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Does better sustainability reporting assurance lead to better reporting? Evidence from the EURO STOXX 600

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Does better sustainability reporting assurance lead to better reporting? Evidence from the EURO STOXX 600

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Abstract: Given recent debate on the quality of sustainability disclosure and its determinants, this study examines the role of sustainability reporting assurance in improving the quality of sustainability reporting. Drawing from a sample of 111 companies listed in the EURO STOXX 600 and located in Italy, France and Spain - where sustainability reporting assurance is mandatory - we find that the quality of the sustainability assurance process generally enhances the quality of assured reports. In essence, a well-executed assurance process positively impacts on sustainability reports' readability, completeness and standardization, thereby enhancing their overall quality. Our study has important implications for the literature on the quality of sustainability disclosure and the role of mandatory assurance, offering important insights for policy makers in light of the forthcoming implementation of the Corporate Sustainability Reporting Directive (CSRD), which requires assurance of mandatory sustainability reports throughout Europe.

Keywords: Sustainability reporting, Assurance, Quality, Non-financial disclosure.

JEL Classification Numbers: M14 - M41 - Q56.

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1 Introduction

In today's business world, where companies increasingly acknowledge the importance of responsible and sustainable practices, the role of sustainability reporting has become pivotal. However, the heterogeneity in report formats and contents, coupled with differences in reporting standards, has posed significant challenges, casting doubt on the quality of the disclosed information.

Over the past few decades, mounting market and societal pressures have driven companies to intensify their efforts towards sustainability (Odriozola & Baraibar-Diez, 2017). Businesses have come to realize that adhering to "business as usual" is insufficient to meet stakeholders' expectations and achieve long-term success. Instead, there is a growing expectation for companies to account for how they mitigate negative impacts and preserve "common assets" (Sethi et al., 2017). This requirement extends beyond products, services, or social behaviors to encompass reporting practices (Odriozola & Baraibar-Diez, 2017). Consequently, as sustainability concerns gain prominence in society, the number of companies publishing sustainability reports has surged.

Historically, sustainability reporting has largely been voluntary and governed by reporting standards issued by various standard-setting organizations (e.g., GRI and SASB). However, in the European Union, the Non-Financial Reporting Directive (No. 95/2014) and the new Corporate Sustainability Reporting Directive (No. 2464/2022) have broadened the scope of mandatory sustainability reporting. While the proliferation of sustainability report publications (KPMG, 2022) is seen as a positive development in the realm of sustainable development, it has raised concerns about the quality and comparability of these reports.

The critical question at hand is whether all sustainability reports provide authentic insights into the sustainability performance of the reporting companies. The role of sustainability reporting can be multifaceted, contingent upon the intentions of the company in question. On one side, it can function as a transparent channel of communication, bridging information asymmetry and fostering trust among stakeholders. Conversely, it can be used as a strategic tool to manipulate externa perceptions of the firm's financial and non-financial status.

In the former scenario, managers disclose information to provide additional understanding and reduce information gaps, facilitating effective communication between information producers and users. However, for this exchange to occur successfully,

sustainability reports must meet a certain standard of quality, ensuring that the company's communicative intent is perceived as genuine and trustworthy by readers (Odriozola & Baraibar-Diez, 2017). Conversely, in the latter scenario, companies may primarily use their sustainability reports to sway stakeholder perceptions, without necessarily committing to improving their sustainability performance (Papoutsi & Sodhi, 2020). Put differently, these companies aim to positively influence stakeholder perceptions and shape their opinions and decisions through narrative disclosures. This viewpoint aligns with impression management theory, which suggests that non-financial disclosures serve as a means for companies to shape external perceptions and establish or maintain their legitimacy to operate, often with a self-promotional agenda.

Therefore, a significant body of literature has examined the quality of sustainability reporting and the factors that contribute to producing high-quality reports (Afeltra et al., 2023). This article aims to contribute to this ongoing debate by examining whether and to what extent sustainability reporting assurance impacts the quality of assured sustainability reports. While assurance has been introduced to enhance the reliability of sustainability reports, its precise influence on the quality of these reports remains unclear in existing literature (Farooq et a., 2023). We propose and test the hypothesis that sustainability reporting assurance positively affects sustainability reporting practices, meaning that the higher the quality of the assurance process, the higher the quality of the assured report.

Our study focuses on sustainability reports published in 2022 by companies listed in the STOXX Europe 600, situated in Italy, France, and Spain, where sustainability reporting assurance is mandatory. To conduct our analysis, we employed two sets of indicators: one to evaluate the quality of sustainability reports, considering aspects such as comprehensiveness, transparency, and adherence to standards, and another to assess the quality of assurance, examining the thoroughness and effectiveness of external review processes conducted by third-party entities.

Our findings indicate that the quality of the sustainability assurance process generally enhances the quality of assured reports. In essence, a well-executed assurance process positively influences report quality, improving its clarity and reliability to users.

These results contribute to the existing literature on the determinants of sustainability reporting quality and the implications of mandatory sustainability reporting assurance. They also hold practical significance for the forthcoming implementation of the CSRD.

The rest of the paper is organised as follows. Section 2 reviews the literature on the quality of sustainability reporting and assurance, and develops our hypothesis. Section 3 describes the methodology, while section 4 presents our results. Section 5 concludes with the contributions and practical implications.

