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Materiality analysis in sustainability reporting: Insights from large Spanish companies

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Abstract

Despite the significance of materiality, its implementation has been perceived as ambiguous, opaque, and heterogeneous. This study focuses on analyzing materiality reporting among companies that utilize GRI and are listed on the Spanish stock exchange between 2018 and 2021. First, it examines the disclosure of materiality analysis by introducing a materiality disclosure assessment index (MDA) and exploring its determinants. Additionally, it investigates the alignment of material topics with GRI Topic Standards, analyzing the cross-cutting nature of material topics. Our results indicate that MDA reached slightly over half of its maximum value. We found evidence that MDA is positively associated with membership in the IBEX 35, as well as with five out of the seven industries comprising the stock index. Furthermore, the years of disclosure experience in two industries significantly influenced MDA. Companies considered 20% of material topics as cross-cutting, while another 20% had no direct correspondence with GRI standards. This study builds upon previous empirical findings on GRI materiality disclosure and provides valuable insights for research, practice, and standard setting.

KEYWORDS
GRI, IBEX 35, materiality analysis, materiality disclosure, sustainability reporting, topic standard

1 | INTRODUCTION

Over the past few years, the changing nature of the risks that companies encounter and growing investor awareness of the financial implications of such risks have led to a very significant increase in demand for corporate sustainability information, especially on the part of the investment community (European Parliament and the Council, 2022; Sierra-García et al., 2015; Vitolla et al., 2019), as well as in the number of documents or information reports disclosed (Frías-Aceituno et al., 2013; García-Sánchez et al., 2019).

However, sustainability reporting is profoundly different from the centuries-old field of financial accounting (Machado et al., 2021). Some of these differences arise due to the presence of multiple reporting standards, changing norms, and the greater impact of environmental, social, and governance (ESG) matters on the financial performance of companies (Friede et al., 2015; KPMG, 2022). This has resulted in a lack of comparability, reliability, and relevance in the disclosure of sustainability-related information (Aguado-Correa et al., 2023; Boiral & Henri, 2017; European Parliamentary Research Service, 2021; Minutiello & Tettamanzi, 2022; Opferkuch et al., 2023; Zhang et al., 2023).

Given the scope of sufficiently relevant topics for their businesses, no corporation can attempt to manage each and every topic. It, therefore, becomes necessary to identify and prioritize the material topics that are a cause of concern, both for the company and for its stakeholders (Abhayawansa, 2022; Aprile et al., 2023; Edgley, 2014; Ferrero-Ferrero et al., 2020; GRI, 2016a; Moroney & Trotman, 2016; Unerman & Zappettini, 2014). Materiality is widely recognized as foundational to corporate reporting (Cooper & Michelon, 2022; Eccles & Krzus, 2014; Luque-Vílchez et al., 2023; Torelli et al., 2020) subject to ongoing debate regarding its role and definition in sustainability reporting (Luque-Vílchez et al., 2023).

Despite the relevance of materiality, it has a series of related problems. In the first place, there is no unanimity in the different standards or frameworks where it is defined (Abhayawansa & Adams, 2022; Calabrese et al., 2019; Eccles & Krzus, 2014; Garst et al., 2022). In addition, it has hardly been the object of normative regulation in Europe, as a reference to the term "materiality" or "material" could neither be found in Directive 2014/95/EU (European Parliament and the Council, 2014) nor in Directive 2022/2464/EU (European Parliament and the Council, 2022), although it was in the Guidelines on nonfinancial reporting: Supplement on reporting climate-related information of 2019 (European Commission, 2019) and in the European Sustainability Reporting Standards (ESRSs), prepared by the European Financial Reporting Advisory Group (EFRAG, n.d.).

In second place, there is no agreement on how to implement materiality, having considered its practical application as ambiguous (Edgley, 2014; Puroila & Mäkelä, 2019; Reimsbach et al., 2020), controversial (Reimsbach et al., 2020), opaque, and subjective (Boiral, 2013; Clark, 2021; Farooq et al., 2021). In general, it is recommended in the standards that the company apply the principle of materiality and explain the steps that are taken (Puroila & Mäkelä, 2019). However, the standards offer general suggestions rather than specific guidelines or tools to conduct the materiality analysis (Wu et al., 2018), and that mere compliance is no guarantee of quality information (Ruiz-Lozano et al., 2022; Torelli et al., 2020). Hence, the emergence of different proposals to evaluate the degree to which the disclosure of materiality has advanced using score items for this purpose (Beske et al., 2020; De Cristofaro & Gulluscio, 2023; Gerwanski et al., 2019; Machado et al., 2021; Ruiz-Lozano et al., 2022).

Despite the GRI Standards being the most widely used globally (KPMG, 2022), Machado et al. (2021, p. 571) declared that "the quality and transparency of materiality analysis in GRI reporting is open for debate." Studies addressing materiality analysis within this framework are limited (Beske et al., 2020; Farooq et al., 2021; Machado et al., 2021; Torelli et al., 2020), and few have analyzed companies disclosing with different versions of the same standard. Specifically, none of the previous studies in their samples include the transition from GRI Standards version 2016 to 2021, nor do they analyze companies from the Spanish stock market. On the other hand, some of the previous studies propose the creation of an index to measure materiality disclosure. However, they only provide the overall value of this index, but not the value of the items comprising it by industry and year. This aspect would be essential for analyzing, in detail, the progress made and the weaknesses that companies and industries need to address. Our study addresses these gaps.

There also remain many open questions related to the determinants of materiality analysis in the context of sustainability reporting. To date, studies focused on the determinants of materiality disclosure have been scarce (Farooq et al., 2021; Fasan & Mio, 2017; Gerwanski et al., 2019; Torelli et al., 2020). In these studies, there is no clear consensus on the drivers of materiality analysis. Even those that agree on the importance of a specific factor do not agree on its predictive nature. Furthermore, research on the determinants of materiality in Spain is an unexplored field. Our work contributes to filling this research gap by analyzing sustainability reports of companies listed on the Spanish stock exchange.

On the other hand, the ultimate goal of materiality analysis is to identify and prioritize the most relevant topics in terms of economic, environmental, and social impact. For disclosure purposes under the GRI standards, companies must select Topic Standards to report specific information on them. By aligning with these standards, companies can ensure that their reports comprehensively address issues that are critical both to the company and its stakeholders. This promotes greater coherence and comparability in sustainability disclosure, thereby enhancing the company's credibility and fostering informed decision-making by stakeholders. However, the list of topics covered by the GRI Standards is not exhaustive (GRI, 2016b), and not all material topics may be covered by the standards. The limited literature on the analysis of material topics (Jayarathna et al., 2022; Sepúlveda-Alzate et al., 2022) has not examined the proportion of material topics disclosed by companies that are not covered by the Topic Standards, nor the multidimensionality of material topics, that is, if the same material topic has been linked by companies to Topic Standards of different categories (economic, environmental, or social), aspects addressed by our study.

Taking into consideration the described research gaps, we consider it necessary to closely examine the materiality disclosures practiced by companies. This article has several objectives. First, it evaluates the disclosure of materiality analysis in sustainability reports of companies listed on the Spanish stock exchange that use the GRI Standards. Secondly, it analyzes the determinants of such disclosure. Lastly, it examines how companies link the material topics resulting from materiality analysis with the GRI Topic Standards.

The remainder of this study is structured as follows: Section 2 provides an overview of the concept of materiality and the GRI Framework, along with materiality analysis and proposals for assessing materiality disclosure. Section 3 develops our hypotheses. The research methodology is detailed in the fourth section, which presents the results in the fifth section. Finally, the discussion and conclusions of the study are presented in the sixth and seventh sections, respectively.

2 | BACKGROUND

When analyzing the theoretical framework on materiality, there is an increasing trend in the number of studies published since 2010

(Fiandrino et al., 2022). In our case, we will proceed, in the following subsections, to develop the concept of materiality, the treatment of materiality in the GRI framework, materiality analysis and proposed approaches for assessing materiality disclosure.

2.1 | The concept of materiality

Despite the importance of materiality, it is a generally accepted fact that at the center of the apparent consensus, there is significant tension between the different approaches that can lead the readers of sustainability reports to draw unjustified conclusions (Jørgensen et al., 2022). Indeed, multiple alternative definitions of materiality are found within the standards (Abhayawansa & Adams, 2022; Calabrese et al., 2019; Eccles & Krzus, 2014; Garst et al., 2022), which introduce ambiguity and subjectivity. In addition, the proliferation of standards has negatively impacted on the standardization of reports (Pizzi et al., 2022).

Table 1 offers a view of the different definitions of materiality adopted by the principal reporting standards and frameworks. According to Clark (2021), the definitions varied on three key items, one of which being the content of the information provided by the company or type of materiality. Thus, we would be facing so-called financial materiality when that information is related with the creation of economic value (an outside-looking-in perspective), which is framed within the definitions provided by IFRS, SASB and TCFD. On the contrary, if the information that is selected, taking into account the impact of the corporation on society and the environment (an inside-looking-out perspective), we would be facing impact materiality, which is only acknowledged in the GRI. Finally, if both perspectives are considered, the so-called double materiality appears, which is where the ESRS and now also GRI (2024) are positioned.

In parallel, and with the purpose of demonstrating the alignment between financial materiality and double materiality, the World Economic Forum introduced the additional concept of dynamic materiality. It is based on the idea that there is pre-financial information that may not be strictly material in the short term, though it is material to society and to the planet and it may therefore become material to financial performance over the medium or longer term (World Economic Forum, 2020).

