESG reports published by Italian unlisted medium-sized companies from both quantitative and qualitative perspectives. This study aims to provide new evidence on the topic, filling the gap in the literature historically focused on large companies and providing useful insight to regulators and standard setters.

This project aligns with the objectives of Axis VI "Education and research for recovery – REACT-EU", which is part of the NOP Research and Innovation 2014-2020, and specifically Action IV.5 which emphasises the importance of the transition of enterprises towards a green economy and the strategic relevance of environmental, social and governance factors, in relation to the 17 SDGs. Furthermore, the present project has the potential to contribute to the goals of the National Research Program (PNR), particularly within the framework of the "Grande Ambito di Ricerca e Innovazione, Cultura Umanistica, Creatività, Trasformazioni Sociali, Società dell'Inclusione". This aim is considered by analysing the

various areas of private strategies with a focus on inclusive and sustainable development and the promotion of a holistic approach to sustainability.

Results achieved with funding obtained under Axis IV of NOP Research and Innovation 2014-2020 "Education and research for recovery – REACT-EU".

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SECOND CHAPTER

The moderating effects of institutional characteristics on the association between environmental disclosure and environmental performance: a meta-regression

Co-authored with Professor Paola Rossi and Saeed Md Abdullah

Abstract

A growing number of studies have attempted to explore the relationship between environmental disclosure and environmental performance, yielding inconclusive results. To deepen and clarify this divergence in the literature, this study conducts a meta-analysis on a sample of 55 academic studies, revealing an overall negative association, and, thus, suggesting the predominance of socio-political theories over economic theories in explaining this relationship. In addition, a meta-regression is conducted to analyse the moderating effect of institutional dimensions. The findings indicate that high levels of voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and anti-corruption measures, can enhance the propensity of companies to disclose environmental information, even in instances of negative relative performance. Conversely, low levels of government effectiveness and quality of regulation act as deterrents. By providing evidence of how these institutional characteristics may affect corporate environmental engagement, this study could offer valuable insights to scholars, practitioners, and standard setters.

Keywords: environmental disclosure, environmental performance, meta-regression analysis, institutional characteristics.

2.1. Introduction

In recent decades, environmental issues have become increasingly important in the global debate, involving governments, businesses, and civil society. In this context, companies are facing pressure not only to improve their environmental performance, but also to communicate their environmental impact transparently (Cormier et al., 2004). The analysis of the relationship between corporate environmental disclosure (ED) and environmental performance (EP) has gained exponential relevance among organizations, practitioners, and academics. While socio-political theories help to understand how disclosure can be used strategically by companies with poor environmental performance to influence stakeholder perceptions and to gain legitimacy, on the other hand, economic theories suggest that firms with good environmental performance tend to disclose more information to highlight their commitment to sustainability. Relying on different theoretical and methodological constructs in various national contexts, no general consistency emerges from the empirical studies (Hummel & Schlick, 2016). Specifically, while some studies find a positive relationship between ED and EP (for instance, Al-Tuwaijri et al., 2004; Clarkson et al., 2008), from others emerge a negative (Patten, 2002; Bewley & Li, 2000; de Villiers & van Staden, 2011) or non-significant (Ingram & Frazier, 1980; Freedman & Jaggi, 1982; Wiseman, 1982; Hughes et al., 2001) relationship between the two. Addressing the inconsistency in the literature within a variegated theoretical framework is an open challenge (Cormier et al., 2004; Hummel & Schlick, 2016). Considering this, in addition to adopting a meta-analytic approach to synthesize the empirical findings regarding the association between ED and EP, this study presents a novel investigation by conducting a meta-regression to further explore the moderating role of several institutional factors. Indeed, although the topic has gained exponential importance in the literature, the role of institutions has been neglected (Brammer et al., 2012). Some empirical studies actually analyse the association between the level of environmental information provided by companies and institutional factors, while others focus instead on the relationship between the latter and environmental performance; however, to the best of our knowledge, none of the meta-analyses conducted on the topic (Cho et al., 2016; Doan & Sassen, 2020) clarify the moderating role of institutional aspects in the ED - EP association.

The aim of this study is not only to clarify the interrelation between ED and EP by synthesising the results emerging from the literature, but also to test whether the institutional characteristics of the different contexts can explain the variety of observed empirical findings. Based on a sample of 55 empirical studies and with 389 effect sizes examined, the meta-analysis identifies a statistically significant negative association between ED and EP. Moreover, the meta-regression results indicate that institutional characteristics moderate the relationship between ED and EP to varying degrees. In contexts characterised by elevated levels of voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and anti-corruption measures, the negative relationship

under analysis is reinforced, making companies with poor environmental performance even more likely to disclose environmental information. Conversely, low levels of government effectiveness and regulatory quality act as deterrents, weakening the aforementioned propensity.

The present study makes a further contribution to the literature on environmental accounting. It offers theoretical insight about the topic and highlights how socio-political theories provide a solid basis for explaining the ED-EP association. Furthermore, by demonstrating the moderating role of six institutional characteristics, the present study may not only enrich the academic debate on the issue, but also provide implications for policymakers and practitioners. Indeed, the results suggest that a strengthened institutional context can foster greater transparency in environmental disclosure and corporate accountability.

The present study is structured as follows. Sections 2 and 3 provide the theoretical framework, literature review, and hypothesis development. Section 4 presents the meta-analysis and meta-review methodological details. The subsequent Section 5 outlines the empirical results and discussion, while Section 6 illustrates the contribution, potential implications, and limitations of the study.

2.2. Theoretical Framework

For several decades, scholars have explored the relationship between ED and EP through various theoretical frameworks, each offering a unique perspective on the motivations driving corporate environmental commitment. Among them, socio-political theories, including legitimacy theory and stakeholder theory are widely applied in the environmental accounting literature (e.g., Ullmann, 1985; Roberts, 1992; Clarkson, 1995; Gray et al., 1995; Hackston & Milne, 1996; Patten 2002). Specifically, according to stakeholder theory, companies should consider the interests of different stakeholder groups, namely employees, customers, suppliers and communities (Jamali, 2008), in order to meet their expectations (Freeman et al., 2010) and thus survive in the long term. Therefore, value creation for companies should not only take into account financial profits, but also a wider range of factors, including environmental, social and ethical considerations that contribute to the well-being of all parties involved (Clarkson, 1995). From this perspective, companies with less satisfactory environmental performance may utilise disclosure as a tool to improve their image and manage stakeholder perceptions, seeking to demonstrate a commitment to environmental responsibility despite their operational shortcomings, (Roberts, 1992; Huang & Kung, 2010). Legitimacy theory is based on the idea that companies must act in accordance with societal values (Suchman, 1995) to ensure their long-term survival (Dowling & Pfeffer, 1975). This theory provides a solid basis for understanding how companies take environmental

actions and provide information about them in order to align corporate actions with societal values (Deegan, 2002), thereby promoting their social legitimacy (Lindblom 1994; Patten, 2002; Cormier et al., 2004). Environmental reporting could therefore be a tactical approach to managing reputation and building public trust. Based on the above theories, a negative relationship between the extent of environmental disclosure and environmental performance could be expected, as companies with lower environmental performance may be inclined to engage in broader disclosure to strengthen their legitimacy and reassure stakeholders about their practices (Patten, 2002).

An opposite perspective is represented by the economic-based theories. Among them, signalling theory (Spence, 1978) posits that firms employ signals to convey their reliability. Specifically, high performers are incentivised to disclose positive information to signal their favourable position by reducing information asymmetry and, consequently, uncertainty in the market. Conversely, those with poor performance are less inclined to disclose such information to avoid compromising their reputation. Again, the application of signalling theory is explored beyond the context of financial disclosure, explaining how companies with a stronger commitment to CSR might be more likely to provide information about it (Hetze, 2016). To conclude, from the perspective of economic theories, companies with weaker environmental performance could be inclined to limit information or remain silent to avoid drawing attention to their shortcomings, while those with stronger environmental performance could be more likely to provide extensive information to enhance their reputation, suggesting a positive relationship between ED and EP.

Finally, institutional theory provides a holistic explanation of corporate behaviour. According to this theory, organisations operating within a similar institutional context tend to exhibit increasing levels of similarity over time. This is due to the pressures they face, which include the adoption of institutional and social norms (DiMaggio & Powell, 1983). In detail, organizations respond to external pressures through a process of homogenization known as “isomorphism,” which manifests in three distinct forms: coercive, mimetic, and normative (DiMaggio & Powell, 1983). Coercive isomorphism refers to the pressure exerted by regulatory or authoritative bodies that force organisations to adhere to specific legal standards. This form of pressure can exert a systematic effect on the adoption of sustainable practices by companies, pushing them to minimise their environmental impacts (Eccles et al., 2014) and promoting the reporting of corporate commitment on these aspects (Larrinaga-González, 2007; Othman, 2011; Dumitru et al., 2017). Mimetic isomorphism occurs when organisations emulate the behaviour of others perceived as successful. This pressure can prompt companies to adopt specific reporting practices (Rodrigues & Craig, 2007) and enhance their environmental practices in response to uncertainties about future environmental trends, leading them to imitate the most legitimate or successful companies in the market (Nasir et al., 2021). Finally, normative isomorphism refers to the cultural values, norms, and beliefs shared within society that exert influence on organisational practices and decisions. The significance of normative framework is particularly evident in the context of corporate environmental

disclosure, as cultural and normative pressure could influence ethical decision-making processes, and the level of transparency adopted by companies in relation to their sustainability initiatives (Tsakumis, 2007; Posadas et al., 2023). In conclusion, institutional theory provides a comprehensive framework for understanding how external pressures —such as regulatory, competitive, and cultural forces—impact corporate behaviour and strategy. When integrated with social-political and economic theories, it offers a robust perspective on how organisations, particularly in the context of environmental disclosure and performance, are shaped by these external influences.

2.3 Literature Review and Hypotheses Development

2.3.1 The association between environmental disclosure and environmental performance

The association between the extent to which companies disclose information about their environmental practices and their actual environmental performance has been the focus of extensive but inconclusive empirical investigation. As anticipated, socio-political theories argue that environmental disclosure can be used by companies as a tool to meet the informational demands of various stakeholders and to gain, maintain, or repair their legitimacy (Deegan, 2002). Companies are expected to be inclined to increase their environmental disclosure when faced with legitimacy-threatening events, satisfying the demand for additional information and signaling transparency by changing the public perception (Patten, 1992). Several empirical studies support this idea. For instance, Bewley and Li (2000), in their examination of factors influencing environmental disclosures, observe that companies with a higher propensity to pollute tend to disclose more general environmental information. Similarly, Patten (2002) finds a negative relationship between environmental disclosure in annual financial statements of 131 U.S. companies and their environmental performance, suggesting that companies with poorer environmental performance use disclosure as a function of their exposure to the social/political environment. Considering different channels of disclosure, de Villiers and van Staden (2011) confirm a negative relationship between ED and EP. They further posit that corporations tend to disclose a greater volume of environmental information on their websites in response to an imminent environmental crisis, while furnishing a more exhaustive array of details in their annual reports when confronted with a long-term negative environmental reputation.

Conversely, other studies, particularly those conducted in the early stages, demonstrate an absence of a relationship between ED and EP. Ingram and Frazier's (1980) pioneering study examines the relationship between CSR disclosure, measured by content analysis, and an index of environmental performance developed by the Council on Economic Priorities, not observing any statistically

significant relationship between the two variables. Similarly, analysing the association between pollution disclosure, pollution level, and economic performance of 31 firms affected by environmental laws in the United States, Freedman and Jaggi (1982) confirm the absence of an association between ED and EP. Furthermore, Wiseman (1982) develops a disclosure index based on various environmental factors to test the relationship between the content of information provided and the environmental performance of 26 companies in sensitive sectors. His results reveal no significant relationship, suggesting that the extent and content of environmental disclosure do not necessarily reflect the environmental performance or commitment of companies. Using the disclosure index developed by Wiseman (1982), Hughes et al. (2001) test whether environmental disclosures are consistent with environmental performance, distinguishing between good, mixed, and poor performance. Although the results show that firms with poor environmental performance tend to provide more environmental information than those with good performance, no significant differences in disclosure levels are found between firms with good and mixed environmental performance.

In contrast to these results, other contributions confirm the existence of a positive relationship between ED and EP, as assumed by economic-based theories. For instance, Al-Tuwaijri et al. (2004) demonstrate a positive correlation between the level of disclosure of specific pollution measures and environmental performance, measured by relative quantity of recycled toxic waste. Furthermore, Clarkson et al. (2008) analyse the extent of disclosure through a content analysis based on GRI indicators and measure environmental performance considering the ratio of corporate emissions of toxic chemicals to sales. The authors show a positive relationship between environmental performance and voluntary environmental disclosure, confirming the results of Al-Tuwaijri et al. (2004).

In essence, the empirical literature examining the relationship between ED and EP remains divided. Some studies confirm that companies with poorer environmental performance tend to disclose more information, using it as a strategy to maintain legitimacy or respond to stakeholder pressure, aligning with socio-political theories. In contrast, other research supports the economic perspective, suggesting that companies with stronger environmental performance are more likely to provide broad disclosure. Moreover, numerous studies have found no significant association between the level of disclosure and the environmental performance of companies. Over the years, several studies have attempted to obtain a more robust and reliable overall view on the topic, defining a clear direction of the association under analysis: through meta-analysis, Cho et al. (2016) find no significant association between environmental disclosure and environmental performance, while the more recent meta-analysis of Doan and Sassen (2020) observes a negative association between the two. Consequently, based on the contrasting views from socio-political theories and economic-based theories, the following hypothesis is formulated:

H₁: The environmental disclosure (ED) is associated with environmental performance (EP).