2 Literature review and hypothesis development

2.1. The quality of sustainability reporting

Although a universally accepted model for assessing sustainability reporting quality has not yet been established, researchers have developed numerous frameworks that share common features. A widely acknowledged consensus in the literature is the recognition of the pivotal role played by standardization attempts regarding the contents, procedures, and indicators of sustainability reports, exemplified by organizations like the Global Reporting Initiative (GRI) and, more recently, the European Commission through the development of the ESRS by EFRAG.

High standardization and compliance with reporting principles can certainly provide specific guidance for reporting ESG impacts and risks, including key performance indicators that can be accurately monitored and measured, facilitating the measurement, and certification of sustainability reporting quality. Adding to this, as far as the European Union is concerned, the obligation to use the same reporting standards in all countries (i.e. the ESRS) is likely to greatly increase the comparability of the sustainability reports among different companies.

However, literature generally agrees that the mere adoption of reporting standards cannot be considered a sufficient guarantee of the quality of sustainability reports, given that it still leaves a margin of business discretion. As a matter of fact, the commitment of companies to transparency and accuracy is deemed essential in shaping the overall quality of sustainability reports (Sethi et al., 2017). This recognition underscores the importance of organizational ethos and integrity in the reporting process, beyond mere compliance with standards and frameworks.

In line with this concept, many studies focus on the role of corporate governance structure in influencing sustainability reporting quality. For instance, the presence of financial institutions and foreign shareholders tends to positively correlate with the publication of sustainability reports (Dienes et al., 2016). This suggests that a diverse ownership base fosters transparency and accountability, as stakeholders demand more comprehensive information.

Similarly, when stock ownership is widely dispersed among numerous shareholders, disclosing non-financial information can bridge information gaps between the company and its stakeholders, enhancing trust and engagement. Conversely, if company ownership is concentrated among a few investors, these efforts may face obstacles, potentially hindering transparency initiatives and limiting the scope of sustainability reporting (Mio et al., 2020).

Furthermore, scholars tend to agree on the importance of considering both qualitative and quantitative indicators when assessing reporting quality. While quantitative measures offer quantifiable data points, qualitative assessments, such as the evaluation of accuracy, sincerity, appropriateness, and balance, provide valuable insights into the integrity and effectiveness of communication within sustainability reports. Overall, the large majority of published studies in this domain advocate for the consideration of multiple variables to achieve a thorough understanding of the quality of non-financial disclosure, given the complex nature of this specific type of reporting (Cooray et al., 2020).

Considering this, this research began with an exhaustive literature review, which considers both the literature pertaining to the quality of sustainability reports and, to a lesser extent, the quality of financial statements. The inclusion of studies focusing on the quality of financial disclosure was deemed valuable, as this area of research is well-established, aligns with our analysis requirements, and can offer valuable insights.

This approach resulted in the identification of twenty studies, synthesized in Table 1. For each one of them, we report the variables that were investigated and the operationalizations methods that were used.

In general, the identified studies reveal a diverse landscape of variables and methodologies to assess sustainability reporting quality, ranging from quantitative formulas to ad hoc codified algorithms, scoring models, software applications, and qualitative indicators. Quantitative analyses cover a spectrum of metrics, including readability indices such as the Gunning Fog Index, alongside measurements of document length, page count, use of quantitative KPIs and the occurrence of specific terms. Conversely, qualitative evaluations entail the scrutiny of factors like balance, comparability, accuracy, clarity, and reliability, frequently employing Likert scales or qualitative software analysis. This diversity highlights the consensus within the field regarding the necessity of adopting a multi-variable approach for comprehensive evaluation of sustainability reporting quality.

Table 1. Summary of the literature review

Reference	Variable for sustainability reporting quality	Variable operationalization
Ben-Amar & Belgacem (2018)	Readability	Two measures of readability are used: 1. Gunning Fog Index 2. MD&A length through the logarithm of the number of words
Boiral et al. (2019)	Reliability (related to the presence of assurance)	Qualitative software analysis with QDA Miner. The categorization process was independently conducted by two coders.
Chang et al. (2019)	1. Balance 2. Comparability 3. Accuracy 4. Timeliness 5. Clarity 6. Reliability	A Likert scale ranging from 0 to 5 was used (0 for no principles applied; 1 for no compliance; 2 for non-compliance because of more than three but fewer than five biases; 3 for an acceptable degree of compliance; 4 for a good level of compliance but with one bias, and finally, 5 for full compliance). The hypotheses were then tested using a statistical software for multiple regression analysis.
Cooray et al., (2020)	30 measurement items related to the qualitative characteristics of SR: 1. Relevance (8 items) 2. Faithful representation (6 items) 3. Understandability (7 items) 4. Comparability (8 items) 5. Timeliness (1 item).	All items of the index were measured on a five-point scale (from 0 to 4). The total score of the index was calculated by adding the sub-scores of each qualitative characteristic. A total of 132 annual reports were independently assessed by a researcher and research assistant.
Courtis (1998)	Readability	Three passages were taken from each of the beginning, middle, and end of the Chairman's Address of the analyzed reports. The Flesch reading ease formula was used to score each of the three passages. The arithmetic average of the three scores was used to represent a company's annual report readability level.
Diouf & Boiral (2017)	Six principles: 1. Balance 2. Comparability 3. Accuracy 4. Timeliness 5. Clarity 6. Reliability	Interviews: all recorded interviews were transcribed verbatim in a word document. Transcripts were subsequently transferred to QDA Miner software for codification.
Fisher et al. (2020)	Readability	Flesch Reading Ease formula, Flesch-Kincaid Grade Level, Smog and Fog formulas.
Lehavy et al. (2011)	Readability	Fog Index.