2.2 | Materiality and global reporting initiative

The development of the GRI Framework and Guidelines system has evolved over more than 20 years, marked by continuous changes, refinements, and improvements (Perera-Aldama, 2023). Initially, materiality was integrated into the principle of Relevance in G2 (Perera-Aldama, 2023), but detailed consideration of materiality was introduced starting with the G3 Guidelines in 2006 (Luque-Vílchez et al., 2023). Subsequent to this, GRI published the G4 Guidelines in 2013, transitioning in 2016 to the format of standards through the GRI Sustainability Standards, and finally, in 2021, to the Revised Standards. These Revised Standards, effective from January 1, 2023, comprise a modular system of three series: Universal Standards (for all organizations), Sector Standards (for specific sectors), and Topic Standards (dedicated to specific topics).

The 2021 update of GRI replaced the former GRI 101, 102, and GRI 103 with a new Foundation (GRI 1), General Disclosures (GRI 2), and Material Topics Disclosures (GRI 3). In this update, materiality is not considered a principle but is covered in a separate standard, GRI 3, which outlines the steps for organizations to determine their material topics and describes how Sector Standards are used in this process. It includes disclosures for reporting material topics, the process for determining them, and their management. The revised definition of materiality in GRI 3 eliminates the two-dimensional aspect present in the GRI Standards 2016 (Table 1), and this change is accompanied by GRI's explicit positioning in favor of double materiality. Specifically, in 2024, GRI published *Double materiality: The guiding principle for sustainability reporting*, explicitly stating that "GRI supports the concept of double materiality, and its standards represent the impact side of double materiality. In terms of the other perspective of double materiality, reporting sustainability-related financial disclosures, companies that produce a GRI report are well prepared for double materiality because of a 'sequencing' effect" (GRI, 2024, p. 2).

Additionally, the Revised Standards have updated their Topic Standards by eliminating the 200 (Economic), 300 (Environmental) and 400 (Social) series. There are now 31 separate Topic Standards, after the withdrawal of three Standards, that should be followed when reporting on Material Topics. The Topic Standards were adapted to make reporting using the revised Universal Standards and the Sector Standards possible. Despite these adaptations, the disclosures in the Topic Standards have remained unchanged. Consequently, the numbering and release year of the Topic Standards remain consistent with those before the update (GRI, 2022). While GRI Standards now emphasize the importance of consulting the Sector Standards as a primary source for potentially material topics (Perera-Aldama, 2023), it is noteworthy that only four Sector Standards have been released by GRI to date. Furthermore, it should be noted that GRI also has ongoing projects to revise the Topic Standards related to climate change, labor, and economic impacts. The Biodiversity project has been completed, resulting in the publication of the new Topic Standard GRI 101: Biodiversity 2024 on January 25, 2024, replacing GRI 304: Biodiversity 2016, which will not come into effect until January 1, 2026.

Research that has examined disclosure made by companies using GRI standards has not only analyzed the Topic Standards (Jayarathna et al., 2022; Khan et al., 2023; Lambrechts et al., 2019; Tozsér et al., 2024) but also studied the indicators, included in the topic disclosures (De la Cuesta & Valor, 2013; Gutiérrez-Ponce, 2023; Gutiérrez-Ponce et al., 2022; Jadhav et al., 2022; Roca & Searcy, 2012), and material topics (Jayarathna et al., 2022; Sepúlveda-Alzate et al., 2022).

The research examining the material topics disclosed by companies has linked them to the economic, environmental, and social categories to determine the weight of each category. Specifically, Sepúlveda-Alzate et al.'s (2022) study, focused on the mining,

TABLE 1 Materiality in the standards and frameworks for disclosure.

Standard/framework	Definition of materiality	Type of materiality	Process for determining the material topics
GRI G4	Aspects that reflect the organization's significant economic, environmental and social impacts; or that substantively influence the assessment and decisions of stakeholders (GRI, 2013, p. 244)	Impact materiality	1. Identification of relevant topics 2. Prioritization to identify the material topics 3. Creation of a materiality matrix 4. Validation of material topics 5. Review of material topics
GRI Standards 2016	Material topics are those that reflect an organization's significant economic, environmental and social impacts; or that substantively influence the assessments and decisions of stakeholders (GRI, 2016b, p. 27).	Impact materiality	It does not explicitly provide a list of steps to implement. However, such steps are implicitly outlined in GRI 101 to 103, which are the same as those in GRI G4: 1. Identification of relevant topics 2. Prioritization to identify the material topics 3. Creation of a materiality matrix 4. Validation of material topics 5. Review of material topics
GRI Standards 2021	Topics that represent the organization's most significant impacts on the economy, environment, and people, including impacts on their human rights (GRI, 2021a, p. 1004)	It focuses on the materiality of impact, informing financial materiality	1. Understand the context of the organization 2. Identify the actual and the potential impacts 3. Evaluate the importance of the impacts 4. Prioritize the most significant impacts for the report
European Sustainability Reporting Standards (ESRS)	Double materiality has two dimensions: impact materiality and financial materiality. A sustainability matter meets the criterion of double materiality if it is material from the impact perspective or the financial perspective or both (European Commission, 2023, pp. 7–8)	Double materiality	
IFRS S1	Information is material if omitting, misstating or obscuring that information could reasonably be expected to influence decisions that primary users of general purpose financial reports make on the basis of those reports, which include financial statements and sustainability-related financial disclosures and which provide information about a specific reporting entity (IFRS Foundation, 2023, p. 8)	Financial materiality	1. Identify the information that could be material 2. Assess whether the information is material 3. Organize the information within the draft financial statements 4. Assess the information provided in the draft financial statements as a whole
SASB	Information is financially material if omitting, misstating, or obscuring it could reasonably be expected to influence investment or lending decisions that users make on the basis of their assessments of short-, medium-, and long-term financial performance and enterprise value (SASB, 2020, p. 11)	Financial materiality	Materiality finder and materiality map
TCFD	Materiality is a concept designed to guide the application of professional judgment for the purpose of determining acceptable levels of information disclosure in mainstream reports and thereby informing the users of those reports for their decision-making (TCFD, 2019, p. 24)	Financial materiality	Four widely adopted recommendations linked to: governance, strategy, risk management, and metrics and objectives Give guidance for all the sectors, as well as complementary orientations for certain sectors

construction, energy, and chemical sectors in Latin America, associated material topics obtained from each company's materiality matrices with 6 GRI subcategories (economic, environmental, labor practices, human rights, society, and product responsibility), with Society and Environment having the greatest weight. However, the document did not mention how this association was carried out, nor the possible limitations of such association. Meanwhile, the study by Jayarathna et al. (2022) analyzed materiality matrices to identify the most significant sustainability topics for the logistics sector, revealing a stronger emphasis on social issues over economic and environmental concerns. This study also included "Ethics, Compliance, Rules & Regulations" as an additional category to encompass the material topics disclosed by companies. However, such studies do not address the proportion of material topics disclosed by companies that are not covered by the Topic Standards, nor the multidimensionality of material topics. In this regard, it is important to note that some material topics may intersect with various aspects of environmental, economic, and social performance, necessitating alignment with multiple GRI Topic Standards across these domains. For instance, a material topic, such as "diversity and equal opportunity" may require reporting on both social indicators related to workforce diversity (e.g., GRI 405 and GRI 406) and economic indicators concerning equal opportunities and fair remuneration (e.g., GRI 202).

2.3 | Materiality analysis

With the purpose of applying materiality in practice, companies must publish the so-called materiality analysis. An analysis that represents a key stage in the reporting process, in which material topics are identified and prioritized, and in which stakeholder engagement is a key component (Farooq & de Villiers, 2019; Gal & Akisik, 2020; Jørgensen et al., 2022; Whitehead, 2017). That analysis implies a complex and inherently subjective process (Farooq et al., 2021) in which a variety of internal and external sources of information must be considered (GRI, 2016b), as well as setting down considered opinions that can differ between the various managers of the same company or in accordance with the context (Mio et al., 2020). As a result, the operationalization of materiality is rarely described (Cerbone & Maroun, 2020). In practice, an important variation is noted both in the form and in the extension of the specific materiality reports (De Cristofaro & Gulluscio, 2023; Jones et al., 2016; Puroila & Mäkelä, 2019).

There are various methodologies and approaches that may be adopted to carry out an analysis of materiality, and the specific method that is chosen will depend on the context, the objectives and the interest groups of the organization. In general, it is recommended in the standards that the reporting organization include in its report an explanation of how the materiality principle has been applied, emphasizing the need to define the steps being taken to identify the material issues and the basis upon which its prioritization was carried out (Puroila & Mäkelä, 2019). Specifically, a series of steps was proposed in IFRS, GRI G4 and GRI Standards 2021 of a non-obligatory nature, as a guide to the analysis of materiality (Table 1). Conversely, GRI Standards 2016, while not explicitly listing the steps, implicitly includes them in GRI 101 to 103. Other standards reflected in Table 1, such as SASB and TCFD, do not specify the steps but offer tools and recommendations. Additionally, some authors have proposed alternative methods to the standards for conducting materiality analysis (Arena & Azzone, 2012; Bellantuono et al., 2016; Calabrese et al., 2016; Calabrese et al., 2019; Eccles et al., 2012; Hsu et al., 2013; Krajnc & Glavič, 2005; Muñoz-Torres et al., 2012).

2.4 | Proposals for assessing materiality disclosure

Although the standards for the measurement and presentation of reports have sought to guarantee information quality (Jørgensen et al., 2022), materiality disclosure in practice deviates from that objective (Lakshan et al., 2021; Pistoni et al., 2018).