2.3.2 The moderating role of institutional characteristics

As demonstrated by Campbell (2007), the institutional environment could exert a significant influence on the adoption of socially responsible behaviour by companies. This phenomenon can be attributed to several factors, including opportunistic motivations and a sense of professional obligation (Garcia-Sanchez et al., 2015). Despite the fact that the role of institutions has been largely overlooked in the extensive debate on CSR (Brammer et al., 2012), certain studies explore the potential influence of the institutional context on environmental disclosure (Buhr & Freedman, 2001; Othman et al., 2011; Baldini et al., 2018; Posadas, 2023), while others analyse the relationship of institutional factors and environmental performance (Hoffmann, 1999; Hoffmann & Jennings, 2011; Jackson & Apostolakou, 2010; Ioannou & Serafeim, 2012; Riti et al., 2021; Mooneeapen et al., 2022; Rahi et al., 2023). Beyond presenting different results across these studies (Ali et al., 2017; Gerged et al., 2021), the role of institutional characteristics in the association between environmental disclosure and environmental performance remains to be explored.

Based on this, while previous meta-analyses of the association between ED and EP are focused on their exclusive relationship (Cho et al., 2016) or explore how outcomes may be influenced by the measurement characteristics used (Doan & Sassen, 2020), the present study differs from previous ones by exploring the moderating role of institutional characteristics on ED-EP relationship. The World Governance Index (WGI) developed by the World Bank is often employed by academics to evaluate institutional context (Kaufmann et al., 2011; Gerged et al., 2021). Covering over 200 countries and collecting data from 1996, the WGI assesses institutional quality through six dimensions: voice and accountability, government effectiveness, political stability, rule of law, regulatory quality, and control of corruption.

Recognized as a key institutional feature, voice and accountability (VA) assesses the extent to which citizens can engage in political processes, exercise freedom of expression and association, and access to free media (World Bank Group, 2023). According to Rahi et al. (2023), VA supports corporate environmental performance in two basic ways. First, citizens can elect political parties committed to environmental goals, thereby influencing government policies and, thus, pushing companies toward sustainable practices. Second, in a system of free speech and free access to communication tools, the mass media can be used to denounce corporate behaviour, including promoting social boycott actions against those companies with low environmental performance. Therefore, the voting power combined with free access to the media allows citizens to influence government and corporate actions, being able to promote greater alignment with environmental and sustainability goals. Using data on 2724 firms in 42 different countries, Hartmann and Uhlenbruck (2015) confirm that corporate environmental performance is driven by the degree of freedom of the press. In addition, being linked to freedom of expression and media exposure, VA could affect the level of environmental information provided by

companies (Gerged, 2021; Pinheiro et al., 2022). Therefore, since differences in VA levels across countries can have a significant impact on both ED and EP, the following hypothesis is proposed:

H₂: The association between ED and EP depends on high/low voice and accountability (VA).

Political stability (PS) reflects the stability of the political environment (World Bank Group, 2023), which in turn ensures that companies can operate in a safe environment (Gomez & García, 2020). Thus, PS can exert a considerable influence on corporate environmental performance (Rahi et al., 2023). Indeed, in politically unstable environments, the high risk of conducting business can act as a deterrent for companies seeking to engage in sustainability initiatives. For instance, Pan et al. (2020) posit that in an uncertain political context, companies may hesitate to disclose environmental information due to a lack of clarity about compliance expectations, or concern about reputational risks if disclosure reveals potential liabilities. Conversely, in a stable environment, companies are more inclined to allocate resources toward environmental initiatives due to heightened pressure from stakeholders (Pinheiro et al., 2022). The following hypothesis is thus proposed:

H₃: The association between ED and EP depends on high/low political stability (PS).

Government effectiveness (GE) is defined as the perceived quality of public services, the degree of independence from political influence, the quality of policy formulation and implementation, and the credibility of the government in supporting those policies (World Bank Group, 2023). According to Rahi et al. (2023), GE can positively influence the environmental performance of companies: effective governance can motivate companies to act more responsibly, both towards the environment and society. Furthermore, de Villiers and Marques (2016) and Gallén and Peraita (2018) suggest that in contexts where public services are most effective, firms are more transparent and tend to have increased environmental disclosure. These conclusions are corroborated by Pinheiro et al. (2022), who posit a positive correlation between government effectiveness and environmental disclosure. Consequently, the following hypothesis is proposed:

H₄: The association between ED and EP depends on high/low government effectiveness (GE).

In relation to the perceived capacity of a government to formulate and execute effective policies (World Bank Group, 2023), regulatory quality (RQ) has the potential to be associated with both environmental performance and disclosure practices. Indeed, when RQ is high, governments appear better able to implement and enforce regulations. The establishment of clear rules and controls, in conjunction with the threat of litigation, could incentivise corporate behavior and enhance

environmental practices (Rahi et al., 2023). This hypothesis is further substantiated by an analysis of a sample of listed firms in OECD countries by Kaufmann and Lafarre (2021), which demonstrates that CSR performance is, overall, higher in countries with higher levels of regulatory quality. Furthermore, implementing stringent environmental legislation leads to greater transparency in the disclosure of environmental performance by companies (Cho et al., 2006). Consequently, it can be hypothesized that:

H₅: The association between ED and EP depends on high/low regulatory quality (RQ).

The rule of law (RL) indicator could have a role in shaping responsible business behaviour. Indeed, when a country has a developed rule of law, businesses may be more likely to invest in sustainable practices, feeling more confident that their efforts and commitment to sustainability will not be compromised by arbitrary government actions or, even worse, illegality. In this regard, Rahi et al. (2023) posit that firms are more likely to take social and environmental actions when legal frameworks hold them accountable, making it clear that unsustainable practices can conversely have serious consequences. Similarly, Kaufmann and Lafarre (2021) argue that in countries where law enforcement is effective, firms that engage in illegal and unsustainable behaviour are likely to be observed and sanctioned, deterring these actions. Moreover, recent findings by Atta et al. (2024) show how specific dimensions of the rule of law - such as constraints on government power, open governance, protection of fundamental rights, and integrity of the criminal justice system - are particularly influential in improving environmental performance. In summary, as suggested by Campbell (2007), understanding the repercussions of unsustainable actions can motivate companies to align more closely with societal values. Along these lines of argument, the following hypothesis is proposed:

H₆: The association between ED and EP depends on high/low rule of law (RL).

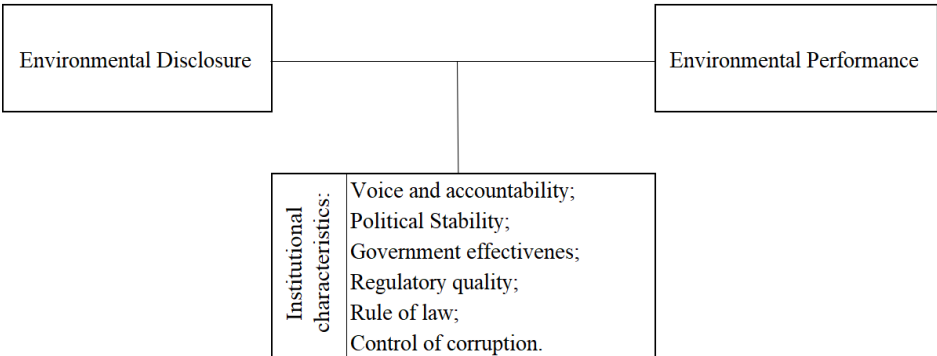
Corruption control (CC) is based on the perceived extent to which public power is exercised for private gain (World Bank Group, 2023). Corruption allows firms to avoid environmental responsibilities, with inevitable damage to the environment (Rahi et al., 2023). In addition to this, according to Ioannou and Serafeim (2012), in highly corrupt contexts, unethical practices can give firms a competitive advantage (which often prompts other firms to adopt similar unethical behaviours to remain competitive); moreover, in these contexts, governments are less likely to reward ethical business practices with incentives, making it more difficult for socially responsible firms to succeed. Regarding the relationship between CC and environmental disclosure, using a difference-in-difference model, Wei and He (2022) find that the anti-corruption campaign in China significantly improved the quality of environmental disclosure. By reducing corruption, this type of campaign creates a competitive landscape in which companies are incentivised to adopt the most transparent and sustainable practices.

This leads companies to comply with broader environmental goals, improving the quality of disclosure and environmental practices. Thus, the final hypothesis to test is:

H₇: The association between ED and EP depends on high/low control of corruption (CC).

Figure 1 presents the research design diagram, structured according to the hypotheses developed in the preceding sections.

Figure 1 – Research Design



2.4. Research methodology

2.4.1 Search for relevant studies

In this study, meta-analysis and meta-regression are utilised as a statistical technique to derive meaningful insights from various empirical studies on the topic. A multi-step process is implemented in order to identify which papers should be included in the analysis, according to pre-defined criteria of inclusion and exclusion. Firstly, studies must be published in peer-reviewed academic journals and written in English, ensuring a certain level of academic rigor and accessibility. Secondly, the focus is exclusively on empirical research, excluding qualitative studies, since it is not possible to extrapolate from these studies quantitative data that would be useful for conducting meta-analysis and meta-regression. Thirdly, studies to be included must examine the relationship between ED and EP within corporate settings, in order to facilitate the measurement of effect size. Lastly, studies involving cross-country samples are intentionally excluded, allowing for a more effective examination of the moderating influence of institutional characteristics within a single country.

After identifying the inclusion and exclusion criteria, the following databases are selected to identify studies: Scopus, ScienceDirect, JSTOR, Emerald Insight, EBSCO, Wiley, Taylor & Francis, Springer, Web of Science, and ProQuest. This selection is based on the comprehensive coverage of studies relevant to the topic and the wide coverage of full-text articles in these databases (Doan & Sassen, 2020; Velte, 2021; Gupta & Das, 2022). In addition, following prior literature (Malik, 2015; Ali et al., 2017, Khan, 2022) some academic journals renowned for publishing high-quality research on environmental issues, business, and accounting are identified. This selection includes Accounting, Auditing and Accountability Journal, Accounting, Organizations and Society, Business Strategy and the Environment, Corporate Social Responsibility and Environmental Management, Journal of Accounting and Public Policy, Journal of Accounting Research, Journal of Business Ethics, Journal of Cleaner Production, and Meditari Accountancy Research.

The following keywords are used to identify relevant papers in the selected databases and journals: environmental disclosure, environmental performance, association between environmental disclosure and environmental performance, environmental reporting and environmental performance, effects of environmental reporting, effects of sustainability reporting, determinants of environmental reporting, sustainability reporting, sustainability performance, green accounting, green practices, corporate sustainability, carbon, climate change, emissions, pollution, toxic, GHG. The presence of keywords in the titles, abstracts, and keyword lists of the various papers leads to an initial identification of 73 studies. To ensure that only the most relevant studies are included, the abstracts are carefully reviewed to ensure that each study meets all the pre-defined selection criteria. As part of this screening

process, one non-empirical paper and three non-peer-reviewed publications are excluded. Additionally, three studies that do not explicitly examine the ED-EP or do not provide sufficient data to calculate a standardized effect size are also excluded. Furthermore, eleven cross-country studies are removed from the sample. The final dataset consists of 55 studies. Figure 2 illustrates the selection process, while Table 1 presents the final sample composition. Appendix I provides details of the studies included in the meta-analysis, including (1) author(s) and year of publication, (2) journal, (3) title, and (4) country.

Figure 2- Studies Selection Process

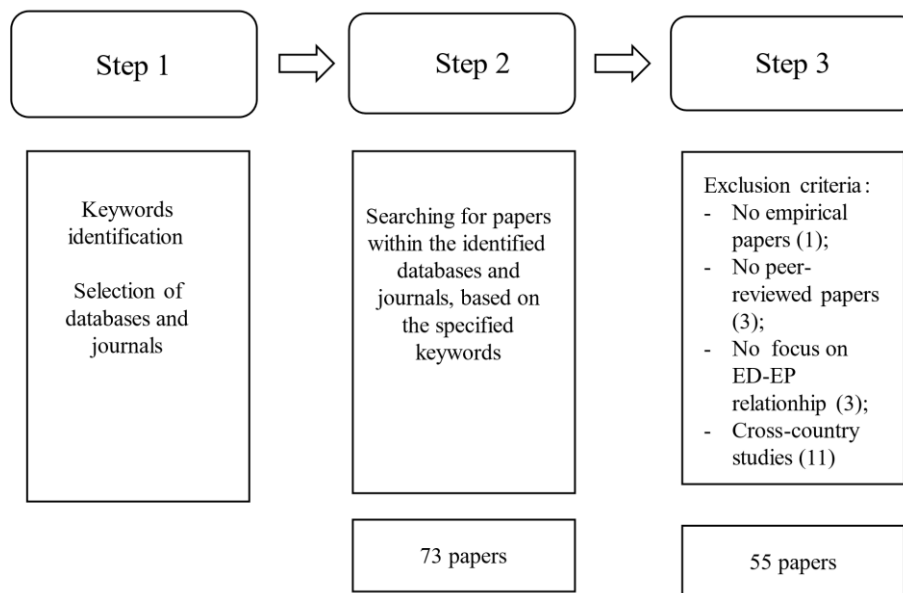


Table 1- Composition of the sample

Initial sample	73
Criteria leading to the exclusion of studies	
- Non-empirical papers	1
- Non-peer-reviewed papers	3
- No direct focus on the ED-EP relationship	3
- Cross-country studies	11
Final sample	55

2.4.2 Meta-analysis and meta-regression techniques

Aiming to address the discordance found in the literature on the topic, this paper uses meta-analysis and meta-regression to systematically analyse and integrate the results of independent studies that address the same research question (Hunter & Schmidt, 1990; Lipsey & Wilson, 2001). A fundamental aspect of conducting a meta-analysis is the evaluation of potential heterogeneity, verifying if the variations in the effect sizes of studies are larger than expected by chance. To quantify the heterogeneity, three statistical measures are used, namely Q statistic, Tau² (τ^2), and I². The Q statistic, a measure of the overall variability of effect sizes, is calculated as the sum of the squared differences between the effect size estimate of each study and the overall effect size estimate, weighted by the inverse of the variance of each study. If the Q statistic is statistically significant ($p < 0,05$), it indicates the presence of heterogeneity, meaning that the observed variation between studies is greater than would be expected by chance. Despite the usefulness of this measure, it is very sensitive to the number of studies included in the meta-analysis and does not specify the degree of heterogeneity. While Q statistics only determines whether heterogeneity exists, τ^2 estimates the variance of the effect sizes across studies included in the meta-analysis, representing the absolute value of the true variance. Finally, I² statistic measures the proportion of the total variability in effect size estimates that is due to heterogeneity rather than random sampling error. Unlike the Q statistic, I² does not depend on the number of studies, hence it is more reliable for assessing the consistency of results. High values of Q, τ^2 , and I² indicate greater heterogeneity. Under the assumption that true effect sizes may vary among studies, this study applies a random-effects model in the meta-analysis to estimate both the overall association between ED and EP and the heterogeneity within this relationship, as quantified by the Q statistic, τ^2 , and I². Furthermore, this study employs a meta-regression analysis to examine the impact of moderating variables on the relationship between ED and EP. Meta-regression is an analytical technique for investigating heterogeneity and establishing a linear relationship between an outcome measure and one or more covariates. In this analysis, the outcome measures are the effect sizes related to the ED-EP association, while the covariates encompass the institutional attributes of each country represented in the studies included in the sample.