Lock & Seele (2016)	1. Understandability 2. Truth 3. Sincerity 4. Appropriateness	1. Software package Flesch, QDA Miner software, and Wordstat dictionary. 2. Custom software for data analysis 3. Custom software for data analysis 4. Custom software for data analysis
Lundholm et al. (2014)	Readability Use of numbers Length	1. Fog Index. 2. Natural log of the numbers in text and tables excluding dates. 3. Natural log of the number of words in the document.
Melloni et al., (2017)	1. Conciseness 2. Readability 3. Completeness 4. Tone of information 5. ESG score	1. Natural logarithm of the number of pages of the entire document. 2. Fog index. 3. Bloomberg ESG disclosure scores. 4. Optimism index provided by DICTION software. 5. ASSET 4 - Thomas Reuters database.
Michelon et al. (2014)	1. Content of the information disclosed 2. Type of measures used to describe and discuss CSR activities 3. Managerial orientation (the corporate approach to CSR).	All the variables were analyzed and measured through custom software, after the definition of 4 quantitative indicators for content analysis.
Miller (2010)	Complexity, as the measure of: 1. Length 2. Readability	1. Logarithm of the number of words in the entire document. 2. Fog Index and a proprietary computational software program (StyleWriter-Plain English Editor).
Odriozola & Baraibar-Diez (2017)	Level of applicability of standards and assurance (as a proxy for SR quality).	A 0-100 score based on: 1. The standards/criteria used and if they are internationally recommended. 2. The processes or controls applied by international standards (mostly GRI). 3. The presence of a verification statement. 4. The level of assurance.
Papoutsi & Sodhi (2020)	32 indicators of content completeness.	Content analysis was used without the use of software for computer-aided text analysis. However, coders were employed to create ad hoc algorithms. The study also examined the link with other established measures of sustainability performance, such as the Bloomberg ESG scores and the Dow Jones Sustainability Index.
Pérez-Cornejo et al. (2020)	1. Corporate reputation 2. Reporting quality, expressed by: - Presence of a Sustainability Committee - Integrated sustainability strategy	1. RepTrak® Pulse software. 2. Thomson Routers ESG Index (considered a good proxy of the quality's determining factors).

	- Adherence to the Global Compact - Stakeholder engagement - Form of the Sustainability reporting - GRI guidelines - External audit - ESG reporting scope	
Pistoni et al. (2018)	1. Background: whether the document presents an introduction devoted to: motivations, objectives pursued, manager in charge, CEO's commitment; 2. Assurance & reliability: whether an internal audit and/or a third-party verification has been carried out; 3. Content: consistency of the document with the prescriptions of the framework 4. Form: readability and clarity, conciseness.	Two researchers read carefully all 116 integrated reports and autonomously classified them consistently with the proposed scoring system (0-5 ranking). They were trained on the scoring protocol to assure the reliability of their analysis.
Rudyanto & Siregar (2018)	1. Content analysis 2. Number of pages, 3. Independent party assessment	1. The score for GRI content analysis is 0 for components that are not disclosed, 1 for components expressed qualitatively, and 2 for components expressed quantitatively. 2. Natural logarithm of the number of pages 3. Existence of opinion on the sustainability report and existence of an independent party assessment on the GRI application
Smeuninx et al. (2020)	Readability	Software analysis through: 1. ABBYY FineReader software for conversion from the report PDFs to plaintext usable for analysis. 2. Stanford CoreNLP suite to quantify the use of passive structures, the syntactic depth of a given sentence, or lexical density. The software was used to calculate: ● Flesch Reading Ease Score ● Flesch-Kincaid Grade Level score ● Gunning Fog Index. 3. IBM SPSS STATISTICS 23.
Tsalis et al. (2020)	Evaluation of the quality of the corporate sustainability reports concerning the scope of each UN_SDG analyzed in the	Three manually calculated indicators: 1. Accountability indicator (AI): it assesses the quality of the information provided for each SDG-related

	United Nations' 2030 Agenda for sustainable development.	GRI disclosure topic by using a 3-point scoring system. 2. Total Accountability Indicator (TAI): it is estimated as the sum of the scores of each disclosure topic proposed for a specific UN_SDG. 3. Disclosure quality performance indicator (DQPI): it is calculated as the sum of the TAI score of each UN_SDG.

To enhance the clarity of the results, the indicators identified by different contributors were reorganized into broader categories. The model presented by Pistoni et al. (2018) was used as a reference, by dividing the analysis into four categories: *Background*, *Form*, *Content*, *Reliability*. This allowed to display the most frequently used indicators for each of these categories, as summarized in Table 2.

Table 2 shows that the most investigated categories are *Form*, *Content*, and *Reliability*. Only a limited number of studies focus on the *Background* category, primarily due to its qualitative nature. Indeed, this aspect involves delving into the characteristics of the reporting companies, focusing on their strategic orientation towards sustainability and the underlying motivations for reporting.