Various different academic proposals have been advanced to evaluate materiality disclosure using scoring items. Some of the most relevant are shown in Table 2. In the case of Gerwanski et al. (2019), they proposed "materiality disclosure quality (MDQ)", whose main objective was to mitigate conflicts of interest between shareholders and other stakeholders, and to increase transparency for report users, entirely in line with the intention of integrated reporting (IR). The authors found that the average value of MDQ was 6.06 with a standard deviation of 3.33, which implied that the average integrated report of the companies only reached half of the maximum MDQ. However, this value was conditioned by the non-inclusion of the financial industry in the sample.

Subsequently, Beske et al. (2020) created a disclosure index to determine whether there had been any evolution of information disclosure relating to materiality analysis. In the first year of their study (2014) the average was 4.76 and continued to rise, year after year, until it reached a value of 5.67 in the last year of the study (2017). However, the study only took into account the definition of the term "materiality" and the identification of stakeholders and topics, as well as the methods used for this purpose.

Machado et al. (2021), in an effort to assess the transparency of materiality analysis, examined the extent of disclosure of six GRI indicators associated with materiality. The findings revealed that approximately 22% of the content pertaining to these indicators was not fully disclosed. These indicators were primarily related to stakeholders, thus overlooking other important aspects for understanding materiality disclosure.

Similarly, Ruiz-Lozano et al. (2022) created the "materiality disclosure index" to assess the level of materiality disclosure. The findings indicated that, out of the 15 components comprising the index, the average score reported by the analyzed public companies was 3.75, suggesting a low level of disclosure (25%). However, these results were derived from a single year of study.

Lastly, De Cristofaro and Gulluscio (2023), seeking to offer an initial evaluation of the global adoption of double materiality by companies, devised a double-materiality implementation intensity index, which resulted in an average value of 2.5, although they only

TABLE 2 Proposals for the assessment of materiality disclosures.

Authors	Gerwanski et al. (2019)	Beske et al. (2020)	Machado et al. (2021)	Ruiz-Lozano et al. (2022)	De Cristofaro and Gulluscio (2023)
Proposal	Materiality disclosure quality (MDQ)	Disclosure index	Rate of disclosure of six of GRI's indicators related to materiality	Materiality disclosure index	Intensity of implementation of the double materiality
Items	1. Materiality section 2. Identification process of material issues by senior management and stakeholders 3. Description of the material aspects. 4. Time horizon of material issues 5. The inclusion of a materiality matrix 6. Connecting both risks and opportunities to material issues 7. Mitigation actions	1. Definition of materiality analysis 2. The company designates how it identifies the most relevant stakeholder groups 3. The company explains how it identifies the most relevant stakeholders 4. The company designates the methods used to identify the most relevant stakeholders 5. The company explains the methods used to identify the most relevant stakeholders 6. The company designates its material topics/aspects 7. The company explains its material topics/aspects 8. The company designates the methods of identification of its material issues/aspects 9. The company explains the methods of identification of its material issues/aspects	1. Explanation of the process for defining the report content and the topic/aspect boundaries 2. List of the material aspects identified during the process of defining the content of the report 3. List of stakeholder groups engaged by the organization 4. Basis for the identification and selection of the stakeholders with whom to engage 5. Organization's approach to stakeholder engagement, including frequency (regularity) of engagement by type and by stakeholder group 6. Information on key topics and concerns that have been raised through stakeholder engagement	Section 1 General 1. Specific section on materiality Section 2 Identification 2. Identification of relevant issues based on standard listings 3. Conducting internal and external consultations 4. Reporting on the techniques used Section 3 Prioritization 5. Reporting on the process or the techniques employed 6. Reporting on the criteria used and/or whether it includes the materiality matrix 7. Reporting on the person or body who takes the final decision Section 4 Validation 8. Reporting on the process or the techniques employed 9. Reporting on the criteria used Section 5 Review 10. Reporting on the process or the techniques employed 11. Reporting on the criteria used 12. Reporting on the frequency of the review Section 6 Material issues 13. Provide a list of material issues 14. Reporting on the specific objectives for each of the material issues 15. Provide links to connect each material issue with the information on that issue in the report	1. Impacts are described or mentioned in the text 2. The role of double materiality is clearly stated in the analysis of materiality 3. The impacts are included in the issue table

TABLE 2 (Continued)

Authors	Gerwanski et al. (2019)	Beske et al. (2020)	Machado et al. (2021)	Ruiz-Lozano et al. (2022)	De Cristofaro and Gulluscio (2023)
Proposal	Materiality disclosure quality (MDQ)	Disclosure index	Rate of disclosure of six of GRI's indicators related to materiality	Materiality disclosure index	Intensity of implementation of the double materiality
Scale	0–12 (only items 5 and 6 are dichotomous)	0–9 Dichotomous	0–6 Dichotomous	0–15 Dichotomous	0–5 (only item 2 is dichotomous)
Technique	Manual content analysis	Manual content analysis	Manual content analysis	Manual content analysis	Manual content analysis
Companies	117	33	NA	64	10
Reports	359	132	140	64	10
Countries	14	1	38	1	7
Fin. Years	2013–2016	2014–2017	2017–2018	2017	2021
Standard	IR	GRI	GRI	GRI/State Ports guide	NA
Average	6.06 ± 3.33	4.76 ± 0.96 (2014); 5.12 ± 1.31 (2015); 5.15 ± 1.17 (2016); 5.67 ± 1.08 (2017)	77.9%	3.75 ± 3.31	2.5 ± 1.51

Abbreviation: NA, not available.

employed three items for this purpose, overlooking other relevant elements in materiality analysis.

3 | HYPOTHESES DEVELOPMENT

Understanding the determinants of materiality disclosure within the context of sustainability reporting is crucial for gaining insight into the multifaceted nature of corporate sustainability practices. To address this area, the literature has primarily focused on the internal and external factors that influence sustainability disclosure in general (Hahn & Kühnen, 2013), with fewer studies examining the variables that impact the disclosure of the materiality process (Fiandrino et al., 2022). Among the latter, there are differences in the factors considered relevant for materiality disclosure. Based on a literature review, we have selected a set of these determinants, which motivate our hypotheses.

3.1 | Index membership

Some researchers argue that while inclusion in a stock index could be considered an indicator of a company's visibility, its inclusion does not influence the level of materiality application (Torelli et al., 2020).

Regarding the relationship between membership in a sustainability index and the quality of reported information, findings show contradictory results. Some authors posit a positive relationship between both variables, indicating that membership in an index like the DJSI may signal leadership in corporate sustainability terms (Makipere & Yip, 2008) and even serve as an indirect indicator of corporate social responsibility reputation (Robinson et al., 2011). Thus, companies included in such indices may attract more socially responsible investors and other stakeholders concerned with sustainability (Kim et al., 2018; Serafeim, 2015), leading to higher quality and transparency in nonfinancial disclosure (Chiu & Wang, 2015; Mallin et al., 2013; Oh et al., 2013).

Conversely, other authors argue that companies included in the DJSI do not exhibit higher disclosure quality, suggesting that this might be due to socially responsible investors' information requirements not differing from those of other investors (Gerwanski et al., 2019). However, to reach that conclusion, they did not include the Financial Services sector in the sample.

In our study, we will test whether membership in the IBEX 35 stock index, a reference index in Spain, is a determinant factor of the extent of materiality disclosure, proposing the following hypothesis:

> **H1.** The membership in the IBEX 35 stock index is positively associated with the level of materiality analysis disclosure.

3.2 | Industry

Throughout the literature, various studies have pointed out that the industry to which a company belongs plays a crucial role in the

quantity and quality of nonfinancial information disclosed (Fasan & Mio, 2017; Hahn & Kühnen, 2013; Torelli et al., 2020). Furthermore, the industry of operation can influence the extent of application and rigor of the materiality principle (Hassan & Ibrahim, 2012; Torelli et al., 2020). Industry-specific regulations, public opinion pressures, as well as stakeholder perceptions (Fasan & Mio, 2017; Hassan & Ibrahim, 2012; Torelli et al., 2020) may generate a disclosure model that fosters mimicry or similarity among companies within the same industry (Husillos et al., 2011), whereby pressures from more powerful stakeholders are mitigated (Patten, 1991).

Findings from studies that conducted comparative analyses across industries show different results. Some researchers have observed that materiality disclosure is not higher in industries with high environmental impact. For example, Fasan and Mio (2017) concluded that companies in the Telecommunications industry rank higher in materiality disclosure compared with firms operating in other industries, such as Consumer Goods or Oil & Gas, which receive significantly lower scores. However, to arrive at this conclusion, they collected data for only 2 years.

In contrast, other authors indicate that companies in industries with a greater environmental impact tend to make more extensive disclosures than those in less environmentally sensitive industries (Hassan & Ibrahim, 2012; Monteiro & Aibar-Guzmán, 2010). Similarly, Torelli et al. (2020) contend that companies in the service sector tend to address the principle of materiality and its underlying process less comprehensively. However, it is important to note that their study excluded the banking, financial, and insurance sectors and was confined to a single year. Possible causes they point out include lesser pressure and demand from civil society and stakeholders to which these companies are subject, due to their less direct and impactful connection with social and environmental issues.

Nevertheless, it is worth noting that companies in the Financial Services industry, which public authorities consider as drivers of sustainable transition (European Commission, 2018), are subject to numerous regulatory (European Parliament and Council, 2020) and supervisory (European Central Bank, 2020) requirements that influence their nonfinancial disclosures.