2.4.3 Measurement of variables

In this study, the meta-dependent variable represents the effect size that quantifies the relationship between ED and EP. To calculate the overall effect size, the coefficient of correlation (r) is used when clearly reported in the analysed studies. In cases where r is not provided, the t -statistic and p -value (extracted from regression results) are converted into r . Since most of the studies from which the effect sizes are derived assess EP using a negative tone, the sign of the effect size is reversed to a positive tone to enhance the interpretability of the analysis. The meta-independent variables in this study correspond to the institutional characteristics of the countries included in the sample. In relation to these dimensions, as anticipated, this study considers six WGI provided by the World Bank database (World Bank Group, 2023), which have been used from previous literature examining the impact of institutional settings on the disclosure of corporate social responsibility (Kaufmann et al., 2011), namely voice and accountability (VA), political stability (PS), government effectiveness (GE), regulatory quality (RQ), rule of law (RL) and control of corruption (CC). These indicators are derived from hundreds of variables sourced from extensive databases, reflecting perceptions of governance worldwide as reported by a diverse range of respondents, including experts from the public and private sectors as well as NGOs (Kaufmann et al., 2011). Each measure is assigned a value ranging from -2.5 to +2.5. Thereafter, the median value for each dimension is calculated and, based on this, each value is classified as high (if the score for the reference country exceeds the median) or low (if the score is less than or equal to the median) (Khelif et al., 2015).

2.5. Results and discussion

2.5.1. Meta-Analysis

Table 2 presents the results from the meta-analysis, covering the overall sample and each of the institutional dimensions. The overall effect size is -0,0383, with a z -value of -2,8266 and a p -value of 0,0047, indicating that the association between ED and EP is statistically significant, which leads to the acceptance of the H_1 hypothesis, and negative. However, the relatively high values of the Q statistic (5007,7507), τ^2 (0,0613), and I^2 (94,08%) suggest the presence of substantial heterogeneity. This underlines the need to further explore this heterogeneity by examining the existence of moderating effects. Regarding institutional characteristics, the results indicate that the relationship between ED and EP is significant and negative for countries with high levels of VA (effect size -0,0434, z -value -3,0024, p -value 0,0027), PS (effect size -0,0439, z -value -3,0913, p -value 0,002), GE (effect size -0,0462, z -value -3,3747, p -value 0,0007), RL (effect size -0,0439, z -value -3,0913, p -value 0,002) and CC (effect

size -0.0439, z-value -3,0913, p-value 0,002). In contrast, this relationship is not significant for countries with low scores of these institutional characteristics. Finally, the relationship is negative for countries with high RQ (effect size -0,0542, z-value -3,8542, p-value 0,0001) while it is positive for countries with low levels of the same dimension (effect size 0,1168, z-value 2,741, p-value 0,0061). Based on these findings, a meta-regression analysis is conducted to further explore the heterogeneity among effect sizes, analysing whether and which institutional characteristics play a moderating role in the ED-EP relationship.

Table 2- Meta-analysis results

Particulars		k	Summary Effect Size	Confidence Interval		Z	p-value	Q Statistic	I ²	Tau ²
Overall meta analysis		389	-0,0383	-0,0649	-0,0118	-2,8266	0,0047	5007,7507	94,08%	0,0613
Institutional Characteristics	Voice and Accountability Index -High	337	-0,0434	-0,0717	-0,0151	-3,0024	0,0027	4409,8092	93,32%	0,0597
	Voice and Accountability Index - Low	52	-0,0058	-0,0827	0,0711	-0,1471	0,8831	569,6766	96,70%	0,0725
	Political Stability Index - High	342	-0,0439	-0,0718	-0,0161	-3,0913	0,002	4426,5353	93,72%	0,0586
	Political Stability Index - Low	47	0,0033	-0,0824	0,089	0,076	0,9394	550,1277	95,90%	0,0815
	Government effectiveness index - High	370	-0,0462	-0,073	-0,0194	-3,3747	0,0007	4844,7862	94,08%	0,0593
	Government effectiveness index - Low	19	0,1246	-0,0161	0,2653	1,7356	0,0826	136,8504	88,66%	0,0848
	Regulatory quality index - High	354	-0,0542	-0,0817	-0,0266	-3,8542	0,0001	4569,24	93,72%	0,0595
	Regulatory quality index - Low	35	0,1168	0,0333	0,2003	2,741	0,0061	332,1891	94,94%	0,0553
	Rule of law index - High	342	-0,0439	-0,0718	-0,0161	-3,0913	0,002	4426,5353	93,72%	0,0586
	Rule of law index - Low	47	0,0033	-0,0824	0,089	0,076	0,9394	550,1277	95,90%	0,0815
Control of corruption index - High	342	-0,0439	-0,0718	-0,0161	-3,0913	0,002	4426,5353	93,72%	0,0586	
Control of corruption index - Low	47	0,0033	-0,0824	0,089	0,076	0,9394	550,1277	95,90%	0,0815	

2.5.2. Meta-Regression

Table 3 illustrates the results derived from the meta-regression. In detail, high levels of VA (coefficient -0,0435, z-value -2,9701, p-value 0,003), PS (coefficient -0,044, z-value -3,037, p-value 0,0024), RL (coefficient -0,044, z-value -3,037, p-value 0,0024) and CC (coefficient -0,044, z-value -3,037, p-value 0,0024) have a significant moderating effect on the ED-EP relationship, supporting the hypothesis H₂, H₃, H₆ and H₇. The negative sign of these institutional variables suggests a strengthening effect on the relationship (Gardner et al., 2017). The low levels of these institutional characteristics are not significant. Furthermore, the ED-EP relationship is moderated by both high and low GE (for high: coefficient -0,0462, z-value -3,3507, p-value 0,0008; for low: coefficient 0,1224, z-value 1,9687, p-value 0,049) as well as high and low RQ (for high: coefficient -0,0542, z-value -3,8636, p-value 0,0001; for low: coefficient 0,1174, z-value 2,6734, p-value 0,0075), supporting hypotheses H₄ and H₅. The negative sign for high values of GE and RQ, and the positive sign for their low values, suggest that when government effectiveness and regulatory quality are high, they reinforce the negative relationship between ED and EP, and when both are low, the contrary.

Table 3- Meta-regression results

Moderators		Coefficient	Standard Error	z-value	p-value	Confidence interval		Tau ²
Institutional Characteristics	Voice and Accountability Index -High	-0,0435	0,0146	-2,9701	0,003	-0,0721	-0,015	0,0614
	Voice and Accountability Index - Low	-0,0067	0,0364	-0,1842	0,8539	-0,078	0,0646	0,0614
	Political Stability Index - High	-0,044	0,0145	-3,037	0,0024	-0,0725	-0,016	0,0613
	Political Stability Index - Low	0,0017	0,0384	0,0453	0,9639	-0,0736	0,0771	0,0613
	Government effectiveness index - High	-0,0462	0,0138	-3,3507	0,0008	-0,0733	-0,019	0,0604
	Government effectiveness index - Low	0,1224	0,0622	1,9687	0,049	0,0005	0,2442	0,0604
	Regulatory quality index - High	-0,0542	0,014	-3,8636	0,0001	-0,0817	-0,027	0,0592
	Regulatory quality index - Low	0,1174	0,0439	2,6734	0,0075	0,0313	0,2034	0,0592
	Rule of law index - High	-0,044	0,0145	-3,037	0,0024	-0,0725	-0,016	0,0613
	Rule of law index - Low	0,0017	0,0384	0,0453	0,9639	-0,0736	0,0771	0,0613
	Control of corruption index - High	-0,044	0,0145	-3,037	0,0024	-0,0725	-0,016	0,0613
	Control of corruption index - Low	0,0017	0,0384	0,0453	0,9639	-0,0736	0,0771	0,0613

2.5.3. Discussion

The results of the meta-analysis confirm a statistically significant association between ED and EP, resulting in the acceptance of H₁. Specifically, the findings of the study indicate a negative relationship between the two, thereby corroborating the extant empirical evidence which suggests that companies do not tend to disclose a greater volume of environmental information in relation to superior environmental performance. This result is in line with social-political theories, which suggest that companies with poorer environmental performance may engage in greater disclosure to manage legitimacy and public perception as well as to respond to pressure from various stakeholder groups. Indeed, companies may use social and environmental disclosures to appear responsible without implementing concrete action in this regard, especially when disclosures lack specificity or avoid discussing negative impacts (Deegan, 2002). Alternatively, companies may seek to compensate for their perceived negative environmental performance by providing a higher level of disclosure and satisfying stakeholders through greater transparency. In light of Campbell's (2007) assertions regarding the impact of institutional conditions on corporate socially responsible commitment, a meta-regression is conducted to examine the role played by institutional characteristics on the association between ED-EP. The significant moderating effects of voice and accountability, political stability, rule of law, and control of corruption highlight the role of these characteristics in shaping the relationship under analysis. In countries with high levels of these institutional dimensions, the negative ED-EP relationship is stronger, suggesting how social expectations and stricter regulations may drive poor performance to engage in

transparency. More in detail, a high level of voice and accountability has a remarkable moderating effect on the association. This infers that, in contexts where a high level of freedom of expression and association is perceived, companies tend to disclose information on environmental performance even if negative. In addition, companies operating in a more politically stable environment, in which there is a perception that rules are followed, would be encouraged to disseminate environmental information, even if their relative performance is not positive. This reasoning is corroborated by the findings of Pan et al. (2020), which demonstrate that in circumstances of political uncertainty, companies are less inclined to disclose environmental information. Furthermore, in contexts where corruption is highly regulated, the present study finds that the negative association between ED and EP is strengthened, suggesting that an anti-corruption climate may motivate companies to disclose more information despite their negative performance. This finding stands in contrast to those reported by Gerged et al. (2021), who find a negative association between control corruption and the level of environmental disclosure provided by companies. Furthermore, the findings of the present study highlight the lack of significance of the low levels of the characteristics, underscoring the reduced importance of corporate environmental practices in these contexts. Finally, the moderating effects of both regulatory quality and government effectiveness reveal a more articulate dynamic: in countries with high levels of these characteristics, the negative ED-EP relationship is more pronounced. On the other hand, in a context where the quality of public services and government policy formulation and implementation is perceived to be low, firms are not incentivised to engage proactively by providing information about their environmental commitment if performance is low. In conclusion, the results of the meta-regression underline the significant role of coercive and normative forces on corporate practices. In particular, companies may find themselves disincentivised to engage in environmentally sustainable practices in contexts where the institutional structure is perceived as fragile. In contexts where institutional characteristics are perceived as stronger, companies may be more willing to provide information on environmental aspects despite their poor environmental performance.

2.6. Conclusions, contributions, and limitations

In recent decades, attention to environmental issues has grown significantly, and as a result, companies have begun to improve their sustainability performance and disclose more information about their sustainability efforts. The topic has received increasing attention in the literature, although the results continue to be inconclusive (Doan & Sassen, 2020). Some studies confirm how higher environmental performance is associated with more comprehensive disclosure, implying that environmentally responsible companies may be more prone to transparency in their practices. In contrast, others show that companies with poorer environmental performance may use disclosure

strategically to manage public perception, while other studies find a lack of significant relationship between ED and EP. The present study aims to clarify the relationship between ED and EP by synthesising the results of empirical studies, and more importantly, it seeks to test the potential moderating effects of institutional characteristics on this relationship. Considering the 55 studies that compose the sample, the results of the meta-analysis indicate the presence of a negative and significant relationship between ED and EP, confirming evidence from previous studies (e.g., Doan & Sassen, 2020; Patten, 2002; Bewley & Li, 2000; de Villiers & van Staden, 2011). This result supports socio-political theories, suggesting that companies with lower environmental performance could face risks to their credibility, thus they may be stressed to provide greater environmental disclosure in order to persuade stakeholders about their behaviour and, therefore, gain legitimacy for their actions. Furthermore, the results of the meta-regression confirm that in contexts in which, in general, freedom of expression and association, perceived quality of public services, political stability, government ability to design policies, trust in compliance with social rules, and control of corruption are perceived to be high, companies might benefit from the institutional support structure and might be more likely to provide information on environmental issues.