Table 2. Literature classification

Variable	**Indicator**	**Reference**
Background		
Sincerity (stakeholder engagement, materiality analysis, sustainability strategy, and goals)	Scoring system	Pistoni et al. (2018) Pérez-Cornejo et al. (2020) Tsalis et al. (2020)
	Other methodologies 1. Custom software for data analysis 2. Human and software-enhanced quantitative content analysis	1. Michelon, et al. (2014) 2. Lock & Seele (2016)
Form		
Readability and clarity	Fog Index	Ben-Amar & Belgacem (2018) Fisher et al. (2020) Lehavy et al. (2011) Lundholm et al. (2014) Melloni et al. (2017) Miller (2010) Smeuninx et al. (2020)
	Flesch Reading Ease Formula	Fisher et al. (2020) Smeuninx et al. (2020)

	Flesch-Kincaid Grade Level	Fisher et al. (2020) Lock & Seele (2016) Smeuninx et al. (2020)
	Likert scale	Chang et al. (2019)
	Other methodologies 1. Two researchers independetly assessed the reports 2. Interviews 3. Two researchers read all the reports and autonomously classified them	1. Cooray et al., (2020) 2. Diouf & Boiral (2017) 3. Pistoni et al. (2018)
Conciseness / Length	Natural logarithm of the number of pages	Ben-Amar & Belgacem (2018) Melloni et al. (2017) Rudyanto & Siregar (2018)
	Natural logarithm of the number of words	Miller (2010)
	Total number of pages	Pistoni et al. (2018)
Content		
Completeness / Accuracy	ESG disclosure scores	Melloni et al. (2017) Pérez-Cornejo et al. (2020) Papoutsi & Sodhi (2020)
	Other scoring systems	Cooray et al. (2020) Chang et al. (2019) Pistoni et al. (2018) Rudyanto & Siregar (2018)
	Other methodologies 1. Custom software for data analysis 2. Human and software coding	1. Michelon, et al. (2014) 2. Lock & Seele (2016)
Reliability		
Standardization	ESG disclosure scores	Pérez-Cornejo et al. (2020)
	Other scoring systems	Rudyanto & Siregar (2018) Odriozola & Baraibar-Diez (2017)
Assurance	ESG disclosure scores	Pérez-Cornejo et al. (2020)
	Other scoring systems	Rudyanto & Siregar (2018) Pistoni et al. (2018) Odriozola & Baraibar-Diez (2017) Cooray et al. (2020)
	Other methodologies 1. Human and software coding 2. Interviews 3. Custom software for data analysis	1. Lock & Seele (2016) 2. Diouf & Boiral (2017) 3. Boiral et al. (2019)

2.2. Sustainability reporting quality and assurance

Sustainability reporting, by its nature, involves the disclosure of a wide array of data related to a company's environmental, social, and governance (ESG) practices. Stakeholders, including investors, regulators, customers, and the public, rely on this information to make informed decisions, assess a company's commitment to sustainability, and hold it accountable for its impact on the environment and society.

Credibility is central to any type of communication, be it personal interaction, political discourse, or companies that communicate their role and responsibility towards society and the environment. However, given the potential for bias, misreporting, or even greenwashing — where companies exaggerate their environmental efforts — there is a pressing need for independent verification and validation on corporate disclosures. For these reasons, a major issue in the realm of sustainability reporting is the trustworthiness of the information that companies disclose. External assurance plays a pivotal role in this context, primarily aimed at improving users' confidence in the accuracy of the disclosed information and the reliability of the corporate performance.

In the European context, the evolution of sustainability reporting assurance (SRA) practices is noteworthy. Previously, under the Non-Financial Reporting Directive (NFRD), European Union (EU) member states had the discretion to decide whether to require assurance for sustainability reporting. This discretionary approach allowed for varying levels of assurance adoption across member states: Italy, France and Spain were the only states mandating assurance under the NFRD, while in the rest of Europe it remains voluntary. However, the introduction of the new Corporate Sustainability Reporting Directive (CSRD) has now mandated assurance for all European companies under the scope of mandatory sustainability reporting, heralding a meaningful change. This transition from discretionary to mandatory assurance has significant implications, particularly in understanding the motivations behind voluntary SRA.

The literature on this topic reveals a range of motivations SRA. Some studies emphasize that SRA can be exploited to manipulate the perceptions of external stakeholders, since organizations can obtain SRA not only to signal an effective commitment on ESG issues, but also to reduce the pressures imposed by interested parties or by government measures (Simoni et al., 2020). This aspect is commonly traced back to the "institutional theory": the fact that companies have to adapt to a similar institutional context and have to comply with the same

external expectations in order to obtain legitimacy for their work, leads them to adopt similar reporting methods and structures (Perego & Kolk, 2012). For example, the study by Venter & Van Eck (2021) showed that in many cases the assurance statements attached to sustainability reports are the result of routines and strategies that tend to reproduce standardized statements regardless of the reliability and content of the reports, through the use of a procedural language (Venter & Van Eck, 2021). The same conclusions were reached by the empirical study of Gürtürk & Hahn (2016), which reported a high homogeneity of assurance statements across companies.

This phenomenon can also be attributed to the commercial dynamics between assurance providers and companies (Boiral et al., 2019). In such relationships, assurance providers may prioritize their commercial interests, potentially leading them to restrict the scope of their mandates to mitigate liability and minimize litigation costs (Perego & Kolk, 2012). This is also testified, according to various studies in the sector, by the conclusions of the assurance process, which are often biased positively and cautious in raising criticisms (Boiral et al., 2019).

These findings can also be linked to the "legitimacy theory", which states that companies with poor sustainability performance that find themselves under public pressure and legitimacy threats can decide to adopt assurance to mask bad performance and avoid the risk to lose their social license to operate (Braam & Peeters, 2018). The assurance would contribute, in this case, to restore the trust of stakeholders and public institutions, and avoid the intervention of the latter (Simoni et al., 2020).

All these considerations have prompted some scholars in the field to question the ability of assurance to make an effective contribution to the reliability of the sustainability reports or to act as a catalyst for the internal change of companies towards authentic sustainability performance (Venter & Van Eck, 2021).