Given the lack of unanimity achieved by previous studies, our research aims to delve further into the aforementioned results by analyzing the relationship between the industry to which the company belongs and the degree of materiality analysis disclosure. Thus, we develop the following hypothesis:

H2. The industry to which the company belongs influences the degree of materiality analysis disclosure.

3.3 | Capitalization

Disclosure of information about the materiality process may be influenced by the size of the company (Ruiz-Lozano et al., 2022). This factor may be considered to have a positive effect on the adoption and scope of sustainability reports, with larger companies being more likely to have more extensive and higher-quality sustainability reports, addressing a greater number of material topics (Fortanier et al., 2011; Gallo & Christensen, 2011; Hahn & Kühnen, 2013). This may be because larger companies, besides having the necessary financial resources to produce costly sustainability reports, can cause greater impacts, become more visible, and face greater scrutiny and pressure from stakeholders. Additionally, the preparation of sustainability reports can serve to legitimize their business activities to shareholders and creditors (Haniffa & Cooke, 2005).

However, other research yields contradictory results (Hahn & Kühnen, 2013). Previous studies argue that company size does not influence the extent of materiality disclosure (Farooq et al., 2021; Ngu & Amran, 2021) or the quality of sustainability reports (Ettredge et al., 2011; Vormedal & Ruud, 2009). In this regard, a high level of indebtedness, leverage, or gearing may decrease the company's ability to bear the costs of report preparation, as well as to cope with the consequences of disclosing potentially harmful information (Stanny & Ely, 2008). However, caution is warranted when extrapolating the findings of these studies due to their time horizon and sample composition (Farooq et al., 2021; Ngu & Amran, 2021).

Despite these disparate results, we consider that company size may be a determining factor in the degree of materiality analysis disclosure. Thus, we propose the following hypothesis:

H3. The capitalization of a company is positively associated with the level of materiality analysis disclosure.

3.4 | Disclosure experience in each industry

Previous experience of the company in reporting may influence the quality of sustainability reporting (Dilling & Caykoylu, 2019; Dilling & Harris, 2018; Truant et al., 2017). In this regard, some researchers argue that reporting practice provides an advantage to the organization over new reporters and positively influences the quality of disclosed information (Dilling & Harris, 2018; Truant et al., 2017). However, others demonstrate a negative correlation between the quality of integrated reporting and previous reporting experience (Dilling & Caykoylu, 2019).

Regarding the variation in the quality of materiality over time, there is a lack of research in this area (Gerwanski et al., 2019), with no conclusive results found. While some authors show a positive association between learning and the quality of materiality disclosure (Gerwanski et al., 2019), others conclude that there is no correlation between the level of materiality principle application and past experience in reporting (Torelli et al., 2020). It is important to note that, to reach these conclusions, these studies did not consider certain sectors or analyzed only 1 year. Thus, we propose the following hypothesis:

H4. The years of experience in sustainability reporting within each industry are positively associated with the level of materiality analysis disclosure.

4 | RESEARCH METHOD

4.1 | Sample selection and data collection

Our initial sample consisted of the 35 companies that were part of the IBEX 35 in 2022, the benchmark index of the Spanish Stock Exchange, comprising 7 business sectors. Following Beske et al. (2020), the IBEX 35 listed companies were selected for the sample from the universe of all companies within Spain that prepare sustainability reports, due in part to the availability of the sector-by-sector groupings and the capitalization indices of Spanish stock-exchange-listed companies. Moreover, the comparability of their reports was a key factor, as 34 out of the 35 companies were legally obligated to disclose nonfinancial information according to Law 11/2018, which transposes Directive 2014/95/EU in Spain. A study period of 5 years (2018–2022) was chosen, commencing in 2018, the year when Spanish companies were first mandated to report in compliance with Law 11/2018.

Sustainability reports from the corporate websites were gathered for the 35 companies belonging to the IBEX 35 in 2022, covering the 5-year study period. One company not required by Law 11/2018 to disclose nonfinancial information was excluded from the sample, as it did not publish sustainability reports in 2018 and 2019. Another exclusion occurred because the company, being integrated into its parent company, also did not publish sustainability reports in those years.

For the remaining 33 companies, an additional requirement was established, mandating reference to GRI standards in their sustainability reports, as it is the most widely used standard globally (KPMG, 2022). This decision stemmed from the structured information these standards provide, aiding organizations in identifying and addressing material issues for sustainable performance, while also facilitating report comparability. Following manual review of the 165 reports over the 5-year study period, it was confirmed that all of them indeed referenced GRI standards. Specifically, from 2018 to 2020, all companies utilized the GRI Standards 2016. In 2021, despite not being mandatory, three companies adopted the GRI Standards 2021, and the rest continued to use the GRI Standards 2016. In 2022, all companies used the GRI 2021 standards. As a result, our final sample consisted of 33 companies and their 165 sustainability reports.

The 165 reports were distributed among five of the authors of this study for analysis. The specific section on materiality, the only section of each report examined alongside the GRI content index, was manually located in each of the reports. The sustainability reports were analyzed using the technique of content analysis to address the study's objectives. Content analysis was defined by Berelson (1952, p. 18) as "a research technique for the objective, systematic and quantitative description of the manifest content of communication" (p. 18). Similarly, Farooq et al. (2021, p. 978) consider it "a particularly effective tool for analyzing large sets of data, thereby facilitating both a comparative and longitudinal analysis." Content analysis has been extensively used in literature to analyze sustainability reports as well as the disclosure of materiality (Beske et al., 2020; Farooq et al., 2021; Fasan & Mio, 2017; Gerwanski et al., 2019; Hahn & Kühnen, 2013; Machado et al., 2021; Ngu & Amran, 2021; Ruiz-Lozano et al., 2022; Torelli et al., 2020). Since each analyst reviewed different reports, no inter-coder reliability figures can be offered (De la Cuesta & Valor, 2013).

4.2 | Dependent variable

To measure the disclosure of materiality analysis, defined as the extent to which companies disclose the materiality determination process and the issues they consider to be material (Fasan & Mio, 2017), a materiality disclosure assessment index (MDA) was constructed, drawing on previous studies (Beske et al., 2020; De Cristofaro & Gulluscio, 2023; Gerwanski et al., 2019; Machado et al., 2021; Ruiz-Lozano et al., 2022), as well as the GRI standards 2016 and 2021.

Table 3 presents the seven scoring elements that comprise MDA, along with the respective references that justify them. In this case, it was decided to use unweighted items, meaning each element of the index had the same importance, due to the nature of the information under investigation (Beske et al., 2020), as well as the lack of experience in applying indices to this context and the subjectivity that weighting could imply (Ruiz-Lozano et al., 2022). MDA ranges from a minimum of 0 to a maximum of 9.

Regarding the scoring items of MDA, the inclusion of "Explanation of the process to conduct the materiality analysis (1)" was justified by the need to include a specific description of how the Materiality principle has been applied. Specifically, the existence of the steps taken to identify relevant topics, and how the relative priority of material topics was determined was analyzed (0: no steps described, 1: steps described). The item "Identification of stakeholders that have participated in the materiality analysis (2)" aimed to verify if companies had specified exactly which stakeholder groups participated in this process (0: no stakeholders referenced, 1: stakeholders identified). Adhering to the principle of Reliability (Verifiability in GRI 2021), the organization can identify the original sources of the information in the report. In this case, the item "Identification of the data sources employed for the materiality analysis (3)" sought to assess this aspect (0: no sources mentioned, 1: sources mentioned). Additionally, we evaluated the "Description of the material topics (4)," specifically, an explanation of why the topic is material (0: no topic is explained, 1: some topics are explained, 2: all material topics are explained). We also included the item "Ranking of the material topics (5)" because not all material topics are of equal importance, and the emphasis within a report is expected to reflect their relative priority. Specifically, it was checked whether the material topics were ranked in order of importance and not merely listed in an unclassified manner (0: no ranking, 1: ordered by importance). The next item, "Representation of the materiality matrix (6)" was related to the previous item as well as to the principle of materiality and GRI 3. Although GRI does not establish the mandatory inclusion of a matrix in either the 2016 or 2021 version, without it, it would often not be possible to know if the material topics are ranked in the reports (0: no materiality matrix, 1:

TABLE 3 Scoring items for MDA index.

Item no.	Scoring element	Point range	References		
			GRI standards 2016	GRI standards 2021	Study
1	Explanation of the process to conduct the materiality analysis	0–1	102-46 (Defining report content and topic Boundaries)	3-1 (Process to determine material topics)	Gerwanski et al., 2019; Machado et al., 2021;
2	Identification of stakeholders that have participated in the materiality analysis	0–1	102-42 (Identifying and selecting stakeholders)	2-29 (Approach to stakeholder engagement)	Beske et al., 2020; Machado et al., 2021
3	Identification of the data sources employed for the materiality analysis	0–1	Reliability reporting principle	Verifiability reporting principle	Ruiz-Lozano et al., 2022
4	Description of the material topics	0–2	103-1 (Explanation of the material topic and its Boundary)	3-3 (Management of material topics)	Beske et al., 2020; Gerwanski et al., 2019
5	Ranking of the material topics	0–1	Materiality reporting principle; Balance reporting principle	3 (Material Topics 2021) Step 4. Prioritize the most significant impacts for reporting; Guidance to 3-1-a-ii	
6	Representation of the materiality matrix	0–1	Materiality reporting principle	GRI Universal Standards 2021 (GRI 3. Step 4. Prioritize the most significant impacts for reporting; Guidance to 3-1-a-ii; Frequently Asked Questions (FAQs) N. 41).	Gerwanski et al., 2019
7	Alignment between material topics and GRI Topic Standards	0–2	101, Section 2.5 (Reporting on material topics)	Requirement 5: Report disclosures from the GRI Topic Standards for each material topic; Requirement 7: Publish a GRI content index	
	Σ	0–9			

materiality matrix present). Finally, our scoring model included the "Alignment between material topics and GRI topic standards (7)" (0: no alignment established, 1: alignment established outside the GRI content index, 2: alignment established in the GRI content index). This is because for each material topic, the reporting organization should inform about the Topic-Specific or Topic-Standards disclosures in the corresponding GRI Standard (GRI, 2016b, 2021a).