This study contributes to the existing literature regarding the topic in different ways. First, from a theoretical point of view, this study contributes to clarifying the fragmentation and divergences present in the theoretical framework concerning the association between ED and PE. Through an in-depth analysis of the different perspectives, this analysis highlights the predominance of socio-political theories, thus offering a more structured key to the existing debate. Furthermore, this study enriches the understanding of corporate environmental practices, suggesting how the different varying of explicitness of the institutional characteristics may explain the heterogeneity of the results that emerged from the empirical studies. Lastly, the study proves that effective institutions are pivotal in fostering transparency in environmental practices. Companies demonstrate a greater propensity to disclose more information regarding their environmental impact when operating within a robust governance framework. In essence, awareness of a robust accountability framework fosters proactive disclosure of significant environmental data. Consequently, it can be concluded that the strengthening of institutional frameworks governing environmental responsibility could not only improve supervision and enforcement mechanisms but also incentivise more sustainable business practices, fostering a more socially responsible approach.

To conclude, the present study has several limitations. First, although the databases considered are highly reputable and contain a wide range of peer-reviewed journals, the exploration of the topic could be further expanded by using other databases. Second, by considering only institutional characteristics, this study may not fully capture all possible and relevant factors that might moderate the relationship under analysis. In fact, although meta-regression helps to explain some of the variations, the high heterogeneity in the results suggests that other moderating factors, whether external (e.g., cultural or

sectoral aspects) as well as internal to the company (e.g., ownership structure, company culture), could be included to gain a broader understanding of the topic and to strengthen the methodological robustness and practical relevance of this type of analysis. Finally, as the study focuses specifically on environmental disclosure and environmental performance, future research could instead focus on social and governance issues, which are still poorly explored (Dinh et al., 2022).

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THIRD CHAPTER

A “New Era” for Reporting in Europe: Are Italian SMEs Ready? An Exploration of ESG Practices among Unlisted Medium-Sized Companies

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The necessity to expand the academic discourse on the reporting of environmental, social, and governance aspects in smaller and less structured companies is becoming increasingly evident. Indeed, despite the global prevalence of SMEs, research on this topic remains limited. Addressing this gap, the present study provides a novel and comprehensive overview of the state of ESG reporting practices in unlisted SMEs. Through an automated textual analysis of 253 standalone reports of Italian medium-sized enterprises, this study assesses their disclosure from a quantitative and qualitative point of view. The results reveal that ESG reporting of these companies primarily emphasizes the social dimension, focusing on employees, customers, and the local community. Environmental concerns are also well represented, while governance aspects are scarcely covered. Additionally, the analysis highlights a generally low quality in ESG reports, which tend to adopt a backward perspective, narrative structure, neutral tone, and high degree of complexity. This work intends to contribute to the empirical debate on the topic, which has so far focused on large and listed companies. By shedding light on the reporting behaviours of unlisted SMEs, this study provides new insights into an underexplored area of ESG research and underscores the potential of automated textual analysis as a valuable tool for examining disclosure practices in smaller firms. In addition, the study offers practical implications for standard setters and regulators currently engaged in the development of voluntary reporting standards for SMEs.

Keywords: environmental, social, governance disclosure, reporting, SMEs, unlisted companies, automated textual analysis.

3.1 Introduction

Given the increasing demand for accountability and transparency regarding their socially responsible behaviour, a growing number of companies – including smaller entities (Dinh et al., 2022) - are engaging in environmental and social reporting (Bouten et al., 2011; Michelon et al., 2015). Empirical research on this topic has been primarily focused on large companies (Spence et al., 2003; Jenkins, 2006; Jamali et al., 2009; Baumann-Pauly et al., 2013; Dinh et al., 2022), due to their higher visibility and tendency to operate in environmentally and socially sensitive sectors (Qui et al., 2016). Conversely, despite the prevalence of small and medium-sized enterprises (SMEs) as the predominant form of business organisation globally (Spence, 2007; Jamali et al., 2009), there has been limited research focusing on their engagement in sustainable business practices (Battisti & Perry, 2011; Gjergji et al., 2021). Historically, this discrepancy has been attributed to the perception that responsible business initiatives are associated only with large corporations (Jenkins, 2006). In addition, the challenges in obtaining relevant data (Cassels & Lewis, 2011) have discouraged research to extend the debate to smaller firms. However, despite their comparatively limited resources and physiological lack of management capacity, SMEs are not necessarily less advanced in terms of organising pro-environmental and social activities than large companies (Baumann-Pauly et al., 2013). Furthermore, given their fundamental contribution to national economies (Fassin et al., 2015) together with their notable collective social and environmental impact (Smith et al., 2022), the perspective of SMEs certainly cannot be ignored.

The necessity to expand the academic discourse surrounding the reporting of environmental, social, and governance aspects (henceforth referred to as ESG reporting) in SMEs is becoming increasingly evident (Dias et al., 2019; Dinh et al., 2022). Given their distinct characteristics in terms of size and organisational structure (Spence, 1999), the implementation of pro-environmental and social approaches by SMEs may vary and generate distinct outcomes compared to those observed in large companies (Russo & Perrini, 2010). Indeed, as SMEs do not merely function as scaled-down versions of large companies (Battisti & Perry, 2011), it appears simplistic to extend the empirical evidence derived from the latter to smaller companies. This underscores the importance of examining SMEs as distinct entities, making them an interesting object of investigation. Recent regulatory developments have increased the relevance of the topic exponentially. In the European context, the Corporate Sustainability Reporting Directive (CSRD, 2022/2464/EU) extends ESG reporting obligations to all listed SMEs, and the European standard setter has been called upon to introduce common reporting standards specifically designed for SMEs, whether listed or unlisted. While guidelines and reporting standards were previously developed for large companies (Dias et al., 2019), the current awareness of the need for SME-specific standards further highlights how reporting on ESG practices is becoming strategically important for

companies of all sizes. Despite the existence of numerous studies that have examined the socially responsible behaviour of SMEs, especially in Europe (e.g., Longo et al., 2005; Hammann et al., 2009; Murillo & Lozano, 2006; Baumann-Pauly et al., 2013), the focus on their ESG reporting practices remains limited (Dias et al., 2019). Indeed, extant literature is dominated by qualitative methodologies (Cicchini et al., 2024) and focuses specifically on listed SMEs, which often exhibit similarities to large companies (Roberto et al., 2024).

In light of the relevance of the topic and the scarcity of existing literature, this study aims to explore the reporting practices of unlisted SMEs through automated textual analysis, seeking to identify any gaps in transparency and to provide actionable insights that can help bridge these gaps, ultimately enhancing the quality and consistency of sustainability disclosures. By examining 253 standalone ESG reports provided by Italian medium-sized companies, the results indicate a persistent underutilisation of environmental, social, and governance reporting. Analysing the content of the documents, the results indicate a tendency among companies to provide information on the social and environmental spheres, while information related to governance is addressed to a limited extent. Furthermore, the analysis reveals a pervasive inadequacy in the quality of reporting, predominantly marked by a backward-looking perspective, narrative reporting, neutral tone, and a notably high degree of difficulty. By exploring the ESG reporting practices of a cohort of medium-sized unlisted companies, this study provides a distinctive perspective on a field that to date has been dominated by research on large and listed companies. Moreover, the implementation of an automated textual analysis provides supplementary investigative instruments for the extant literature on SMEs. Finally, given the pivotal role of academic contributions in offering insights to policymakers and standard setters, the findings of this study could be useful for the development of ESG reporting standards appropriate for smaller companies, in light of the recognised need to extend these practices to a wider range of companies.

The paper is organized as follows. Section 2 illustrates the theoretical framework and reviews the literature on ESG reporting practice among SMEs. Section 3 provides the research methodology, while Section 4 presents and discusses the findings. Finally, Section 5 concludes the study, underlying its contributions and limitations.

3.2 Theoretical framework and literature review

In recent decades, the debate on environmental and social reporting among SMEs has expanded significantly; however, no unified theoretical perspective has emerged (Lepoutre & Heene, 2006; Russo & Perrini, 2010). Although accounting scholars employ various theoretical frameworks to investigate the topic, the dominant reference used in the debate predominantly embraces the stakeholder perspective, with specific reference to stakeholder and legitimacy theories, even among SMEs (e.g.,

Crossley et al., 2021; Guerrero-Baena et al., 2024). Originally proposed by Freeman (1984), stakeholder theory posits that firms are not only accountable to owners, whose primary goal is profit maximization but must also consider the needs and expectations of various stakeholder groups to ensure their long-term success. The disclosure of responsible business practices facilitates dialogue with these groups (Dierkes & Antal, 1985; Ullmann, 1985; Roberts, 1992), as the demonstration of the corporate commitment to social and environmental issues could address the information needs and expectations of stakeholders, strengthening their trust in the company (Calace, 2014; Nekhili et al., 2017). Articulated by Suchman (1995), the legitimacy theory is based on the idea of a social contract between society and organizations, arguing that the latter must adopt strategies to demonstrate their alignment with societal expectations. Indeed, to maintain their legitimacy, firms are expected to conform to social norms and values (Dowling & Pfeffer, 1975), seeking societal approval to justify their existence (de Villiers & van Staden, 2006). From this perspective, the disclosure of pro-environmental and social practices could enable companies to shape their public identity, foster community relations, and strengthen their reputation, thus enhancing their legitimacy (Guthrie & Parker, 1989; Deegan, 2002; Aerts & Cormier, 2009; Cormier & Magnan, 2013). Despite their pervasive application, reservations concerning their integration into discourse among SMEs persist. Indeed, it has been asserted that social capital theory is more closely aligned with the motivations underlying the adoption of environmentally and socially responsible practices by smaller firms (Perrini, 2006; Sen & Cowley, 2013). Social capital refers to the characteristics of relationships between individuals that facilitate and encourage collective action and cooperation for mutual benefit (Putnam, 2000). It is characterised by elements such as transparency, trust, cooperation, consideration, investment in the community, organisational citizenship, and public goodwill (Spence et al., 2003). These attributes are considered to serve as a foundation for the long-term survival of SMEs (Perrini, 2006), whose operations are highly dependent on interpersonal relationships (Murillo & Lozano, 2006). Investing in social capital involves formal commitments and voluntary networking (Spence et al., 2003), highlighting the critical need for effective implementation and accountability of environmental and social policies. However, social capital theory alone does not seem to be sufficient to explain the environmental and social commitment of SMEs (Russo & Perrini, 2010).

Despite the expansion of the academic debate on ESG reporting practices in recent decades, there is an increasing necessity to incorporate SMEs into this discourse, thereby addressing the paucity of literature on the topic (Dias et al., 2019; Dinh et al., 2022; Lisi et al., 2023). The reasons are several. First, despite their relatively lower visibility and less frequent involvement in environmentally and socially sensitive sectors compared to larger enterprises (Qiu et al., 2016), SMEs constitute the dominant form of business organization globally (Murillo & Lozano, 2006; Spence, 2007; Jamali et al., 2009; Battisti & Perry, 2011), and, therefore, they cannot be excluded from the academic debate (Morsing & Perrini, 2009). Indeed, the heterogeneous and pervasive nature of SMEs is increasingly recognised as

pivotal in driving environmentally and socially responsible behaviour (Del Baldo, 2012; Lisi et al., 2023). Furthermore, the distinctive characteristics of small and medium enterprises – in terms of limited human and financial resources, informal relationships and communication processes, low visibility, lack of managerial capacity, and strong links with local communities and other immediate stakeholders (e.g., employees, customers, and suppliers) - often lead to informal or silent social responsibility practices (Spence, 1999; Jenkins, 2006; Perrini et al., 2007; Russo & Tencati, 2009; Baumann-Pauly et al., 2013; Coppa & Sriramesh, 2013). This contrasts with the formalized practices typical of larger firms. These differences underscore the limitations of employing reasoning and approaches designed for large firms within the context of SMEs (Morsing & Perrini, 2009; Battisti & Perry, 2011; Coppa & Sriramesh, 2013; Gjergji et al., 2021). Lastly, although the historical absence of specific guidelines for SMEs (Dias et al., 2019) has contributed to their generally lower levels of ESG reporting, this does not necessarily imply that SMEs still lag large companies in organising sustainable practices (Baumann-Pauly et al., 2013).

While research on social and environmental responsibility among European SMEs is growing (e.g., Hammann et al., 2009; Murillo & Lozano, 2006; Longo et al., 2005; Baumann-Pauly et al., 2013; Oduro et al., 2021), their related ESG reporting practices deserve further investigation (Dias et al., 2019). In the Italian context, the centrality of SMEs has recently given rise to a surge of academic interest in the topic. Considering 81 Italian-listed SMEs, Gjergji et al. (2021) apply a manual content analysis to investigate the correlation between environmental, social, and governance disclosure and the cost of capital. The results show that, in contrast to large firms, environmental disclosure tends to increase the cost of capital for SMEs. Similarly, Massari and Giannoccaro (2023) conduct a content analysis of the sustainability reports of Italian-listed SMEs in order to assess how GRI 300 standards are used to communicate circular economy practices, such as recycling, eco-design, renewable energy, and product reconditioning. Recently, Roberto et al. (2024) quantitatively assess the ESG disclosure of Italian-listed SMEs through a content analysis of 65 reports. They extend the analysis beyond the environmental factors to social and governance aspects, identifying the determinants that may have influenced the level of information provided. In addition to highlighting an overall insufficient level of disclosure especially regarding environmental and governance aspects, the authors emphasise the urgency for Italian-listed SMEs to improve the completeness of sustainability reporting to align with emerging regulatory requirements in the European context. Further, Cardoni and Kiseleva (2024) investigate influencing factors and disparities in ESG disclosures provided through annual reports and websites of 100 manufacturing SMEs located in Umbria, an Italian region. The results obtained through content analysis demonstrate that companies exhibit a higher level of disclosure on their websites in comparison to their annual reports. Furthermore, their comparative analysis of the ESG aspects reveals that the social dimension is the most frequently covered, whereas governance is the least disclosed.