In contrast with this hypothesis, many empirical studies have demonstrated that providing sustainability reporting with third-party assurance offers numerous benefits, particularly for companies demonstrating strong ESG performance and seeking to publicly certify their efforts. These organizations prioritize transparency and seek high-quality assurance to underscore their commitment to addressing social, environmental, and ethical concerns. It follows that companies that have a superior ESG performance also voluntarily provide reports with SRA (Clarkson et al., 2019). This is why when discussing the quality and credibility of the information provided in SRs, numerous scholars argued that third-party assurance can have

beneficial implications, including an increase in market trust in the information disclosed and a decrease in the cost of disclosure (Mio et al., 2021). In this case, the objectives and benefits that can be achieved are multiple and concern both the external and internal spheres of the organization.

As for the external benefits, as stated by Simoni, et al. (2020), seeking an independent assurance signals a company's commitment to corporate responsibility, as the process exposes it to greater scrutiny. This can reinforce stakeholders' trust in the company's intent to satisfy "the demand for reliable and credible information […] from stakeholders who want assurance that the report truly represents the company's efforts and achievements'' (Perego & Kolk, 2012). Furthermore, assurance can also help to improve the comparability of sustainability reporting across companies and sectors by verifying that information is reported according to recognized standards.

In addition to the external benefits, sustainability reporting assurance also entails important organizational ones, since it can help to verify and improve management systems (Gürtürk & Hahn, 2016), information systems and internal reporting, with consequent better management of social and environmental performance (Perego & Kolk, 2012). This is especially important in the context of non-financial disclosures as the information they contain typically comes from a variety of departments within the company and their coordination is consequently difficult.

Moreover, external assurance can lead to internal learning processes and cultural steps forward with regards to sustainability and CSR. In fact, many companies that have sustainability reporting assurance confirm that it is a strong engine for internal improvement: it can promote the strategic integration of sustainability within the company because it acts as an organizational and behavioural control mechanism (Ballou et al., 2012)

Following this logic, companies with higher levels of social or environmental performance seem more genuinely motivated to resort to assurance than companies that perform poorly, to avoid adverse selection problems. As stated by Braam & Peeters (2018): "For superior performers, third-party assurance is an effective signal to positively differentiate themselves".

These findings collectively support the hypothesis that sustainability reporting assurance enhances the quality of sustainability reports by fostering transparency, credibility, and internal improvement within companies. Hence, the underlying idea of this study posited

that sustainability reporting assurance can effectively boost the credibility of sustainability reports and catalyze internal changes within companies (Venter & Van Eck, 2021).

We formulated our hypothesis as follows:

H1: The quality of sustainability reporting assurance is positively related to the quality of sustainability reports.

If a positive correlation is established between these two variables, it would suggest that a higher quality of sustainability reporting assurance is associated with improved sustainability reporting. This improvement may manifest in more detailed information, enhancing comprehension of the relevance and reliability of the reported data. Such a discovery would hold significant implications for companies and their stakeholders, offering additional support for the efficacy of assurance in elevating the quality and reliability of non-financial information. It would also serve as validation for the implementation of the Corporate Sustainability Reporting Directive (CSRD) and the mandatory requirement for sustainability reporting assurance in Europe.

3. Methodology

3.1. Sample

To create the sample for the analysis, we considered companies included in the STOXX Europe 600 Index, which provides a high coverage of the main European stock market capitalisations, covering seventeen European countries and almost 90% of the underlying investable market. We limit our sample to companies based in European countries that have introduced mandatory assurance in the transposition of the Non-Financial Directive of 2014. These countries are Italy, France, and Spain. By focusing only on the countries with mandatory SRA, it was possible to obtain a more homogeneous and comparable sample and adopt a more consistent approach to quality assurance evaluation, which improves the reliability and validity of our results.

The choice of the sample was also led by the assumption that large and visible companies would have greater transparency and availability of information regarding their ESG performance. Additionally, it was assumed that their sustainability reports would be readily available for download from their corporate websites.

Using these criteria, we obtained a final sample of 111 companies.

3.2. Regression model

To test H1, we use the following OLS regression model:

$$SR\_quality = \beta_0 + \beta_1 SRA\_quality + \beta_2 Total\_Assets + \beta_3 Market\_Capitalization + \beta_4 ROE + \beta_5 Debts\_on\_Equity + \in$$

The dependent variable is the quality of sustainability reporting (*SR_quality*) while the exploratory variable is the quality of sustainability reporting assurance (*SRA_quality*).

Control variables were introduced to ensure a more accurate and comprehensive analysis and to account for potential moderating factors that could have influenced the observed correlations between SRA quality and SR quality. Drawing on a comprehensive review of the existing literature, this study carefully selected three pivotal control variables to augment the analysis and enhance the understanding of the relationship between sustainability report quality (SR) and sustainability reporting assurance (SRA) quality. Each control variable was chosen with the intention of capturing essential factors that have the potential to influence this relationship significantly.

The first two control variables, expressed by the natural logarithm of the Total Assets and the natural logarithm of the Market Capitalization, serve as a proxy for the size of the company. Indeed, extensive research suggests that company size can exert a notable impact on sustainability reporting practices and overall quality. By incorporating these variables, we aimed to account for the potential influence of company size on the observed relationship between SRA quality and SR quality.

The third control variable, Return on Equity (ROE), was selected to reflect a company's profitability. Profitability stands as a recognized determinant of reporting quality, as financially successful companies typically possess greater resources and incentives to produce high-quality sustainability reports. Including ROE as a control variable allowed us to mitigate the impact of profitability on the investigated relationship.