4.3 | Independent variables

To predict the dependent variable (MDA), the following independent variables or determinants of materiality analysis disclosure were taken into consideration: *IBEX_35*, *INDUSTRY*, *CAPITALIZATION*, and *EXPERIENCE_INDUSTRY*.

The first variable, *IBEX_35*, aimed to determine whether, as of January 1st of a specific fiscal year, the company belonged to the IBEX 35 index (value 1 if the firm was included in the index on January 1st of the disclosed fiscal year, and 0 otherwise). The requirement of January 1st was due to cases, such as a company that joined the IBEX 35 on 12/20/2021. That is, in 2021, it belonged to the index for only 12 days, so for the analysis of the 2021 fiscal year report, we assigned a value of 0 to the *IBEX_35* variable. However, in 2022, having remained in the index for the entire year, it was assigned a value of 1. It is also important to note that, during the 5-year study period, no company exited the index.

The *INDUSTRY* variable classified each company according to its belonging to one of the 7 industries into which the IBEX 35 was divided (Petrol and Power; Basic Materials, Industry and Construction; Consumer Goods; Consumer Services; Financial Services; Technology and Telecommunications; Real Estate Services).

CAPITALIZATION represented the *z*-score normalization of the market value of all the shares of a company, thus providing a measure of its relative size.

Finally, the disclosure experience in each industry was taken into account through *EXPERIENCE_INDUSTRY*. Specifically, this variable was constructed by the interaction between the number of disclosure years and the industry of belonging. To measure the number of disclosure years, the base year 2018 was subtracted from the year of the report. This way, it reached the minimum value (0) in the 2018 reports and the maximum value (4) in the 2022 fiscal year reports.

The data for the first three variables were obtained from BME Holding (n.d.).

4.4 | Model specification

In order to estimate the effect of specific company characteristics on MDA, the following linear mixed-effects regression model was employed, using the independent variables as fixed effects and considering variability among companies as random effects:

$$\begin{aligned} MDA_{it} = {} & \beta_{0k} \times IBEX\_35_{it} + \beta_{1l} \times INDUSTRY_{it} + \beta_2 \\ & \times CAPITALIZATION_{it} + \beta_{3lm} \times YEAR_t \times INDUSTRY_{it} \\ & + u_i + \varepsilon_{it}, \end{aligned}$$

Where: i represented the company and t represented time in years. β_{0k}, β_{1l}, y β_{3lm} were coefficients that could vary depending on membership in the IBEX 35, industry l, and according to the combination of sector and years of disclosure experience, respectively.

Specifically, the model was fitted using the restricted maximum likelihood (REML) method, and hypothesis tests (t-tests) were conducted using the Satterthwaite method to account for the complexity of the model and provide more accurate results. The model was executed using the R software.

4.5 | Alignment between material topics and GRI topic standards

Initially, the GRI content index of each report was analyzed to determine if each company had established correspondence between material issues and GRI Topic Standards. Where this alignment was not found in the index, it was sought in the materiality analysis section. For the companies that did establish alignment, each material topic and its associated Topic Standard/s were recorded.

Given that the sample included reports prepared using both GRI Standards 2016 and GRI Standards 2021 and that the majority of reports in our sample used GRI Standards 2016, the classification into series (200 (economic topics), 300 (environmental topics), and 400 (social topics)) was maintained. Furthermore, standards 307-1, 419-1, and 412 were excluded from the analysis. The first two became part of Disclosure 2-27 in GRI Standards 2021, while the 412 was integrated into the Universal Standards (GRI, 2021b).

Thus, to fulfill the third objective of our study, the material topics covered by a Topic-Specific GRI Standard were categorized as: economic (ECO), environmental (ENV), social (SOC), and possible combinations of these three categories (ECOENV, ECOSOC, ECONENVSOC, and ENVSOC). Those not covered by a GRI Standard but covered by a sector standard were labeled as SEC. Finally, those not covered by a GRI Standard or a sector standard were labeled as NC. This categorization approach aimed to eliminate any subjectivity arising from linking a material topic to a specific category based on the topic label.

Finally, on an exploratory basis, the MDA score obtained for each industry was compared with the proportions of the previous categories to establish possible relationships.

5 | RESULTS

5.1 | Descriptive statistics and correlation analysis

The dependent variable (MDA) had a mean of 4.788 and a standard deviation of 2.071, indicating that the average sustainability report achieved approximately just over half of the maximum MDA value. The vast majority of companies belonged to the IBEX 35 throughout the study period (86.1%). The average market capitalization was 16.438 billion euros, with 52.30% of the total capitalization represented by 84.8% of the companies.

Table 4 shows the MDA disaggregated into its score items as well as their ratings by industries. The item with the highest disclosure was item 2 (Identification of stakeholders that have participated in the materiality analysis), while the least disclosed was item 5 (Ranking of the material topics). In the industry analysis, industry 3 (Consumer Goods), followed by industry 1 (Petrol and Power) and industry 5 (Financial Services), exhibited the highest scores. Significant differences were found between the score items and also between industries after applying a one-way repeated measures analysis of variance.

On the other hand, Table 5 shows the MDA disaggregated by its score items and by years. It is notable the increase in MDA up until 2021, followed by a decline in the last year, coinciding with the application of the new GRI standards. Regarding the individual analysis of the items, the scores for items 2 to 6 decreased with the implementation of the new standard, while the ratings for items 1 and 7 had the opposite effect. Additionally, the score for item 4 dropped below the 2018 figure in 2022. The one-way repeated measures analysis of variance showed a significant difference between the years. However, at a significance level of $p < 0.05$, no significant differences were found in the pairwise comparisons of the different years with respect to 2022.

Finally, the correlation analysis revealed preliminary results of potential relationships between the MDA score and our variables of interest (Table 6). Specifically, MDA was positively and significantly correlated with the variables *IBEX_35* (0.256), *CAPITALIZATION* (0.221), and *EXPERIENCE_INDUSTRY* (0.189), indicating a possible positive association.

5.2 | Multivariate results

Consistent with our expectations, the model reveals a positive and significant association between *IBEX_35* and MDA (Table 7). Thus, for each additional year of the company's membership in the stock index,

TABLE 4 Scoring items for MDA index disaggregated by industries.

Point range	MDA scoring items	Total[a] ($N = 165$)		Industry[b]													
				I1 ($N = 30$)		I2 ($N = 35$)		I3 ($N = 15$)		I4 ($N = 20$)		I5 ($N = 35$)		I6 ($N = 20$)		I7 ($N = 10$)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
0–1	1. Explanation of the process to conduct the materiality analysis	0.455	0.499	0.533	0.507	0.457	0.505	0.667	0.488	0.200	0.410	0.457	0.505	0.650	0.489	0.000	0.000
0–1	2. Identification of stakeholders that have participated in the materiality analysis	0.915	0.280	0.933	0.254	0.886	0.323	1.000	0.000	0.750	0.444	0.914	0.284	1.000	0.000	1.000	0.000
0–1	3. Identification of the data sources employed for the materiality analysis	0.879	0.327	0.867	0.346	0.771	0.426	1.000	0.000	0.800	0.410	0.943	0.236	0.900	0.308	1.000	0.000
0–2	4. Description of the material topics	0.794	0.940	0.867	0.973	0.800	0.994	0.800	1.014	0.800	1.005	0.800	0.833	0.800	1.005	0.500	0.850
0–1	5. Ranking of the material topics	0.285	0.453	0.567	0.504	0.400	0.497	0.067	0.258	0.300	0.470	0.171	0.382	0.150	0.366	0.000	0.000
0–1	6. Representation of the materiality matrix	0.824	0.382	0.800	0.407	0.800	0.406	1.000	0.000	0.600	0.503	0.886	0.323	0.900	0.308	0.800	0.422
0–2	7. Alignment between material topics and GRI topic standards	0.636	0.911	0.700	0.952	0.629	0.942	1.133	0.990	0.300	0.571	1.000	1.000	0.200	0.616	0.000	0.000
	Total	4.788	2.071	5.267	1.530	4.743	2.430	5.667	1.952	3.750	2.359	5.171	2.176	4.600	1.465	3.300	0.823

Note: I1. Petrol and Power; I2. Basic Mat., Industry and Construction; I3. Consumer Goods; I4. Consumer Services; I5. Financial Services; I6. Technology and Telecommunications; I7. Real Estate Services.
***Significance at the 1% level.
[a]*F* test (Total) *F* ratio = 25.24, *p* value = <0.001***, $\eta^2 = 0.78$.
[b]*F* test (Sectors) *F* ratio = 12.16, *p* value = <0.001***, $\eta^2 = 0.75$.

TABLE 5 Scoring items for MDA index disaggregated by years.