Despite recent efforts to explore this topic in greater depth, previous research has mainly relied on manual content analysis, often considering only listed SMEs (e.g., Gjergji et al., 2021; Roberto et al., 2024), focusing on disclosure related to specific topics such as environmental aspects (Massari & Giannoccaro, 2023) and analysing the information disclosed through alternative channels - such as annual reports or corporate websites (Cardoni & Kiseleva, 2024) - which, however, tend to cover a less broad range of topics than standalone ESG reports (Clarkson et al., 2020). To overcome these limitations, this study aims to explore ESG reporting practices among Italian unlisted SMEs using an automated textual analysis, addressing the following research questions:

RQ1: What is the extent of topic occurrence in standalone ESG reports, and how is it distinguished between the environmental, social and governance dimensions?

RQ2: To what extent, in qualitative terms, do the standalone ESG reports extend?

3.3. Research methodology

3.3.1 Sample

For the purposes of this study, the sample selection focuses on the Italian context for several reasons. First, scholars have identified the need for further research on SMEs in Europe (Dinh et al., 2022; Cicchini et al., 2024), since existing studies offer limited insights, often analysing SMEs together with other types of firms. Secondly, Italy represents a particularly pertinent context for investigation, given the pivotal role of SMEs in the national production system (Balluchi et al., 2011; Coppa & Sriramesh, 2013; OECD, 2024). Moreover, Italian SMEs have demonstrated a notable inclination towards the development and adoption of sustainable practices (Thomas et al., 2021; Roberto et al., 2024), rendering them a compelling subject of analysis in this domain.

In contrast to previous studies conducted in the Italian context, concentrated on SMEs that are listed (Gjergji et al., 2021; Massari & Giannoccaro, 2023; Roberto et al., 2024) or situated in specific regional contexts (Cardoni & Kiseleva, 2024), the present study focuses on unlisted SMEs distributed throughout the national context. This type of firm is the most prevalent in Europe, and it has been relatively understudied in terms of quantitative analysis (Dinh et al., 2022; Cardoni & Kiseleva, 2024). Considering the operational difficulties of manually verifying the existence of ESG reports for each Italian unlisted SME due to the absence of databases from which to extract them, the present study focuses on medium-sized companies: since the company dimension inevitably influences the implementation of social responsibility strategies (Russo & Tencati, 2009; Balluchi et al., 2011; Cassels

& Lewis, 2011), it is assumed that ESG reporting practices are more widespread in this type of firms respect than in smaller ones.

The selection of the sample of companies is conducted by the steps described below. The Aida database, provided by Bureau Van Dijk, is utilized to identify unlisted firms in Italy that meet the size requirements of medium-sized enterprises as defined by European legislation (European Commission Recommendation 2003/361/EC) in the years 2022-2023. Aida is widely recognized in the accounting literature for its comprehensive coverage of financial and non-financial data on Italian firms (Coppa & Sriramesh, 2013; Campopiano & De Massis, 2015; Roberto et al., 2024). The research identifies 10.151 unlisted medium-sized companies belonging to different industries and operating in Italy. Subsequently, companies that do not publish any ESG information, as well as those that publish such information but through web pages or other disparate documents, are excluded. Conversely, companies that published standalone ESG reports in the years 2022-2023 are identified, resulting in a preliminary sample of 224 companies (which equates to approximately 2,21% of the total number of unlisted medium-sized companies), corresponding to a total number of 286 reports. From this amount, companies that have indicated the publication of an ESG report but have not made it available (4 in 2023, 4 in 2022; 4 in both) are excluded. Furthermore, companies that publish ESG reports in languages other than Italian (5 in 2023; 6 in 2022; 10 in both) are also excluded. The final sample is composed of 253 ESG reports. In this regard, the nomenclature of the identified reports is not uniform (for instance, the most frequent titles are “sustainability report”, “environmental and social report”, and “CSR report”). However, at the content level, there is a high degree of similarity, since all the reports generally contain environmental, social, and governance information. In this study, the term "ESG report" is therefore employed. Table 1 and Table 2 present the sample selection process and the final composition of the sample. Table 3 displays the distribution of the sampled companies by industry (Panel A) and by geographical location in relation to their legal headquarters (Panel B).

Table 1 - Sample selection process

Initial population of Italian unlisted medium enterprises (MEs) in 2022-2023	10.151	%
MEs not publishing any ESG information	9.189	90,52%
MEs publishing ESG information via their own webpage	633	6,24%
MEs disclosing ESG information through other documents (e.g. company policies, code of ethics, etc.)	105	1,03%
MEs providing standalone ESG reports in 2022-2023	224	2,21%

Table 2- Final composition of the sample

	Years		Total
	2023	2022	
Initial population of ESG reports of selected MEs	137	149	286
- ESG reports not available	6	6	12
- ESG reports published in non-Italian	10	11	21
Final population of ESG reports	121	132	253

Table 3 - Sample distribution by industry group and geographical location

Panel A	Frequency	%
Administrative and Support Service Activities	2	1,01%
Accommodation and Food Service Activities	2	1,01%
Agriculture	2	1,01%
Arts, Entertainment and Recreation	2	1,01%
Construction	14	7,07%
Energy	3	1,52%
Financial and Insurance Activities	7	3,54%
Human Health and Social Work Activities	1	0,51%
Information and Communication	5	2,53%
Manufacturing	112	56,57%
Professional, Scientific and Technical Activities	12	6,06%
Real Estate Activities	1	0,51%
Transporting and Storage	10	5,05%
Utilities	16	8,08%
Wholesale and Retail Trade	9	4,55%
Final population of Italian medium-sized enterprises	198	

Panel B	Frequency	%
Campania	5	2,53%
Emilia - Romagna	20	10,10%
Friuli - Venezia Giulia	7	3,54%
Lazio	12	6,06%
Liguria	4	2,02%
Lombardia	63	31,82%
Marche	6	3,03%
Piemonte	16	8,08%
Puglia	2	1,01%
Sicilia	5	2,53%
Toscana	24	12,12%
Trentino - Alto Adige	9	4,55%
Umbria	1	0,51%
Valle d'Aosta	1	0,51%
Veneto	23	11,62%
Final population of Italian medium-sized enterprises	198	

3.3.2 Textual analysis

In order to assess the level of ESG disclosure among the selected SMEs, the present study relies on automated textual analysis, which has recently gained popularity in research focusing on large and listed companies (e.g. Baier et al., 2020; Mittelbach-Hörmanseder et al., 2021; Ferjančič et al., 2024). The decision to adopt this type of analysis is motivated by the aim of overcoming the limitations of the manual content analysis used in previous studies. Indeed, the latter is inherently variable in terms of sophistication (Breijer & Orij, 2022), relies on subjective human judgments (Ananzeh, 2022), and is difficult to use for larger samples.

The present analysis is conducted in the following steps. All the 253 standalone ESG reports are retrieved as PDF documents from the website of each company in the sample. In order to obtain useful information for analysis, each PDF is opened in Python and converted into raw text. In detail, for every page of the pdf, the textual information is extracted using the library PyPDF2 and the function `page.extract_text`. After obtaining the raw text, a cleaning process is performed on it to reduce the measurement error. The library `regex` is utilised to implement a series of text cleaning steps, including the removal of URLs, replacement of hyphens with spaces, removal of any alphanumeric characters (`\w`), whitespace (`\s`), periods (`.`), newline characters (`\n`), and Italian accented vowels (`àèìòù`). Furthermore, the text is converted to lowercase. Subsequent steps of text cleaning are facilitated by the library `nlTK`, to remove the most common words as the stopwords. This process can be modified and improved depending on the type of analysis required, and it is a crucial part of many natural language processing tasks, as it helps to standardise the text, making it easier for algorithms to analyse and extract meaningful information. Further details are provided in Appendix II. After the completion of the preparatory stage, the analysis is conducted in two distinct phases. Firstly, the text is analysed to ascertain the number of sentences that contain information regarding the environmental, social, and governance aspects, measuring the topic occurrence. Then, the quality of each document is analysed, utilising a range of appropriate metrics.

i) Sentence extraction and topic occurrence measurement

In the initial phase of the analysis, the extent to which companies provide information on ESG dimensions is quantitatively examined. Since most previous studies are focused specifically on environmental aspects, a more in-depth study on the disclosure of social and governance aspects is needed (Dinh et al., 2022). Consequently, all three dimensions are considered in the present analysis. The automatic detection of purpose-relevant information is implemented through the *a priori*

identification of a set of keywords, on the basis of which the text is categorised. Specifically, the GRI standards are considered for the identification of topics referring to each of the three ESG dimensions, consistent with previous studies (e.g. Bouten et al., 2012; Michelon et al., 2015; Muslu et al., 2019; Papa et al., 2022). Indeed, this reporting framework is frequently considered an efficacious point of reference for contemplating and quantifying reporting regarding not only environmental aspects, but also the social and governance dimensions (Gamerschlag et al., 2011). Furthermore, the GRI framework is utilised in the context of SMEs (Roberto et al., 2024), given that, at the time of writing, no specific ESG reporting standards for this kind of entities have been promulgated. In this analysis, the GRI standards have been used as a basis for the derivation of a total of 29 topics, which are distributed as follows: 7 topics for the E dimension, 15 for the S dimension, and 7 for the G dimension, as reported in Table 4. Once the topics for each ESG dimension have been identified, a list of keywords is developed for each of them, based on previous research (e.g. Baier et al., 2020; Mittelbach-Hörmanseder et al., 2021; Moreno & Caminero, 2022; Ferjančič et al., 2024). The list of keywords associated with each ESG topic can be found in Appendix II.

Table 4 - ESG dimensions and related topics

ESG dimensions	ESG topics
Environmental	Materials
	Energy
	Water and effluents
	Biodiversity
	Emissions
	Waste
	Supplier environmental assessment
Social	Employment
	Labor/Management relations
	Occupational health and safety
	Training and Education
	Diversity and equal opportunity – Non discrimination
	Freedom of association and collective bargaining
	Child labor - Forced or compulsory labor
	Security practices
	Rights of Indigenous people
	Local community (and charity)
	Supplier social assessment
	Public policy
	Customer health and safety
	Marketing and labeling

	Customer Privacy
Governance	Governance structure - composition and decision-making processes of top management
	Nominations and compensation - selection criteria and compensation policies for top management
	Role in Sustainability - oversight and management of ESG impacts
	Conflicts of interest - management and transparency
	Ethics and Integrity - codes of conduct and reporting mechanisms
	Anti-corruption
	Anti-competitive behaviour

To measure the topic occurrence, the sentence is selected as the unit of analysis. This approach is consistent with previous research (Hooks & Van Staden, 2011; Milne & Adler, 1999), even in the context of automated textual analysis (Ferjančič et al., 2024). Each sentence is analysed according to a pre-established coding procedure, the details of which are outlined in Appendix II. To facilitate the counting of sentences aligned with the aforementioned dictionary, a series of preliminary operations are performed. In order to mitigate discrepancies arising from word capitalisation (Anand et al., 2020), all words in the dictionary are converted to lowercase. Furthermore, it is ensured that the dictionary includes both words in their fundamental form and their conjugated variants, thus ensuring a more complete coverage. For entries comprising several words, up to two words are identified among the key terms. In addition, as with the initial stage of analysis, a process of stemming and cleaning is performed on the keywords, utilising the function match of the library regex. These steps are implemented to achieve greater accuracy in sentence counting and dictionary matching, minimising possible underestimates (Anand et al., 2020). In this way, all sentences that contain specific keywords are identified, allowing the identification of ESG topic occurrence.

ii) *Qualitative measures of ESG reporting*

In order to analyse the extent to which the ESG reporting of Italian unlisted medium-sized companies extends in qualitative terms, several complementary dimensions are taken into account, namely forward-backward looking, numerical - narrative information, sentiment, and readability.

Forward - backward looking: the information disclosed by companies can be distinguished by two perspectives, namely forward-looking and backward-looking. While backward-looking information refers to corporate retrospective results, forward-looking disclosure encompasses directions, plans, and goals that allow users to predict the corporate future commitment, including environmental and social aspects (Ananzeh et al., 2024). This is especially pertinent in the context of the dynamic economic and social environment, where the provision of solely past information is inadequate for informed decision-

making (Muslu, 2019; Ananzeh et al., 2024). Indeed, ESG information appears to be more likely to be informative when it includes information about future trends and/or targets, helping investors to predict future performance (Muslu et al., 2015). In order to assess the extent to which Italian medium-sized companies provide forward-looking ESG information, a specific dictionary is implemented for automated identification. Following, Muslu et al. (2015) several keywords are consequently considered and translated into Italian. These include: “yearly”, “long-run”, “long-term”, “look forward”, “looking forward”, “go forward”, “look ahead”, “looking ahead”, “trend”, “expect”, “anticipate”, “outlook”, “intend”, “century”, “decade”, “coming years”, “following year”, “foreseeable future”; “subsequent year”, “upcoming year”, “foreseeable future”, “subsequent year”, “upcoming year”, “following year”; “incoming year” “project”, “expect”, “plan”, “developments”. Once identified, the number of forward-looking references is divided by the total number of ESG-matched text units.

Numerical versus narrative information: accounting studies indicate that users of annual financial statements exhibit a preference for numerical data in comparison to narrative information. This is due to the fact that narrative information is perceived to be susceptible to confusion and manipulation (Balata & Breton, 2005). A comparable expectation is proposed for environmental and social reporting (e.g. Michelin et al., 2015; Dumitru et al., 2017; Muslu et al., 2019), suggesting that the employment of quantitative or numerical data is widely perceived to signify a superior level of quality. To measure numerical content, the following keywords are identified: "thousand", "thousands", "million", "millions", "billions", "billions", "percent"; "%", "euro", and "zero". Thus, the number of references that refer to numerical information is divided by the total number of matched textual units.