Lastly, the control variable expressed by the ratio of Debts on Equity was introduced to consider the influence of financial leverage on reporting quality. Levels of financial leverage can impact a company's financial stability and, consequently, its commitment to sustainability reporting. By isolating this aspect, we aimed to analyze its specific relationship with the primary

research question, adding depth to our exploration of the interplay between SRA quality and SR quality.

3.3. Sustainability reporting quality score

The ultimate model for evaluating sustainability reporting quality (*SR_quality*), derived from the comprehensive literature review, is outlined in Table 3. This model comprises a set of indicators organized into three areas of analysis: Form, Content and Reliability.

Table 3. The set of indicators for the SR quality assessment

Indicator	Definition	Scale
Form		
Readability	Readability level measured with Fog Index, Flesch-Kincaid Grade Level, and Flesch Reading Ease Score.	0 Readability rating < B 1 Readability rating ≥ B and ≤ A
Content		
Completeness	Bloomberg ESG disclosure scores.	Continuous 0-10 scoring system based on the quality of the disclosure.
Reliability		
Standardization	Compliance with international reporting standards.	0 No compliance 1 Compliance

Figure 1. Readability indexes

Flesch Reading Ease Score	206.835 − 1.015 * average sentence length) − (84.6 * average syllables per word)
Flesch-Kincaid Grade Level	(0.39 * average sentence length) + (11.8 * average syllables per word) − 15.59
Gunning Fog Index	0.4 * (average sentence length + percentage of polysyllabic words)

Source: Smeuninx et al. (2020).

1. ***Readability.*** Regarding the form of the report, one of the most recurring variables used in the literature is "readability", meant as "the ease of understanding or comprehension due to the style of writing" (Loughran & McDonald, 2014). The literature analysis revealed three widely used indicators for measuring readability (see Figure 1): the Fog Index, which captures the written complexity of a document as a function of the number of syllables per word and the number of words per sentence (Lehavy, et al., 2011), the Flesch-Kincaid Grade

Level, which quantifies the years of education that the reader requires to understand the text (Smeuninx , et al., 2020), and the Flesch Reading Ease Score, which assigns a text a score between 1 and 100 based on ease of reading for the average adult. In our analysis, we use a Readable software to obtain a synthetic measure of readability for each report. This measure, taking into account the results returned by all three indexes, produced an overall score for the readability of the sustainability reports. The results ranged from A (highest level) to E (lowest level). According to what the software defined based on the scales of the individual readability indexes, a text can be considered easily readable if it has at least a score equal to B. For this reason, a score equal to 1 was assigned to reports presenting an evaluation between A and B, while a score of 0 was assigned to reports that received a rating lower than B (therefore C, D or E).

2. ***Completeness.*** As far as SR content is concerned, the most important variable is completeness, which considers the coverage of ESG topics. To measure this aspect, most of the reference studies use scoring systems based on the number of ESG topics disclosed. For our scope, it was decided to use the Bloomberg database, which is the most widely used data provider for corporate data. Bloomberg produces an ESG disclosure score that ranges from 0 to 10. It captures the number of possible ESG topics a company is reporting and is based on both quantitative and qualitative information. Many studies in the past have confirmed the reliability and effectiveness of this tool. As stated by Papoutsi & Sodhi (2020), Bloomberg's ESG scores are subject to a high level of verification and the information collected is highly verifiable: unlike other data providers, Bloomberg does not estimate any of the ESG data, as they can all be traced back to their primary source (Melloni et al., 2017). This implies elevated levels of reliability, which is why many researchers use these indices as a proxy for sustainability performance itself and not just for its disclosure (Papoutsi & Sodhi, 2020).
3. ***Standardization.*** Reliability can be considered an umbrella theme, which affects all the previous dimensions. In fact, adherence to international standards is an important element in determining the quality and, above all, the comparability of documents. For this reason, there is general agreement by scholars that standardization is one of the most important variables in this area. Consequently, the report's adherence to international reporting standards was assessed. If the sustainability report did not align with any reporting standard, it was assigned a score of 0. If it complied with one reporting standard, it received a score of 1.

Upon completion of the calculation of individual partial scores, a comprehensive score denoted as the “SR quality score" was derived by summing the partial scores for readability,

completeness, and standardization. This composite score serves as a representative measure of the sustainability report's overall quality. Furthermore, using a single variable to represent the overall quality of the sustainability report allows for a more direct examination of the connection between report quality and assurance quality..

3.4. Sustainability reporting assurance quality

Like the approach taken for the sustainability reporting (SR) quality model, the development of the sustainability reporting assurance quality (*SRA_quality*) model began with a literature review. However, given the emerging nature of the topic, the volume of available studies was comparatively limited. Therefore, unlike the extensive classification undertaken for the SR quality model, a condensed review sufficed for SRA quality. The final model for assessing its quality, as shown in Table 4, is composed by seven indicators.