Point range	MDA scoring items	Year[b] Total[a] (N = 165) Mean	SD	2018 (N = 33) Mean	SD	2019 (N = 33) Mean	SD	2020 (N = 33) Mean	SD	2021 (N = 33) Mean	SD	2022 (N = 33) Mean	SD
0–1	1. Explanation of the process to conduct the materiality analysis	0.455	0.499	0.364	0.489	0.455	0.506	0.333	0.479	0.545	0.506	0.576	0.502
0–1	2. Identification of stakeholders that have participated in the materiality analysis	0.915	0.280	0.909	0.292	0.848	0.364	0.909	0.292	0.970	0.174	0.939	0.242
0–1	3. Identification of the data sources employed for the materiality analysis	0.879	0.327	0.788	0.415	0.788	0.415	0.970	0.174	1.000	0.000	0.848	0.364
0–2	4. Description of the material topics	0.794	0.940	0.727	0.944	0.727	0.911	0.788	0.960	1.030	0.984	0.697	0.918
0–1	5. Ranking of the material topics	0.285	0.453	0.212	0.415	0.212	0.415	0.303	0.467	0.364	0.489	0.333	0.479
0–1	6. Representation of the materiality matrix	0.824	0.382	0.788	0.415	0.758	0.435	0.848	0.364	0.909	0.292	0.818	0.392
0–2	7. Alignment between material topics and GRI topic standards	0.636	0.911	0.485	0.834	0.576	0.902	0.545	0.869	0.667	0.924	0.909	1.011
	Total	4.788	2.071	4.273	2.198	4.364	2.409	4.697	1.895	5.485	1.734	5.121	1.916

Note: ***Significance at the 1% level.
[a]*F* test (Total) *F* ratio = 25.24, *p* value = <0.001***, $\eta^2 = 0.78$.
[b]*F* test (Years) *F* ratio = 5.16, *p* value = <0.001***, $\eta^2 = 0.14$.

TABLE 6 Correlation matrix.

Variable	MDA	*IBEX_35*	*CAPITALIZATION*	*EXPERIENCE_INDUSTRY*
MDA	1			
IBEX_35	0.256***	1		
CAPITALIZATION	0.221***	0.500***	1	
EXPERIENCE_INDUSTRY	0.189**	0.049	−0.004	1

Note: **Significance at the 5% level and ***Significance at the 1% level. The table displays Spearman correlations of the variables.

the value of MDA increased by around 1.66 points. These results support H1 (*The membership in the IBEX 35 stock index is positively associated with the level of materiality analysis disclosure*).

On the other hand, it is demonstrated that belonging to industries 1 to 5 has a positive and significant impact on MDA. Therefore, H2 (*The industry to which the company belongs influences the degree of materiality analysis disclosure*) is corroborated in five industries.

However, the results did not support hypothesis H3 (*The capitalization of a company is positively associated with the level of materiality analysis disclosure*).

Regarding experience, only industries five and six had a positive and significant impact on MDA. Thus, each year, the Financial Services industry increased its score by an average of 0.69280 points, while the Technology and Telecommunications industry increased by an average of 0.47889. Therefore, H4 (*The years of experience in sustainability reporting within each industry are positively associated with the level of materiality analysis disclosure*) could only be corroborated in two industries. Additionally, we must note that industry five exhibited atypical behavior compared with other industries. This can be observed by analyzing the relationship between the coefficients associated with each industry or average values at the beginning of the study period and the slopes associated with the experience of each industry, that is, how much the score grows on average per year of industry experience (Figure 1). In this figure it can also be seen that the correlation between the coefficients and the slopes was negative.

TABLE 7 Empirical results for determinants of MDA.

Variables	*p*-value (coefficient)
IBEX_35	1.66136**
	(0.71542)
INDUSTRY 1. Petrol and Power	3.35294***
	(1.03651)
INDUSTRY 2. Basic Mat., Industry and Construction	3.44516***
	(0.88173)
INDUSTRY 3. Consumer Goods	4.36121***
	(1.16790)
INDUSTRY 4. Consumer Services	2.32676**
	(1.08698)
INDUSTRY 5. Financial Services	2.33863**
	(0.93105)
INDUSTRY 6. Technology and Telecommunications	1.93523
	(1.17109)
INDUSTRY 7. Real Estate Services	1.37228
	(1.52317)
CAPITALIZATION	0.40376
	(0.27493)
EXPERIENCE_INDUSTRY 1. Petrol and Power	0.05171
	(0.16093)
EXPERIENCE_INDUSTRY 2. Basic Mat., Industry and Construction	0.11088
	(0.15012)
EXPERIENCE_INDUSTRY 3. Consumer Goods	−0.12404
	(0.23305)
EXPERIENCE_INDUSTRY 4. Consumer Services	0.16783
	(0.19708)
EXPERIENCE_INDUSTRY 5. Financial Services	0.69280***
	(0.14878)
EXPERIENCE_INDUSTRY 6. Technology and Telecommunications	0.47889**
	(0.19673)
EXPERIENCE_INDUSTRY 7. Real Estate Services	0.25888
	(0.27825)

Note: *Significance at the 10% level, **Significance at the 5% level, and ***Significance at the 1% level.

5.3 | Alignment between material topics and GRI topic standards

The percentage of companies that conducted alignment increased year by year from 30.3% in 2018 to 48.5% in 2022 (Table 8). Companies from all industries aligned their material topics with the Topic Standards during the study period, except for those in the Technology and Telecommunications sector, which did not do so from 2018 to 2020.

Throughout the study period, companies disclosed 967 material topics that were related to 1991 Topic Standards. The ratio comparing these variables showed an increasing trend from 2018 to 2020, decreasing in 2021, and then recovering in 2022. Specifically, in 2022, companies assigned an average of 2.16 standards to each material topic.

The one-to-many assignment conducted by companies showed that the majority of material topics (60.09%) were exclusively related to economic, environmental, or social issues (Table 9). In contrast, 19.23% of the material topics were cross-cutting or multi-category, being aligned through the following combinations: ECOENV, ECOSOC, ECONENVSOC, and ENVSOC. Only 0.62% were covered by a sector standard (SEC), and the remaining 20.06% of material topics were not covered by a GRI standard (NC).

In more detail, social topics (SOC) predominated in the assignment, followed by those not covered (NC). Regarding the multidimensionality of material topics, those jointly linked with economic and social topics stood out (ECOSOC).

By industry, only two of them (Petrol and Power and Financial Services) reached the maximum in several categories. Precisely, these sectors were the ones that obtained the second and third highest score in the MDA index.

Specifically, the Petrol and Power industry stood out, ranking second in the proportion of material topics exclusively linked to the ENV category and first in the percentage of cross-cutting material topics linked to two environmental categories (ECOENV, ENVSOC).

Unlike the preceding sector, companies within the Financial Services industry were not subject to the same environmental pressures, although they faced regulatory pressures due to their significance in the countries' economic systems. The results indicate that Financial Services disclosed the fewest material topics in the ENV category, contributing another 7.5% of cross-cutting material topics related to the environment (ECOENV, ECOENVSOC, and ENVSOC), placing it fourth. However, it was the sector with the most ECO material topics and even the highest number of cross-cutting material topics in the ECOSOC category.

Regarding the sector that scored the highest in MDA, Consumer Goods, ranked first in the proportion of material topics not covered. Among the material topics considered NC by companies in the Consumer Goods sector are examples, such as "Innovation and sustainable technology," "Just transition," or "Energy vulnerability." On the other hand, despite Consumer Goods being a sector subject to high environmental pressure, ranked fifth in the proportion of material topics related to the ENV category and last in cross-cutting material topics related to two environmental categories (ECOENV, ENVSOC).

It is also noteworthy that the Technology and Telecommunications sectors, as well as Real Estate Services, which ranked fifth and seventh in MDA, stood out for disclosing the highest proportion of SOC and ENV material topics, respectively.

Finally, to provide a more comprehensive view of companies' positioning, the frequency of Topic Standards aligned with material topics was collected, showing the top 10 positions by volume in Table 10. As observed, social standards predominated.