Sentiment: additional qualitative characteristics, measured through sentiment analysis, encompass tone and subjectivity. The tone could be defined as the polar attitude between a positive/optimistic perspective and a negative/pessimistic perspective (Muslu et al., 2019; Du & Yu, 2021). As posited by Muslu et al. (2019), the utilisation of a pessimistic tone in ESG reports may be indicative of a heightened degree of transparency, thereby signifying an elevated disclosure quality. Conversely, the employment of an optimistic tone in such reports is likely to be associated with a diminished disclosure quality. The determination of the tone of the document can be achieved through the use of existing dictionaries of positive and negative words, counting the percentage of such words in the text in order to obtain a measure of this qualitative characteristic. The dictionary-based approach has become a popular approach among researchers in the fields of accounting and finance since it is a less costly and less complex method (Anand et al., 2020). Therefore, the tone of ESG reports is evaluated by employing a general dictionary provided by Textblob, a Python library designed for sentiment analysis (e.g. Aljedaani et al., 2022). The tone score is a continuous variable that ranges from -1 to 1, with -1 representing a negative tone, 0 representing a neutral or uncertain tone, and +1 representing a positive

tone. Subjectivity, on the other hand, can be defined as the expression of an individual opinion in each statement, a detriment to the reliability of the information. In a manner consistent with the tone, the subjectivity of ESG reports is evaluated by employing a general dictionary provided by Textblob. The degree of subjectivity is represented by a floating-point number ranging from 0.0 to 1.0, with 0.0 representing information that is highly objective and 1.0 representing information that is highly subjective.

Readability: the utilisation of readability indexes is a method by which the comprehensibility of a text can be evaluated. Indeed, these indices are typically used to assess the ease with which a reader can comprehend the content of a text. The accounting literature has demonstrated how companies can deliberately make accounting disclosures more complex and thus less readable in order to hide poor performance (De Souza et al., 2019), with consequences for investor response (Miller, 2010; Asay et al., 2017; Reichmann, 2023). A similar practice has been observed in the context of ESG reporting (e.g., Wang et al., 2017; Du & Yu, 2021), where it is found that companies with more readable ESG reports are more transparent and less likely to use an impression management strategy that opportunistically obfuscates their activities by using complex information (Ben-Amar & Belgacem, 2018). In the domain of textual analysis, the FOG index (Miller, 2010; Wang et al., 2017; Eftretuei & Hussainey, 2023) is a frequently employed metric for evaluating readability. Originally proposed by Gunning (1952), the FOG formula, presented below, considers the relative number of words contained in a sentence and the relative number of complex words, where the latter are defined as those comprising three or more syllables. This sum is then scaled by a constant (0,4) to obtain the Fog value, which corresponds roughly to the number of years of formal education required to understand the text. Thus, the FOG index is calculated as follows:

$$\text{Fog Index} = 0,4 * \left[\left(\frac{\text{number of words}}{\text{number of sentences}} \right) + 100 * \left(\frac{\text{number of complex words}}{\text{number of words}} \right) \right].$$

The Fog Index and the readability of the disclosure are inversely correlated; thus, a high Fog Index results in a text that is more difficult for the average reader to understand.

3.4 Results

The present study is based on automated textual analysis, with the aim of providing a comprehensive overview of the state of reporting practice of environmental, social, and governance issues among Italian unlisted medium-sized companies. The initial step of the analysis is the identification of all sentences related to ESG aspects. This process is undertaken to facilitate an exploratory approach used to map the most frequently reported ESG dimensions and related topics. Secondly, ESG reports are analysed through the utilisation of several metrics, with the objective of evaluating their qualitative level. The results of the first stage of analysis are presented in Table 5. This table illustrates the frequency with which each identified topic occurs in the sentences of all 253 standalone ESG reports.

Table 5 – Results of ESG topic occurrence

	Total number of sentences	Percentage (%)
	59.625	
Environmental	26.341	44,18%
Materials	9.188	15,41%
Energy	5.772	9,68%
Water and effluents	2.544	4,27%
Biodiversity	639	1,07%
Emissions	4.328	7,26%
Waste	1.239	2,08%
Supplier environmental assessment	2.631	4,41%
Social	29.152	48,89%
Employment	10.875	18,24%
Labor/Management relations	845	1,42%
Occupational health and safety	3.430	5,75%
Training and education	2.864	4,80%
Diversity and equal opportunity - Non discrimination	1.903	3,19%
Freedom of association and collective bargaining	67	0,11%
Child labour - Forced or compulsory labour	121	0,20%
Security practices	353	0,59%
Rights of Indigenous people	20	0,03%
Local community (and charity)	4.088	6,86%
Supplier social assessment	478	0,80%
Public policy	377	0,63%
Customer health and safety	2.245	3,77%
Marketing and labeling	1.200	2,01%
Customer privacy	286	0,48%
Governance	4.132	6,93%
Governance structure	3.121	5,23%
Nominations and Compensation	237	0,40%
Role in Sustainability	139	0,23%

Conflicts of interest	207	0,35%
Ethics and integrity	202	0,34%
Anti-corruption	195	0,33%
Anti-competitive behaviour	31	0,05%

The results indicate that the distribution of information across the three ESG dimensions is not uniform. A significant proportion of the identified sentences containing ESG information is classified as falling within the social dimension, accounting for almost half of all cases (48,89%). This is followed by sentences relating to the environmental sphere, accounting for 44,18% of all identified ESG sentences. The governance dimension is represented by a comparatively low percentage (6,93%) of the total number of sentences reporting ESG information. An analysis of the individual topics reveals that "Employment" is the most prevalent item, accounting for 18,24% of sentences containing ESG information. The remaining most prevalent topics are as follows: "Materials" (15,41%), "Energy" (9,68%), "Emissions" (7,26%), "Local community and charity" (6,86%), "Occupational health and safety" (5,75%), "Governance structure" (5,23%), "Training and education" (4,8%), "Supplier environmental assessment" (4,41%) and "Water and effluents" (4,27%). Conversely, those related to "Rights of Indigenous People" (0,03%), "Anti-competitive behaviour" (0,05%), "Freedom of association and collective bargaining" (0,11%), "Child labour – Forced or compulsory labour" (0,2%), and "Role in sustainability" (0,23%), "Anti-corruption" (0,33%), "Ethics and integrity" (0,34%), "Conflicts of interest" (0,35%), "Nominations and compensation" (0,4%), "Customer privacy" (0,48%) are those which occur with the least frequency in ESG-related sentences.

With regard to the examination of qualitative characteristics of ESG reporting, Table 6 presents the relevant summary statistics, including the number of observations, maximum and minimum values, mean and standard deviation of each of the five qualitative characteristics considered in the analysis.

Table 6 – Results of qualitative characteristics of ESG reports

Qualitative measures	N	Minimum	Maximum	Mean	Std Dev
Forward - backward looking	253	0,00%	50,00%	4,59%	0,039
Numerical - narrative information	253	0,00%	62,50%	3,04%	0,060
Tone	253	-0,430	0,329	0,016	0,083
Subjectivity	253	0,094	0,635	0,376	0,089
Readability	253	29,379	42,499	34,390	3,124

The mean value of sentences containing forward-looking information is 4,59%, while for sentences containing numerical/quantitative information, the mean value is 3,04%. Regarding both these

qualitative characteristics, the minimum value of 0% indicates the presence of sampled ESG reports in which predictive and numerical information are absent. Conversely, their maximum value (50% for forward-looking; 62,5% for numerical information) indicates that, in other reports, these characteristics are present in most of the text. However, there is no strong dispersion from the average for both quality characteristics. The findings of the sentiment analysis demonstrate that, on average, the reports adopt a neutral tone (mean value of 0,016), with some documents exhibiting a predominantly negative tone (minimum value of -0,43) and others a more positive tone (maximum value of 0,329). However, no high levels of either positive or negative tone are identified. Furthermore, the analysis shows a generally good level of impartial information (mean value of 0,376 of subjectivity), with a low level quite far from a high level of subjectivity (maximum value of 0,635). Finally, the readability score of ESG reports is predominantly high across all the sample: in addition to the maximum score of 42,499, even the lowest score (29,379) indicates an overall elevated level of difficulty.

3.4.1 Discussion

The aim of this study is to conduct an automated textual analysis of the ESG reports of Italian unlisted medium-sized companies, to investigate the extent to which they provide information on their commitment to environmental, social, and governance issues. In general, standalone ESG reports are still uncommon, suggesting that Italian SMEs are hesitant to adopt sustainability-related disclosure practices. Specifically, more than 90% of Italian unlisted medium-sized enterprises do not publish any information about environmental, social, and governance aspects. This reluctance can be attributed to a still limited awareness of the benefits associated with the implementation of ESG reporting strategies, as well as to their undoubted operational difficulties in implementing such practices (Arena & Azzone, 2012). Furthermore, the preference for informal or silent practices seems to persist among SMEs, as noted in previous literature (e.g., Coppa & Sriramesh, 2013). Considering those companies that make such information available, the primary channel of dissemination of ESG information is through their website, as previously suggested by Cardoni and Kiseleva (2024). Nevertheless, this channel has been found to cover a less extensive range of topics than standalone ESG reports (Clarkson et al., 2020). Considering the latter reporting instrument, the number of reports identified among unlisted medium-sized enterprises is significant considering the voluntary nature of such reporting (also in the future, as unlisted SMEs are not included in the scope of the CSRD). Despite the ongoing engagement of smaller companies in stakeholder dialogue utilising informal and direct communication channels (Russo & Perrini, 2010), the decision of these entities to provide information on their ESG commitment through specific standalone reports can be attributed to increasing stakeholder demand for reporting on these aspects, for instance from the banking sector (D'Apollito et al., 2024).

Following the identification of 253 standalone ESG reports for the 2022-2023 period, the first phase of the automated textual analysis reveals that almost half of the sentences containing ESG information pertained to the social dimension, with those related to the environmental dimension following closely behind. This result indicates that the social sphere may be more significant for SMEs, given their close connections with the social context in which they are established, as suggested by social capital theory. Moreover, the generation of social information is often less onerous than that of environmental information, which frequently needs the allocation of both financial and non-financial resources for the monitoring and production of data. While a substantial proportion of sentences containing ESG pertain to social and environmental aspects, in contrast, sentences associated with the governance dimension are significantly less frequent. This discrepancy can be attributed to the inherent limitations of SME governance systems, which are often poorly structured. Indeed, it is often the entrepreneur who directly influences both the nature of governance relationships - within and outside the company- and the management of the company itself (Del Baldo, 2009, 2012). These results are consistent with what has been reported by Roberto et al. (2024) on listed SMEs and by Cardoni and Kiseleva (2024) on disclosure provided through annual reports and web pages. Despite the methodological discrepancies with the present analysis, these studies also demonstrate a predominance of disclosure on social factors, followed by environmental factors and, with a substantial disparity, governance factors. In terms of the frequency with which individual topics characterising the three ESG dimensions are addressed, five of the ten most common topics belong to the environmental dimension. These include the inputs used in the production process, energy consumption, emissions produced, environmental assessment of suppliers, and water consumption. This suggests that, despite the difficulties in finding data on environmental performance (Roberto et al., 2024), SMEs are interested in reporting such information. Moreover, a total of three of the ten most prevalent topics are specifically related to employees, namely their working conditions, training, education, and health, while one pertains to the local community. This finding serves to underscore the pivotal role that stakeholders, especially employees and the local community, play in the context of SMEs (Spence et al., 2003; Jamali, 2008). This may suggest that SMEs often disclose stakeholder-oriented information rather than reporting their actual activities (Lisi et al., 2023). This result partly contradicts the findings of Roberto et al. (2024), who surprisingly individualise little information about the local community. This may be attributed to the fact that, as suggested by the same authors, listed SMEs exhibit greater similarities with large companies than with unlisted SMEs. A further result that differs from Roberto et al. (2024), who identify a paucity of details regarding the governance structure, is that the latter is among the ten most prevalent topics in the present analysis. Conversely, the remaining items related to the governance dimension are among the least frequently reported. Poor results are also noted regarding the rights of indigenous people and child labour topics. The absence of data concerning data protection and privacy is particularly salient given the pivotal role of customers in the viability of SMEs.

As far as quality measures are concerned, a prevalence of backward perspectives is noted. Considering that the provision of past information alone seems to be inadequate for informed decision-making (Ananzeh et al., 2024) also regarding ESG information (Muslu et al., 2015), the conspicuous paucity of forward-looking information analysed reveals low levels of quality in reporting practice. Similar considerations can be made regarding the second qualitative dimension, namely the distinction between narrative and numerical information. Furthermore, the analysis of the reports reveals the prevalence of narrative/qualitative information, which seems to compromise the quality of disclosure, giving rise to confusion and manipulation (Balata & Breton, 2005). Concerning the tone employed, the extant literature indicates that the utilisation of a negative tone signifies a higher level of transparency and thus represents a higher level of quality (Muslu et al., 2019). However, the present analysis reveals a general use of a neutral tone, with no marked use of either a negative or positive tone. On the other hand, the considerable presence of objective information is a positive attribute, as it serves to reinforce the reliability of the information provided and, consequently, the informative quality of the documents analysed. The last qualitative dimension, which refers to the degree of readability, indicates a general high level of difficulty in the analysed texts. However, previous studies on the readability of corporate disclosure show that official reports generally exhibit a Fog index that falls within the range of 30 to 35 (Gangadharan & Padmakumari, 2024). Furthermore, it has been posited that sustainability reports are a much more arduous genre to read than the average text (Smeuninx et al., 2016; Adhariani & du Toit, 2020). Indeed, complex disclosures may be attributable to regulatory reporting requirements, rather than to intentional obfuscation by management, as observed in financial reports (Guay et al., 2016). The remarkably high FOG index values are consistent with the results of other studies, where low levels of readability of ESG disclosures are found (Smeuninx et al., 2016). In general, the observed low quality of disclosure can be attributed to the voluntary nature of the information provided, which grants companies a significant margin of discretion in the selection and presentation of data. The findings of the present study highlight significant opportunities for the enhancement of voluntary ESG reporting practices among SMEs. This is also to be expected in light of the evolving regulatory framework, which has the potential to encourage an increase in the quality and quantity of information provided by companies (Criado-Jiménez et al., 2008).