1. ***Assurance standards.*** As regards the standardization of SRA processes, what is commonly accepted both in practice and at a research level is that the adoption of internationally recognized standards leads to greater reliability and certainty on the methods followed by the assurance provider and on the contents of the final SRA report (García-Sánchez et al., 2019). For this reason, an indicator on compliance with international standards was introduced in the model for assessing the quality of SA. If the SRA did not align with any reporting standard or lacked any reference, it was assigned a score of 0. If it adhered to locally or nationally recognized standards, it received a score of 1. A score of 2 was assigned if it conformed to one of the two internationally recognized standards. Finally, 3 points were awarded if it adhered to more than one internationally recognized standard.
2. ***Level of assurance***. The international standards distinguish between various levels of assurance. The assurance level indicates how confident the assurance provider is that the report is error-free. Given the fundamental importance of this topic, it was decided to introduce an indicator in the model to evaluate the level of assurance as follows: 0 points in case there was no mention of the level of assurance provided or the level of assurance could not be discerned; 1 point for limited assurance engagements; 2 points in case there was a mix of different levels (e.g. limited assurance on the entire sustainability report and reasonable assurance on some selected indicators or two different levels of assurance for different parts of the report); 3 points for reasonable assurance on the entire content of the SR.

3. ***Scope***. In addition to the level of assurance, the assessment of its scope is also relevant. In fact, SRA processes and statements can vary considerably in terms of content coverage, ranging from an assurance given on the entire report to an assurance given on a specific section or a selection of indicators (Braam & Peeters, 2018). For this reason, several studies including that of García-Sánchez et al. (2019), Gürtürk & Hahn (2016), Martínez-Ferrero et al. (2018), Prinsloo & Maroun (2020), include an indicator in this regard into their models. Following Gürtürk & Hahn (2016)'s model, we evaluate the presence of a declaration that expresses that all the material aspects are covered by the assurance report. The indicator was constructed as follows: 0 points were assigned in case of no references; 1 point was assigned in the case it was mentioned.
4. ***Auditor independence.*** Numerous studies agree on the fact that what is truly critical is the independence of SRA's providers. The fact that some assurance providers maintain long-term relationships with their clients raises concerns about potential conflicts of interest (Sethi et al., 2017). In fact, it is quite common that companies that already audited the financial statements broaden their work by also reviewing the sustainability report of the same client company. The same approach used for the evaluation of assurance standards was adopted. 0 points were received in case of absence of reference; 1 point was awarded in case there was a mere statement expressing independence or compliance with nationally recognized standards; 2 points were finally awarded in case of explicit compliance with the International Ethics Standards Board for Accountants (IESBA) codes of ethics, which are founded on fundamental principles of integrity, objectivity, professional competence, due care, confidentiality, and professional behaviour.
5. ***Quality control.*** The same scale was also used for evaluation of the quality control since 2 points were gained only if the assurance process was compliant with the International Standard on Quality Control 1 (ISQC 1) drawn up by IFAC.
6. ***Work summary.*** Two final aspects included in this model concern the transparency of the final assurance report. Firstly, García-Sánchez et al. (2019), Gürtürk & Hahn (2016), Martínez-Ferrero et al. (2018) introduced in their models the assessment of the presence of a so-called "work summary", i.e. an explanation of the actions taken to arrive at the conclusions expressed in the assurance statement. The illustration of the steps followed and the analyzes conducted makes it possible to understand the depth of the assurance process and therefore to define its level of reliability. In this case the indicator was limited to ascertaining the presence or absence of this summary, but did not evaluate its extension nor

quality. Therefore, a score equal to 0 was attributed if there was no work summary, 1 otherwise.

7. ***Conclusion.*** Extant studies also evaluate the presence of a statement which expresses the result of the assurance engagement. They also assess if this statement is limited to a standardized sentence or if it highlights the specificity of the work through a brief comment or a series of recommendations addressed directly to those who drafted the sustainability report and are therefore responsible for its continuous improvement. In this area: 0 was assigned in case of absence of explicit references to conclusions; 1 in case of a simple statement expressing the insurer's opinion in a standardized and non-specific way (e.g., "There is no element that suggests that the sustainability report of company XY is not a correct presentation of the company and its ESG performance"); 2 points were finally obtained if there was an explanatory statement, including recommendations for improvement if necessary (Martínez-Ferrero et al., 2018).

Table 4. The set of indicators for the SRA quality assessment.

Indicator	**Scale**
Assurance standards (AS)	0 No compliance 1 Compliance with local or national standards 2 Compliance with one international standard 3 Compliance with more than one international standard
Level of assurance (AL)	0 No reference 1 Limited/moderate level of assurance 2 Mix of different levels 3 Reasonable/high level of assurance on the entire content
Scope (Sc)	0 No reference 1 Reference
Auditor independence (AInd)	0 No reference 1 Statement expressing independence/compliance with national standards 2 Compliance with international ethical standards
Quality control (QC)	0 No reference 1 Compliance with national standards 2 Compliance with international standards
Work summary (WS)	0 No reference 1 Reference
Conclusions (Concl)	0 No reference 1 Standardized and non-specific conclusions 2 Explanatory statement

Following the completion of the sustainability report quality analysis, the subsequent phase involved evaluating the quality of the SRA statements associated with them. To ensure the accuracy of the results, every SRA statement was meticulously read and assessed. Objective evaluations of the text and statements were carried out to establish indicators, minimizing the

risk of bias. Furthermore, for added precision, each statement underwent a secondary review at a later stage.

Similar to the methodology employed for the sustainability reporting quality score, the assurance quality score was computed by aggregating individual sub-scores derived for standard adherence, assurance level, scope, auditor independence, quality control, work summary, and conclusions.

4. Results

4.1. Descriptive statistics and correlation matrix

Following the formulation of the two datasets, we conducted a series of statistical analyses, using MATLAB and STATA software. The initial phase of these analyses was focused on computing fundamental parameters within the sample. Specifically, the mean and standard deviation were calculated, offering a foundational insight into the central tendencies and variability present in the dataset.