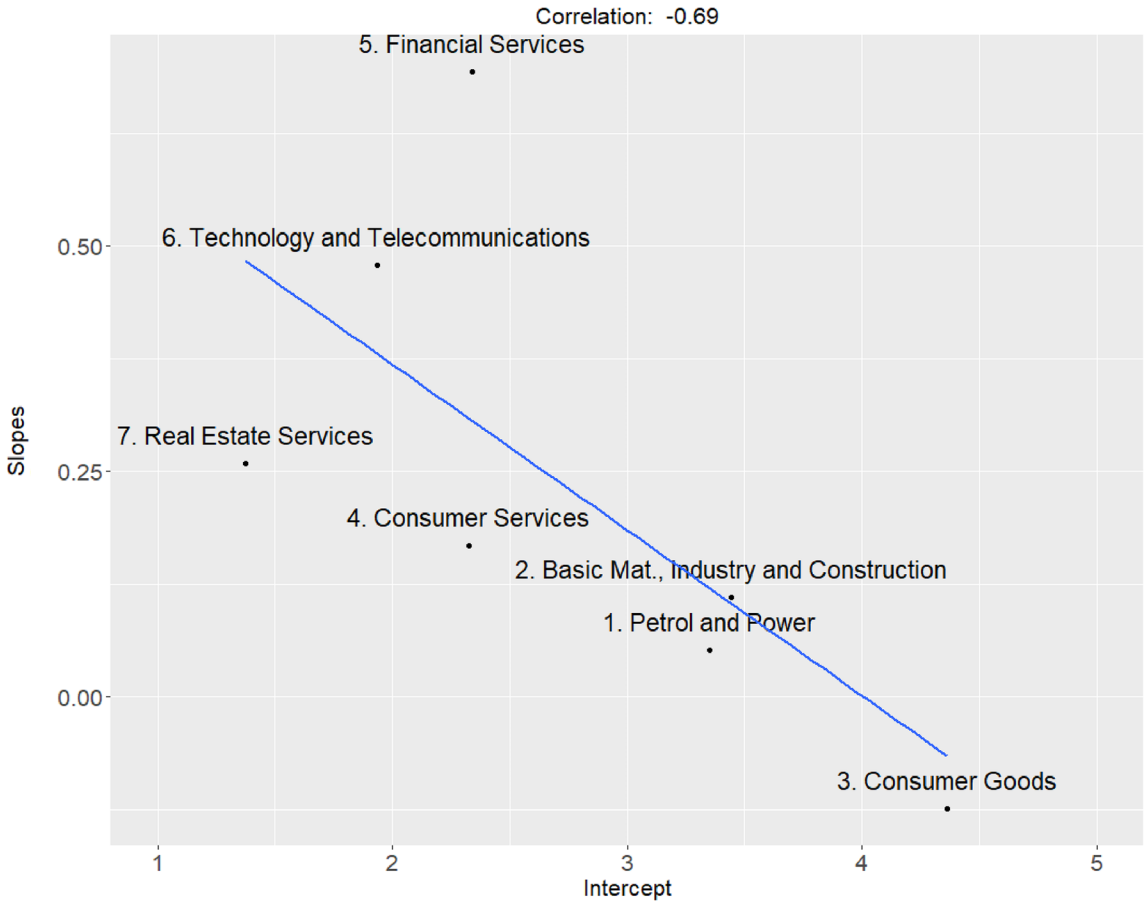

FIGURE 1 Positioning of industries according to the slope associated with experience and their initial performance.

TABLE 8 Material topics and GRI topic standards.

Variables	2018	2019	2020	2021	2022	Total
GRI topic standards (TS)	263	318	408	437	565	1991
Material topics (MT)	163	174	147	222	261	967
TS/MT ratio	1.61	1.83	2.78	1.97	2.16	2.06
Companies (%)	10 (30.3)	11 (33.3)	11 (33.3)	13 (39.4)	16 (48.5)	61

6 | DISCUSSION

The results of the study are relevant for several reasons. First, it is one of the first studies to have examined the degree to which the disclosure of materiality has advanced, analyzing companies that disclosed sustainability reports using the GRI Standards of 2016 and subsequently those of 2021. Specifically, after analyzing five periods, it provides evidence that the average valuation of materiality disclosure reached medium levels, with still ample room for improvement. This result is consistent with previous studies, such as those of Gerwanski et al. (2019), Beske et al. (2020), and De Cristofaro and Gullusccio (2023), although it is true that not all the proposals included the same topics for assessment, nor the same disclosure standards.

Over the 5 years of the study, a progressive increase in the value of MDA was observed from 2018 to 2021, followed by a decrease in 2022, with significant differences found in the ratings across different periods, although not in pairwise comparisons with respect to 2022. This decline could be explained by the fact that the reports for that year were prepared in accordance with the GRI Standards 2021, the first year from which companies were required to use these standards and with which they were not familiar. The study by Machado et al. (2021), which analyzed reports from 2017 (GRI G4) and 2018 (GRI Sustainability Standards), also found no significant differences in the ratings between the 2 years based on the type of GRI employed. No declines in the average valuation of disclosure were recorded in the work of Gerwanski et al. (2019) or Beske et al. (2020), despite the latter analyzing reports that applied two different GRI guidelines (G3 and G4).

When analyzing the average valuation of each of the items comprising MDA, the results showed disparate scores. The item that

TABLE 9 Alignment between material topics and GRI topic standards by industries.

Sectors	MDA score	Material topics								
		Covered by topic-specific GRI standards (%)								Not covered (%)
		ECO	ENV	SOC	ECOENV	ECOSOC	ECOENVSOC	ENVSOC	SEC	NC
1. Petrol and power	5.267	11.84	24.34	32.89	3.95	10.53	4.61	3.29	3.95	4.6
2. Basic mat., industry and construction	4.743	7.18	23.76	28.73	0.55	7.18	7.73	1.66	-	23.20
3. Consumer goods	5.667	10.47	15.12	32.56	2.33	4.65	0.00	1.16	-	33.72
4. Consumer services	3.750	14.77	15.91	37.50	3.41	6.82	2.27	0.00	-	19.32
5. Financial services	5.171	14.98	6.37	29.96	2.25	20.60	2.25	3.00	-	20.60
6. Technology and telecommunications	4.600	14.29	17.86	39.29	3.57	17.86	3.57	0.00	-	3.57
7. Real estate services	3.300	6.33	30.38	27.85	0.00	8.86	7.59	1.27	-	17.72
Total	4.788	11.48	17.17	31.44	2.17	11.38	3.72	1.96	0.62	20.06

TABLE 10 Ranking of the topic Standards most aligned with the material topics.

GRI topic standard	N	Position	Disclosure title	Topic-specific standards 2016 categories
201	99	1	Economic Performance 2016	Economic
205	86	2	Anti-corruption 2016	Economic
405	77	3	Diversity and Equal Opportunity 2016	Social
305	75	4	Emissions 2016	Environmental
404	72	5	Training and Education 2016	Social
403	72	5	Occupational Health and Safety 2018	Social
302	69	6	Energy 2016	Environmental
401	68	7	Employment 2016	Social
206	67	8	Anti-competitive Behavior 2016	Economic
308	64	9	Supplier Environmental Assessment 2016	Environmental
414	63	10	Supplier Social Assessment 2016	Social
418	63	10	Customer Privacy 2016	Social
406	63	10	Non-discrimination 2016	Social

received the highest score was the one corresponding to the *Identification of stakeholders that have participated in the materiality analysis*, which also received the maximum rating in the study by Machado et al. (2021). The lowest scoring item was *Ranking of the material topics*. This low rating could be because companies limited themselves to disclosing the list of material topics according to standard 102-47 (GRI Standards 2016), or its equivalent 3-2 (GRI Standards 2021). However, the Materiality and Balance principles of the GRI 2016 standard clearly established that not all material topics were of equal importance, and the emphasis within a report was expected to reflect their relative priority. With the implementation of the updated standards, prioritization was linked to standard GRI 3, emphasizing the prioritization of impacts, but not material topics. While it is true that in Step 4 of GRI 3, it was emphasized that "the organization then needs to determine how many of the topics it will report on, starting with those that have the highest priority" (GRI, 2021a).

On the other hand, the item *Representation of the materiality matrix* ranked third. Although disclosure of the materiality matrix was never mandatory, it may have been the way companies attempted to disclose the prioritization of material topics without explicitly showing a list of material topics. This item received a significantly lower rating in the study by Gerwanski et al. (2019), which may have been because the standard analyzed was IR.

Regarding the evolution of the item values, all of them increased their score in 2022 compared to 2018, except for the item *Description of the material topics*. In the case of this item, its evolution was positive until 2021, declining slightly in the reports of 2022. One of the reasons for this could be the implementation of the updated standards, where materiality changed from being a principle in GRI 2016 to a standard (GRI 3), involving key changes. On the contrary, the item that experienced the greatest increase was *Alignment between material topics and GRI Topic Standards*, an assessment item not considered in

previous studies. One reason could be that companies became accustomed to the format established by GRI regarding the need to disclose material topics in the table of contents.

Regarding the industry analysis, the results show how the industry plays a key role in the nonfinancial disclosure of a company. This could be due to the different pressures they receive from public opinion, current regulations, and stakeholders. In our case, the consumer goods, petrol and power, and financial services sectors obtained the highest average MDA score in that order. As for consumer goods and financial services, the result contradicts that obtained by Torelli et al. (2020), where service-based companies tend to be less rigorous in their application of the materiality principle and in the underlying preparation process of their nonfinancial reports, although we must once again point out that no banking, financial, or insurance companies were included in that study.

In more detail, the consumer goods industry achieved the highest score in 5 of the 7 items that composed the MDA index. Specifically, its three constituent companies obtained the maximum rating in the items identifying stakeholders, data sources, and representation of the materiality matrix. The fact that consumer goods is composed of textile and pharmaceutical companies, which are attributed a high environmental impact (Belkhir & Elmeligi, 2019; European Parliament, 2024), may explain this rating. We agree with Torelli et al. (2020) that the constant pressure that companies within that sector face from governments, activists, associations, and customers, who lobby them to enhance their commitment to environmental protection and to provide greater transparency regarding the real impact of their activities.

Similarly, the second position obtained by the Petrol and Power industry may also be due to its significant environmental impact compared to other industries. However, the results obtained contrast with the work of Fasan and Mio (2017), where the authors determined that companies operating in the consumer goods and petrol and power industries had significantly lower scores for materiality disclosure than the rest of the sample.

On the other hand, the position occupied by the financial services sector might be due to the role attributed to the sector by public authorities to promote sustainable transition (European Commission, 2018), and new regulatory (European Parliament and of the Council, 2020) and supervisory requirements (European Central Bank, 2020). It is necessary to highlight that the results of Fasan and Mio (2017) for this sector were ambiguous, reaching the highest values in the ratio between the total words "material" and "materiality," and the number of report pages, as well as lower scores in terms of relevance of materiality disclosure.

It is also noteworthy that the Technology and Telecommunications industry occupied the fifth position. This contrasts with the work of Fasan and Mio (2017), where the same sector occupied the best position in the disclosure of materiality.