3.5 Conclusions, contributions, and limitations

Although ESG reporting has historically been associated with large companies, the development of recent regulatory frameworks and increasing information demands of stakeholders are stimulating the evolution of corporate reporting practices, leading to their inclusion by a growing number of SMEs (Dinh et al., 2022). This paper responds to the call for a more in-depth analysis of the social responsibility practices of European SMEs (Oduro et al., 2021; Dinh et al., 2022; Cicchini et al., 2024),

by exploring the state of the art of ESG reporting of Italian unlisted medium-sized companies. The present study employs an automated textual analysis to examine 253 ESG reports, thereby determining the most recurring topics related to each of the three ESG dimensions, and capturing the general level of quality of disclosure. In addition to providing evidence of the limited dissemination of reports specifically dedicated to ESG aspects, the results reveal that, beyond a natural predilection for the social dimension, there is also widespread disclosure of environmental performance, despite the difficulties for smaller companies to measure and monitor this type of data. Furthermore, the analysis indicates an overall inadequate quality of disclosure in the ESG reports under consideration. To conclude, this study reveals that ESG reporting practices among unlisted Italian SMEs are still in their infancy and highlights the persistent challenges still associated with the provision of this type of information by companies. However, in light of European efforts to promote voluntary reporting among smaller and less structured companies, the adoption of ESG reporting practices may improve in the near future, driven by increasing stakeholder demand for information.

The paper aims to contribute to the literature in several ways. Firstly, since research on ESG reporting of SMEs is focused on listed companies (e.g., Roberto et al., 2024) located in specific geographical contexts (e.g., Massari & Giannoccaro, 2023), the present study aims to provide a more comprehensive picture of the topic, considering the entire population of unlisted medium-sized companies in a national context. This is believed to be important not only from an academic perspective, but also for policymakers who today are involved in the development of standards specifically for small and medium undertakings. Indeed, this study could offer several practical contributions. It could provide policymakers with a detailed picture of current ESG reporting practices adopted by SMEs, allowing them to identify areas where regulatory intervention or support is needed to foster transparency and accountability. Additionally, the findings could be a valuable resource for industry associations and standard setters, facilitating the creation of specific guidelines that promote meaningful ESG disclosures among SMEs. For business owners and managers, the study could highlight best practices in reporting, offering concrete guidance on how to enhance their sustainability efforts in accordance with international standards. Furthermore, the present paper is among the first to investigate the ESG reporting practice among SMEs employing an automated textual analysis, to overcome some of the weaknesses of previous manually performed analyses. Indeed, in response to the increasing demand for automated textual analyses in the European context (Dinh et al., 2022), this kind of analysis could become increasingly prevalent in empirical research (Velte, 2023), enriching the literature on SME reporting practices, which to date has been predominantly oriented on qualitative methodologies, particularly case studies (Cicchini et al., 2024).

This study presents several limitations, primarily concerning the generalisability of the findings and the utilisation of automated analysis. First, while the employed automated analysis offers several advantages, particularly in terms of objectivity (Mittelbach-Hörmanseder et al., 2021), manual content

analysis could provide a more detailed finding (Brennan, 2009). Secondly, the preliminary manual individuation of ESG reports led to the decision to restrict the analysis to medium-sized companies only. In this regard, future research could extend similar analyses to small or even micro-enterprises. In addition, since the present study is limited to the Italian national context, comparative analysis across European regions might be of interest (Dumitru et al., 2017) to identify potential differences between countries and thus provide a more comprehensive understanding of reporting practices adopted in the Old Continent. Furthermore, although the study presents a time horizon longer than one year, as recommended in the literature (Roberto et al., 2024), future research could conduct a longitudinal analysis to elucidate the way SMEs alter their ESG reporting practice over time. More generally, further research on the state of the art on the ESG reporting practices of SMEs could offer valuable insights into the reasons behind the limited engagement in sustainability efforts. Future studies could also examine the impact of external factors, such as the latest regulatory changes in the European context, on the adoption of ESG practices among SMEs.

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General conclusions and final remarks

The consideration of ESG factors is becoming strategically important for companies of all sizes. In this context, interpreting environmental, social, and governance reporting as a mere exercise is, or can become, a real strategic mistake that can jeopardise business continuity. Indeed, the communication of corporate commitment in this domain serves not only as a catalyst for reflection and discussion, but also as a significant source of differentiation, with consequent benefits for companies (Herzig & Schaltegger, 2011; Liu et al., 2022). ESG reporting has been the subject of considerable academic attention. Nevertheless, a certain degree of ambiguity remains surrounding the relationship between corporate social reporting and performance (Koh et al., 2023). Moreover, a paucity of empirical evidence concerning reporting practices among SMEs persists (Dinh et al., 2022; Lisi et al., 2023). Research is called upon to address these gaps in the literature, with significant implications for academics, policymakers, and practitioners.

In light of the aforementioned shortcomings, the present thesis aims to investigate the topic, comprising two main investigations. The first study offers a comprehensive examination of the relationship between environmental disclosure and environmental performance, synthesising the extant findings of empirical research through a meta-analysis and meta-regression. This study reveals the propensity of firms with weaker environmental performance to engage in higher levels of disclosure. Furthermore, it highlights the pivotal influence of the institutional environment in shaping this relationship. The results contribute to the existing literature in several ways. By addressing and clarifying discrepancies in the empirical evidence on the relationship between environmental disclosure and performance, this first study highlights the dominance of socio-political theories and the role of institutional pressures in explaining result heterogeneity. Practically, it provides insights for standard setters and policymakers on how strengthening coercive and normative forces can improve transparency and corporate accountability. Future research could build on these findings by exploring other moderating factors and extending the analysis from environmental to social and governance issues, which remain underexplored (Dinh et al., 2022). The second study included in this thesis focuses specifically on SMEs, with the aim of providing a detailed analysis of their ESG reporting practices. An automated textual analysis of 253 standalone reports is conducted to measure, both quantitatively and qualitatively, how Italian unlisted medium-sized companies provide information regarding environmental, social, and governance aspects. From a quantitative perspective, ESG reports appear to provide information on several typical aspects, particularly those related to the social and environmental dimensions. Nevertheless, there is considerable room for improvement with regard to the quality of disclosure. The contributions of this investigation are twofold. Firstly, this analysis provides novel empirical insights on the topic, conducting automated textual analysis of reports provided by unlisted

medium-sized companies. This could be considered an enrichment of the extant literature, which has focused on larger or listed companies and on the manual analysis of ESG reporting practices. Secondly, the results could be helpful to regulators and standard setters, providing a useful basis for the development of reporting standards dedicated to smaller companies. Future research could extend this analysis by including small or micro-sized enterprises across a range of European regions and considering a longer time horizon. This would facilitate the achievement of a more comprehensive understanding of the topic.

In conclusion, while there has been a recent tendency towards standardising the reporting of environmental, social, and governance aspects to enhance transparency and comparability, it seems important to consider the specific institutional contexts that influence reporting practices, as well as the increasing involvement of smaller companies. This thesis would underscore the significance of adopting corporate social responsibility reasoning on a large scale. While the primary objective of companies remains the generation of profits, the adoption of a vision that extends responsibility beyond company boundaries could represent a rewarding strategy, which strengthens business and ensures company survival in the medium - long term (European Commission, 2011). Nevertheless, the significance of adopting environmental and social action is not confined to corporate entities; the entire system stands to benefit from the implementation of these initiatives on a wide scale in global economies. The integration of actions into a synergistic framework, involving different actors within the economic system, has the potential to initiate a virtuous cycle for collective growth.

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Appendices

Appendix I

List of Studies included in the meta-analysis and meta-regression:

Author(s) (Year)	Journal	Title	Country
Abba et al. (2018)	<i>Journal of Environmental Accounting and Management</i>	The Relationship Between Environment Operational Performance and Environmental Disclosure of Nigerian Listed Companies	Nigeria
Acar and Temiz (2020)	<i>International journal of emerging markets</i>	Empirical analysis on corporate environmental performance and environmental disclosure in an emerging market context	Turkey
Adinehzadeh et al. (2018)	<i>Asian Academy of Management Journal of Accounting and Finance</i>	The Mediating Role of Environmental Performance on The Relationship Between Corporate Governance Mechanisms and Environmental Disclosure	Malaysia
Ahmadi and Bouri (2017)	<i>Management of Environmental Quality: An International Journal</i>	The relationship between financial attributes, environmental performance and environmental disclosure; empirical investigation on French firms listed on CAC 40	France
Alciatore and Callaway Dee (2006)	<i>Environmental Accounting</i>	Environmental Disclosures in the Oil and Gas Industry	USA
Al-Tuwaijri et al. (2004)	<i>Accounting, Organizations and Society</i>	The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach	USA
Arena et al. (2014)	<i>Corporate Social Responsibility and Environmental Management</i>	Environmental Reporting: Transparency to Stakeholders or Stakeholder Manipulation? An Analysis of Disclosure Tone and the Role of the Board of Directors	USA
Bae Choi et al. (2013)	<i>Pacific Accounting Review</i>	An analysis of Australian company carbon emission disclosures	Australia
Bewly and Li (2000)	<i>Advances in Environmental Accounting & Management</i>	Disclosure of environmental information by Canadian manufacturing companies: A voluntary disclosure perspective	Canada
Braam et al. (2016)	<i>Journal of Cleaner Production</i>	Determinants of Corporate Environmental Reporting: the importance of environmental performance and assurance	Netherlands
Brammer and Pavelin (2006)	<i>Business Strategy and the Environment</i>	Factors Influencing the Quality of Corporate Environmental Disclosure	UK
Cho and Patten (2007)	<i>Accounting, Organizations and Society</i>	The role of environmental disclosures as tools of legitimacy: A research note	USA
Cho et al. (2010)	<i>Accounting, Organizations and Society</i>	The language of US corporate environmental disclosure	USA
Cho et al. (2012)	<i>Accounting, Organizations and Society</i>	Do actions speak louder than words? An empirical investigation of corporate environmental reputation	USA

Clarkson et al. (2008)	<i>Accounting, Organizations and Society</i>	Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis	USA
Clarkson et al. (2011)	<i>Abacus- A journal of accounting, finance and business studies</i>	Environmental Reporting and its Relation to Corporate Environmental Performance	Australia
Cormier et al. (2011)	<i>Management Decision</i>	The informational contribution of social and environmental disclosures for investors	Canada
Datt et al. (2019)	<i>Accounting Research Journal</i>	Corporate voluntary carbon disclosure strategy and carbon performance in the USA	USA
Dawkins and Fraas (2011)	<i>Journal of Business Ethics</i>	Coming Clean: The Impact of Environmental Performance and Visibility on Corporate Climate Change Disclosure	USA
Dawkins and Fraas(2011b)	<i>Journal of Business Ethics</i>	Erratum to: Beyond Acclamations and Excuses: Environmental Performance, Voluntary Environmental Disclosure and the Role of Visibility	USA
De Villiers and Staden (2011)	<i>Journal of Accounting and Public Policy</i>	Where firms choose to disclose voluntary environmental information	USA
Delmas and Blass (2010)	<i>Business Strategy and the Environment</i>	Measuring Corporate Environmental Performance: the Trade-Offs of Sustainability Ratings	USA
Deswanto and Siregar (2018)	<i>Social Responsibility Journal</i>	The associations between environmental disclosures with financial performance, environmental performance, and firm value	Indonesia
Fontana et al. (2015)	<i>Measuring Business Excellence</i>	Does environmental performance affect companies' environmental disclosure?	Italy
Freedman and Jaggi (2004)	<i>Re-Inventing Realities</i>	Carbon Dioxide Emission and Disclosures by Electric Utilities	USA
Freedman and Stagliano (2008)	<i>Accounting and the Public Interest</i>	Accounting Disclosures of Toxics Release Inventory for 2002	USA
Giannarakis et al. (2017)	<i>International Journal of Law and Management</i>	The relation Between Voluntary Carbon Disclosure and Environmental Performance: The case of S&P 500	USA
Giannarakis et al. (2017a)	<i>Business Strategy and the Environment</i>	The Impact of Carbon Performance on Climate Change Disclosure	UK
Hassan and Kouhy (2014)	<i>International Journal of Accounting and Economics Studies</i>	Time-series cross-sectional environmental performance and disclosure relationship: specific evidence from a less-developed country	Nigeria
He and Loftus (2014)	<i>Pacific Accounting Review</i>	Does environmental reporting reflect environmental performance? Evidence from China	China
Heflin and Wallace (2017)	<i>Journal of Business Finance and Accounting</i>	The BP Oil Spill: Shareholder Wealth Effects and Environmental Disclosures	USA
Hora and Subramaniam (2018)	<i>Journal of Industrial Ecology (research and analysis)</i>	Relationship between Positive Environmental Disclosures and Environmental Performance	USA
Hughes et al. (2001)	<i>Journal of Accounting and Public Policy</i>	Corporate Environmental Disclosures: are they useful in determining environmental disclosure	USA
Hughes et al. (2015)	<i>Advances in Environmental Accounting & Management</i>	Do environmental disclosures in U.S. annual reports differ by environmental performance?	USA