Table 5. Descriptive statistics of the model variables

Variable	Obs	Mean	Std. Dev.	Min	Max
SR_quality	111	5.348	1.329	2.58	8.42
SRA_quality	111	8.973	1.417	7	13
Total_Assets	111	17.316	1.511	14.095	21.561
Market_Capitalization	111	9.523	1.113	7.837	12.743
ROE	111	10.64	11.41	-38.488	45.835
Debts_on_Equity	111	.661	.214	-.543	1.077

Following the computation of basic parameters, the research advanced to a deeper exploration through the calculation of the Pearson correlation index.

Table 6. The Pearson's correlations among model variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) SR_quality	1.000					
(2) SRA_quality	0.268	1.000				
(3) Total_Assets	0.162	0.060	1.000			
(4) Market_Capitalization	0.149	-0.053	0.476	1.000		
(5) ROE	0.010	0.083	-0.153	0.237	1.000	
(6) Debts_on_Equity	0.025	0.174	0.478	-0.026	-0.038	1.000

This critical step in our research aimed at systematically assessing the linear relationship between *SR_quality* and *SRA_quality*. The outcomes of this analysis serve as a quantitative representation of the associations between the variables of interest. With a Pearson correlation

coefficient of 0.2681 between *SR_quality* and *SRA_quality*, a moderate positive linear relationship between the two variables is found. This indicates that as *SR_quality* increases, there is a tendency for *SRA_quality* to increase as well.

4.2. Main results

The results of our regression analyses are described in Table 7.

Table 7. Results of the multiple regression analysis

	(1) SR_quality
SRA_quality	0.266***
	(0.0887)
Total_Assets	0.119
	(0.119)
Market_Capitalization	0.123
	(0.145)
ROE	-0.00240
	(0.0119)
Debts_on_Equity	-0.539 (
	0.707)
Constant	0.116
	(1.688)
N	111
R^2	0.1104
adj. R^2	0.0680
F-test that all μi = 0	F (5, 105) = 2.60;
	Prob > F = 0.0291

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

First, the regression analysis resulted in a positive and statistically significant relationship between *SR_quality* and *SRA_quality* with a p-value < 0.01. This result suggests that the quality of sustainability reporting assurance has a positive influence on the quality of sustainability reporting.

In terms of the magnitude of this effect, the estimated coefficient of *SRA_quality* suggest that a one-unit increase in the *SRA_quality* is associated with increase in *SR_quality* by 0.266 basis points. Thus, a firm would increase the quality of sustainability reporting by 1.6 basis points or (based on a mean *SR_quality* of 5.348) by approximately 30% if the quality of the sustainability reporting process increases from the minimum (7) to the maximum (13) score reported by the sampled companies. This appears to be an economically significant effect.

In terms of control factors, no variables have a significant correlation with *SR_quality*.

To fortify the robustness of our analysis, we conducted the Variance Inflation Factor (VIF) test to assess multicollinearity among independent variables. The results, detailed in Table 8, indicate low correlation among the variables included in the model, enhancing the overall reliability of our analytical framework.

Table 8. Variance Inflation Factor (VIF) test

	VIF	1/VIF
Total_Assets	2.147	.466
Market_Capitalization	1.723	.58
Debts_on_Equity	1.522	.657
ROE	1.227	.815
SRA_quality	1.047	.955
Mean VIF	1.533	.

5. Conclusions

This study examines the relationship between sustainability reporting quality and the quality of assurance provided by independent third parties, against the backdrop of increasing emphasis on high-quality sustainability disclosure.

These results yield timeliness contributions to the literature. Firstly, it introduces two comprehensive sets of indicators for assessing the quality of sustainability reports and the process of sustainability reporting assurance. In today's landscape marked by a surge in sustainability reporting publications and a lack of universally recognized standards, defining assessment methods becomes crucial. While previous studies have focused on developing models and indicators for assessing sustainability reporting quality, limited research has delved into the quality of sustainability reporting assurance.

Secondly, our findings indicate that the quality of the sustainability assurance process generally enhances the quality of assured reports. In essence, a well-executed assurance process positively influences report quality. This lends empirical support to the implementation of mandatory sustainability reporting assurance, suggesting its potential to effectively enhance non-financial reporting practices. Rigorous assurance procedures can help companies to disclose more clear, comprehensive and complete information, improving the overall quality of the report. These findings are particularly noteworthy given the introduction of the Corporate

Sustainability Reporting Directive (CSRD) and mandatory sustainability reporting assurance all across the Europe.

In conclusion, this study advances knowledge in the field by underscoring the importance of robust assurance practices in improving the reliability and credibility of non-financial information disclosed by companies.

However, it is essential to acknowledge certain limitations inherent in this study. The focus on the European context, driven by the introduction of the new assurance obligation under the CSRD, resulted in a relatively small sample size for analysis. Additionally, the concentration on the STOXX Europe 600 Index provides valuable insights into European companies' sustainability reporting practices but may not fully represent other regions. The homogeneity observed in the sample regarding applied standards and assurance providers could limit the generalizability of the results. Furthermore, the indicators used may be incomplete, primarily focusing on quantitative aspects without delving deeply into qualitative features.

Exploring additional dimensions or measures of reporting and assurance quality in future research could provide a more comprehensive understanding of sustainability reporting and assurance practices. Addressing the ongoing debate about suitable measures for determining sustainability reporting assurance quality in the ESG context through case studies or direct observations within organizations would be beneficial.

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