Regarding our second objective, related to determining factors, the results showed a positive and significant association between the *IBEX_35* and MDA. This could be due to the presence of a greater number of investors and other stakeholders concerned about sustainability (Kim et al., 2018; Serafeim, 2015) in companies belonging to an index, which can lead to higher quality and transparency of disclosure (Chiu & Wang, 2015; Mallin et al., 2013; Oh et al., 2013). Our results contrast, however, with those obtained by Gerwanski et al. (2019), who found no relationship between belonging to an index like the Dow Jones Sustainability Index and the quality of disclosure. Likewise, authors like Torelli et al. (2020) considered that inclusion in a stock index did not influence the level of materiality application.

Furthermore, in line with the aforementioned results, when analyzing MDA by industries, our findings suggest that belonging to industries 1 to 5 had a significant impact on materiality disclosure. In this sense, certain factors, such as sector-specific regulation, pressures from public opinion or stakeholders, may generate a disclosure model specific to companies within the same industry. Authors such as Fasan and Mio (2017) and Torelli et al. (2020) also found evidence related to the importance of the industry in materiality disclosure, although Ngu and Amran (2021) did not.

With respect to the relationship between company capitalization and MDA, we did not find an association between the two variables, which supports findings, such as those of Farooq et al. (2021) or Ngu and Amran (2021), who stated that company size did not influence the extent of materiality disclosure. This may be because, as shown in Table 6, this variable was positively and significantly correlated with the *IBEX_35* variable. In this regard, it should be noted that the first requirement for a company to be part of the IBEX 35 is that its average capitalization be higher than 0.30% of the average capitalization of the index during the control period (6 complete months).

Regarding the last hypothesis, only a positive relationship between years of experience and MDA could be confirmed in the Financial Services and Technology and Telecommunications sectors. Authors like Gerwanski et al. (2019) found a positive association between learning and the quality of materiality disclosure, while others concluded that there was no correlation between the level of application of the materiality principle and past experience in disclosure (Torelli et al., 2020). However, none of these studies provided results on the relationship of experience within each industry with respect to materiality disclosure.

Furthermore, regarding the negative correlation between the average rating of each industry at the beginning of the study period and the average growth rate of that rating per year of experience, this pattern is intuitively coherent, as industries with higher ratings from the beginning may have less room for improvement over time. Regarding the atypical behavior of the Financial Services sector compared to other sectors, it appears that its growth rate over time is significantly higher than would be expected given its initial performance. This seems to corroborate that the Financial Services sector is subject, as mentioned earlier, to regulatory sustainability requirements higher than those of other sectors, making it the only industry that verifies hypotheses 1, 3, and 4.

Lastly, the third objective, related to the alignment between material topics and Topic Standards, found that companies tended to assign more than one topic to each material issue. Additionally, unlike

works that have linked material issues to GRI categories, our study provides a differentiating element regarding the analysis of the multidimensionality or transversality of material topics. Thus, it was found that almost 20% of material topics were related to Topic Standards from different categories (economic, environmental, and social), and that another 20% were not covered by any standard. This seems to indicate, on the one hand, that companies do consider material topics to be transversal and, on the other hand, that there is a percentage, not insignificant, of material topics that do not have a direct correspondence with GRI standards. As for the material topics that were associated by companies with a single category, social issues dominated. This predominance of social issues was also highlighted in the works of Sepúlveda-Alzate et al. (2022) and Jayarathna et al. (2022).

Of the three industries with the highest MDA scores (Petrol and Power, Consumer Goods, and Financial Services), it is noteworthy that the first two are associated with significant environmental impact (European Parliament, 2024; Shamoon et al., 2022). This may have contributed to the Petrol and Power sector positioning itself well in the environmental category, although Consumer Goods did not achieve the same level of disclosure in this category, with a proportion below the average.

Regarding the specific standards most used, two economic and one social topped the list, although among the top 10, the most numerous were the social ones. The fact that these are publicly traded companies may justify that the first two places are occupied by standards 201 (Economic Performance 2016) and 205 (Anti-corruption 2016). El trabajo de Khan et al. (2023), que también analizó un índice bursátil, aunque de un país en vías de desarrollo, presentó resultados similares al coincidir con nuestros resultados en 6 de sus 10 primeros estándares (201, 403, 404, 305, 401 y 206), aunque solo el 201 coincidió en la posición. También presentaron similitudes los trabajos de Lambrechts et al. (2019) y Jadhav et al. (2022) ya que, en ambos casos, 7 estándares de sus respectivos top ten coincidieron con los nuestros, a pesar de que ambos trabajos se centraron, exclusivamente, en el sector logístico.

7 | CONCLUSIONS

The practical application of the materiality principle can present certain challenges and limitations, complicating its implementation. The aim of this study has been to assess the disclosure of materiality analysis in sustainability reports using the GRI reporting framework, as well as to analyze its determinants in companies listed on the Spanish stock exchange. Additionally, the study aimed to delve into the positioning of companies regarding the alignment of material topics with GRI Topic Standards.

The study offers several theoretical contributions. From an academic standpoint, considering the absence of conclusive findings and the recognition that mere adherence to standards does not ensure information quality (Ruiz-Lozano et al., 2022; Torelli et al., 2020), this research addresses the call for further exploration into materiality disclosure (Beske et al., 2020; Unerman & Zappettini, 2014). Consequently, it enriches the literature by being among the pioneering studies to examine the extent to which materiality disclosure has progressed, encompassing companies that have disclosed using the GRI Standards of both 2016 and 2021. The developed assessment index (MDA) incorporates scoring elements not previously considered, such as the incorporation of a material topics ranking and the alignment between material topics and GRI Topic Standards. Furthermore, a comprehensive analysis of scoring components has been provided, facilitating a deeper comprehension of how materiality disclosure varies across industries and evolves over time. Our findings suggest that the average assessment of materiality disclosure has reached moderate levels, indicating substantial room for enhancement. Particularly, the stakeholder identification item attained the highest disclosure. Across industries, consumer goods, petrol and power, and financial services demonstrated the highest scores. Lastly, concerning temporal evolution, there was an increase in MDA value up to 2021, succeeded by a decline in 2022, coinciding with the implementation of the new standard.

Moreover, the study has analyzed the determinants of materiality analysis, contributing to the limited existing literature on these factors and the lack of consensus on them. Specifically, to the authors' knowledge, it is the first study on determinant factors conducted on companies included in the Spanish stock market index IBEX 35. Additionally, it distinguishes itself by associating the years of experience in disclosure within each industry with the level of materiality analysis disclosure. In our study, evidence has been found that the value of MDA is positively associated with companies' belonging to the stock market index, to industries 1 to 5, as well as with the years of disclosure experience in the case of the Financial Services and Technology and Telecommunications sectors. An atypical behavior of the Financial Services sector has also been detected, as the average growth rate of its rating per year of experience is significantly higher than expected given its initial performance. Moreover, it is the only sector simultaneously verifying hypotheses 1, 2, and 4.

The study is also novel in that it explores a facet where a material topic in an organization's sustainability reporting framework can intersects with diverse elements of environmental, economic, and social performance. This necessitates alignment with multiple GRI standards in these areas. This multifaceted nature underscores the importance of selecting and aligning material topics with the appropriate combination of GRI standards to ensure comprehensive and accurate reporting that addresses the organization's key sustainability concerns across different dimensions. Specifically, our study found that almost 20% of material topics were related to Topic Standards from different categories (ECOENV, ECOSOC, ECONENVSOC, and ENVSOC), and that another 20% were not related to any standard.

From a practical perspective, and based on the findings, we can offer actionable recommendations or strategies for companies and industry experts to enhance materiality disclosure practices and, consequently, quality. In this regard, it is crucial to recognize that how companies approach materiality analysis will be pivotal in ensuring that what is outlined in the sustainability report is accurately aligned with their strategy. Therefore, as a first step, they are encouraged to

focus on improving certain areas related to materiality disclosure, such as prioritizing material topics or providing explanations of the steps taken for materiality analysis. It is also important for them to consider industry context to identify potential differences that could benefit them when developing specific disclosure strategies. Additionally, it would be beneficial for them to analyze the evolution of materiality disclosure over time, as it can offer valuable insights into trends and changes in disclosure practices, which, in turn, can inform strategic decision-making and the development of future sustainability initiatives. Lastly, it's important for them to consider the impact of changes in standards to adjust their disclosure practices, ensuring compliance with updated requirements and maintaining consistency in disclosure over time.

Furthermore, while acknowledging that materiality assessment is closely tied to the individual characteristics of each company and thus not entirely standardizable, it is important for the global reporting initiative to take into account the high percentage of material topics that were not related to any standard. It was found that, among the three sectors with the highest MDA scores, two of them (Consumer Goods and Financial Services) stood out in the proportion of disclosed non-compliant material topics. In this regard, it is worth highlighting that GRI is already developing the Sector Standard Project for Financial Services and the Sector Standard Project for Textiles and Apparel, scheduled to be approved in the third quarter of 2025 and the first quarter of 2026, respectively.

Lastly, and as with all empirical investigations, the results of our study must be considered in the light of its limitations. First, as is normal in content analysis, the score to evaluate materiality disclosure can be affected by subjectivity, although clear criteria were defined, and the points assigned to each were verified. Second, the study focuses only on companies listed on the IBEX 35. However, the implications of the study transcend the specific context of these companies, providing ideas that can guide future research. Third, all companies employed the GRI standard for their disclosures; thus, future investigations should confirm whether the use of other standards or frameworks can offer comparable results. Finally, the fact of using companies with headquarters in Spain could have affected the results. In future research, comparisons could be drawn with companies from other countries to gather more information on materiality analysis and to determine whether the country of origin influences the assessment. Additionally, it would be interesting to extend the study period to analyze materiality disclosure with the GRI Standards of 2021 in more detail, as well as to delve into the study of the multidimensionality of material topics.

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