Iatridis (2013)	<i>Emerging Markets Review</i>	Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance	Malaysia
Ingram and Frazier (1980)	<i>Journal of Accounting Research</i>	Environmental performance and corporate disclosure	USA
Iqbal et al. (2013)	<i>International Journal of Business and Management Invention</i>	Effect of Environmental Accounting Implementation and Environmental Performance and Environmental Information Disclosure as Mediation on Company Value	Indonesia
Jaggi and Freedman (1982)	<i>Omega</i>	Pollution Disclosures, Pollution Performance and Economic Performance	USA
Lai et al. (2015)	<i>International Journal of Production Economics</i>	Sharing environmental management information with supply chain partners and the performance contingencies on environmental munificence	Hong Kong
Li et al. (1997)	<i>Contemporary accounting research</i>	Corporate Disclosure of Environmental Liability Information: Theory and Evidence	Canada
Li et al. (2017)	<i>Human and Ecological Risk Assessment: An International Journal</i>	Corporate Environment Performance, Environmental Information Disclosure and Financial Performance: Evidence from China	China
Lu et al. (2018)	<i>Asian Review of Accounting</i>	A study of the relationships among environmental performance, environmental disclosure, and financial performance	USA
Mahmud et al. (2017)	<i>Pakistan Journal of Commerce and Social Sciences</i>	Does environmental disclosure relate to environmental performance? Reconciling legitimacy theory and voluntary disclosure theory	Pakistan
Meng et al. (2014)	<i>Journal of Environmental Management</i>	The relationship between corporate environmental performance and environmental disclosure: An empirical study in China	China
Mitchel et al. (2004)	<i>Australian Journal of Corporate Law</i>	Voluntary Environmental Reporting Practices: A Further Study of 'Poor' Environmental Performers	Australia
Patten (2002)	<i>Accounting, Organizations and Society</i>	The relation between environmental performance and environmental disclosure: a research note	USA
Shima and Fung (2019)	<i>Meditari Accountancy Research</i>	Voluntary disclosure of environmental performance after regulatory change	USA
Sutantoputra et al. (2012)	<i>Australasian Journal of Environmental Management</i>	The relationship between environmental performance and environmental disclosure	Australia
Tadros and Magnan (2019)	<i>Sustainability Accounting, Management and Policy Journal</i>	How does environmental performance map into environmental disclosure? A look at underlying economic incentives and legitimacy aims	USA
Van Staden and Hooks (2007)	<i>The British Accounting Review</i>	A comprehensive comparison of corporate environmental reporting and responsiveness	New Zealand
Wang et al. (2017)	<i>Corporate Social Responsibility and Environmental Management</i>	CSR Performance and the Readability of CSR Reports: Too Good to be True?	USA
Wiseman (1982)	<i>Accounting, Organizations and Society</i>	An evaluation of environmental disclosures made in corporate annual reports	USA

Appendix II

List of ESG Disclosure Keywords

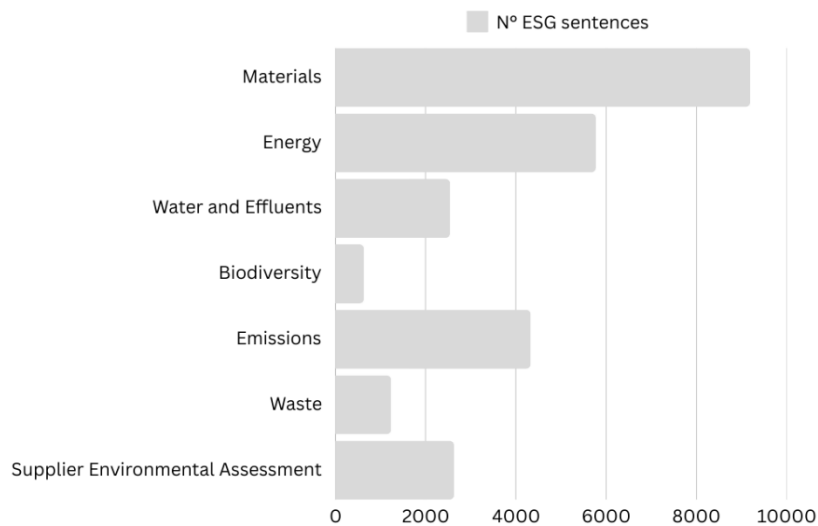
ESG dimensions	ESG topics	Keywords
Environmental	Materials	biodegradable, circular, input, material, packaging, recycled, raw material, reuse, upcycling
	Energy	energy, electricity, energy consumption, energy-efficient, energy-intensive, geothermal, hydrogen, photovoltaic, renewable, smart grids, storage, solar, wind
	Water and Effluents	aridity, drought, discharge, effluent, freshwater, groundwater, groundwater, irrigation, rainwater, water, hydric
	Biodiversity	biodiversity, ecosystem, habitat, land use, nature-oriented, protected area, restoration, species, wildlife
	Emissions	air, atmosphere, carbon, CO ₂ , decarbonization, emission, footprint, fuel, gas, GHG, greenhouse, methane, net-zero, nitrogen, NOx, ozone, oxid, pollution, SOx
	Waste	biphenyls, composting, disposal, landfill, printing, radioactive, recycling, substance, toxic waste, waste storage
	Supplier Environmental Assessment	environmental assessment, environmental audit, environmental criteria, environmental selection, environmental requirements, ISO 14001
Social	Employment	award, benefit, career, employ, fixed-term, open-end, hiring HR, human resource production award, production bonus, recruitment, retention, salary, staff, turnover, welfare, work-life, workforce
	Labor/Management relations	agreement, dispute resolution, employee engagement, labour law, management cooperation, representation
	Occupational Health and Safety	care, clinical health, disease, hygiene, incident, medical, mental health safety, wellness
	Training and Education	course, e-learning, education, learning, talent, mentoring, scholarships, skills, training
	Diversity and Equal Opportunity - Non discrimination	accessibility, discrimination, diversity, equality, ethnic, female, gender, gender-balance, gender-gap, harassment, homosexual, homophobia, inclusion, minority, pay- gap, LGBT, LGBTQ+, racial, religion, sex, transgender, violence, women,
	Freedom of association and Collective bargaining	advocacy, CCNL, collective bargaining, empowerment, fair negotiation, grievance,

		strike, trade union
	Child labour - forced or compulsory labour	compulsory labour, corporatism, forced labour, human exploitation, human right labour coercion, slavery
	Security practices	facility maintenance, health surveillance, ISO 9001, protective equipment, safety monitoring, safety protocol, safety procedure, risk assessment,
	Rights of Indigenous people	culture, domestic, land, heritage, human recognition, language, preservation, self-determination, tradition
	Local community (and charity)	charity, community, donation, foundation, housing, hospital, local, local community, nonprofit, poverty, philanthropy, socially, volunteer
	Supplier Social assessment	human rights compliance, SA800, social assessment, social criteria, social requirements, social selection
	Public policy	lobby, public administration, public contribution, political exposure, public financing, public party
	Customer health and safety	bug, customer health, customer safety, defect, grievance inspection, product quality, recall, safety,
	Marketing and labeling	advertising, branding, claim, greenwashing, labelling, marketing, packaging, promotion, readability
	Customer privacy	anonymisation, confidentiality, customer privacy, data breaches, data security, encryption, GDPR, profiling
Governance	Governance Structure	board of directors, BOD, CFO, committee, CTO, director, governance, management, manager, member
	Nominations and Compensation	board compensation, board nomination, remuneration, stock options
	Role in Sustainability	corporate responsibility, ESG committee, sustainability committee, reporting
	Conflicts of Interest	conflict of interest, conflict management, conflict mitigation, competing interest, self-dealing prevention whistleblowing, transparency, transparency guidelines
	Ethics and integrity	code of conduct, ethics, ethical code, ethical standards, conduct guidelines, behavioural accountability, integrity
	Anti-corruption	anti-corruption, corruption, misappropriation, rating di legalità

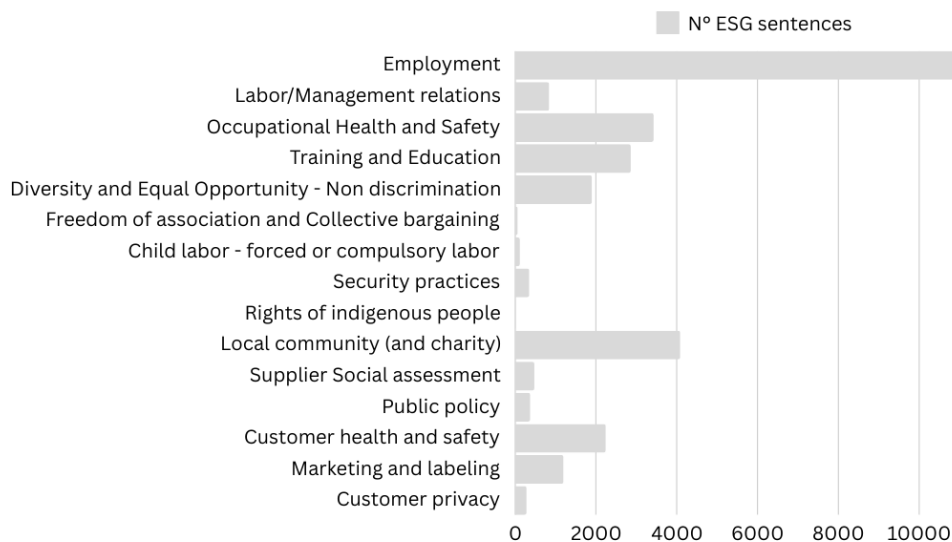
	Anti-competitive behaviour	AGCM, antitrust, collusion, competition, dominance, manipulation, predatory, unfair
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ESG Topics occurrence– Results

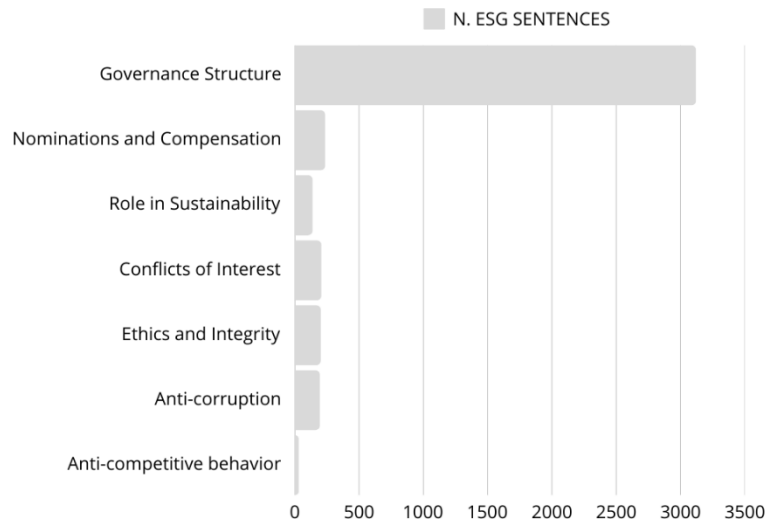
Topics occurrence - Environmental dimension



Topics occurrence- Social dimension



Topics occurrence - Governance dimension



Textual analysis procedure:

1. Import Required Libraries

The algorithm is initiated by the importation of the requisite libraries for PDF reading, text processing, and content extraction. The libraries used are listed below.

- **PyPDF2**: used for reading the PDF document;
- **pdfminer**: employed to provide detailed PDF layout analysis for text extraction;
- **pdfplumber**: used for extracting tables from PDF documents;
- **PIL (Python Imaging Library) & pdf2image**: applied for converting PDF pages into images;
- **pytesseract**: used to perform Optical Character Recognition on images for text extraction;
- **os**: responsible for managing file operations such as file deletion;
- **pandas**: used for data manipulation and table processing;
- **NLTK (Natural Language Toolkit)**: applied to text processing tasks (tokenization, stemming, and stop word removal);
- **spacy**: used for advanced text processing features, including lemmatization;
- **BeautifulSoup**: used for parsing HTML content.

2. Initialize the PDF

- **PDF Path**: it specifies the path to the PDF file to be processed;
- **Open PDF**: `PyPDF2` is used to open the PDF file and create a PDF reader object.

3. Extract Content from Each Page

- **Initialize Dictionary**: dictionary creation (`text_per_page`) to store the extracted content from each page;
- **Loop Through Pages**: `pdfminer`'s `extract_pages` method used to iterate through each page in the PDF.

4. Process Each Page

- **Initialize Variables**: set up variables to store text, format, images, and tables for each page;
- **Identify Tables**: `pdfplumber` used to detect tables on the page;
- **Sort Elements**: sorted the elements of the page according to their vertical position.

5. Identify and Extract Page Elements

- **Loop Through Elements**: iteration through sorted page elements and categorization them into text, images, and tables:
 - **Text Elements**: extraction of text using `pdfminer` and storing it along with its format.
 - **Image Elements**: extraction and crop images using `LTFigure`, converted them to image files, and used `pytesseract` to extract text via OCR.
 - **Table Elements**: extraction of table content with `pdfplumber`, converted tables to a structured string format.

6. Store Extracted Content

- **Save to Dictionary:** stored the extracted content in the dictionary with keys representing page numbers.

7. Cleanup

- **Close PDF:** ensure the PDF file is properly closed.
- **Remove Temporary Files:** deleted temporary files created during the process, such as cropped images.

8. Display Results

- **Print Extracted Content:** output the extracted content from the first page for verification.

9. Further Text Processing

- **Read Another PDF:** `pypdf` used to read an additional PDF file and extract text.
- **Text Cleaning:** extracted text cleaning using regular expressions and removing stop words with NLTK.
- **Tokenization, Stemming, and Lemmatization:** tokenized the text, and performed stemming and lemmatization using NLTK and Spacy.
- **Sentence Identification:** Use regular expressions to identify and count sentences.

10. Keyword Filtering

- **Keyword List:** definition of keywords related to specific ESG topics.
- **Sentence Removal:** removal of sentences containing these keywords to focus on relevant content.

11. Forward-Looking Sentence Identification

- **Regex Patterns:** creation a list of regex patterns to identify forward-looking statements.
- **Sentence Check:** iteration through each sentence and check for the presence of these patterns.

12. Narrative Sentences Identification

- **Regex Patterns:** creation list of regex patterns to identify narrative statements.
- **Sentence Check:** iteration through each sentence and check for the presence of these patterns.

13. Tone Analysis

- **Word Lists:** definition of positive and negative tone word lists Textblob
- **Word Counting:** counting occurrences of words in the text.

14. Subjectivity Analysis

- **Word Lists:** definition of subjectivity word lists through Textblob
- **Word Counting:** counting occurrences of words in the text.

15. Readability Analysis: Calculate readability metric (FOG index) to evaluate text complexity.

