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" THE ASSURANCE OF SUSTAINABILITY REPORTS AND THEIR IMPACT ON SOCIAL MEDIA BEHAVIOURS OF CORPORATIONS "

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Introduction

Sustainability reporting has become a central topic in the field of transparency and corporate responsibility. As companies do their best to meet growing stakeholder expectations for clear, reliable and accountable reporting, sustainability reporting has emerged as a key tool to convey a company's environmental, social and governance (ESG) performance. This thesis aims to explore the link between the reliability of sustainability reports and their impact on corporate social media behaviour, a topic that has gained increasing importance in recent years, particularly in the context of corporate social responsibility (CSR) communication.

The first chapter provides a literature review, delving into the evolution of sustainability reports, the role of assurance in enhancing their credibility and the regulatory landscape governing assurance practices, also making a comparison between EU and US. The chapter also analyses the Global Reporting Initiative (GRI) standards as well as the benefits that assurance brings to companies that practice it and the importance of assurance in building trust among stakeholders.

The second chapter focuses on the behaviour of companies that assure their sustainability reports on social media. The chapter outlines the strategic role of social media in CSR communication, discussing how it has transformed the relationship between companies and stakeholders. The chapter introduces the research question, formulates hypotheses and describes the methodology used to investigate these dynamics.

The third chapter presents the research model, specifying the variables and econometric methods used to test the hypotheses. The chapter highlights the structure of the model and the data analysis steps, including the analysis itself by applying t-tests, multivariate regression models and univariate tests to observe trends over time.

The fourth chapter interprets the results of the study, testing the various hypotheses and discussing the outcomes considering the statistical results. It also addresses the limitations encountered in concluding the research and offers important suggestions for future improvements and studies that could be carried out in the same topic, emphasising the importance of refining the model to capture additional factors influencing the behaviour of companies on social media.

Finally, the main insights derived from the research are summarised, providing a direct answer to the initial question. By understanding the relationship between the reliability of sustainability reporting and social media behaviour, this study aims to provide valuable insights for companies seeking to strengthen their ESG practices and stakeholder engagement strategies.

Therefore, it can be anticipated that the assurance of sustainability reports has a positive impact on companies' social media behaviour, but is often influenced by other business factors. To optimise its effectiveness, assurance should be integrated into a broader strategy that includes strategic communication, transparency and adaptability to external changes. The study of this phenomenon provides useful insights into how assurance can improve corporate transparency and promote stakeholder trust in an increasingly digital environment.

In conclusion, this thesis aims to provide a comprehensive understanding of the influence of sustainability report assurance on corporate social media behaviour. Integrating different research methods, including literature review, t-tests and multivariate regression models, the study offers valuable insights into the interplay between assurance, transparency and corporate communication strategies. The topic was chosen in view of the growing importance of corporate social responsibility (CSR) in today's business environment and the critical role of social media in shaping company-stakeholder relations. The results should help companies improve their ESG practices and build stronger and more transparent relationships with their stakeholders.

Chapter 1 - The role of sustainability reports and their assurance, literature review

1.1. Sustainability reports

Sustainability is a concept that embraces a wide range of practices and policies aimed at meeting the needs of today without compromising the ability of future generations. This concept, which is based on a balance between economic growth, environmental protection and social well-being, has become a fundamental pillar for many organisations and governments around the world. Sustainability is rooted in sustainable development: meeting the current needs of this generation without depriving future generations of the ability to meet their needs (Abeysekera I., 2022).

The growing recognition of the importance of sustainability has led to the need for transparency and accountability on the part of companies in the environmental, social and governmental (ESG) spheres. In this context, sustainability reports have emerged as a key tool for building and maintaining stakeholder trust. These reports allow companies to communicate their performance in terms of environmental, social and economic sustainability in a clear and structured manner. Companies that publish such reports can be more transparent about the risks and opportunities they face, providing a greater understanding of their performance outside the company, beyond the bottom line.

The decisions companies make every day have a strong impact on stakeholders as well as the environment; rarely are these decisions based on financial information, while sustainability is increasingly integrated into corporate decision-making processes. Sustainability reports serve multiple purposes for modern companies: they allow them to openly display their sustainability performance, meeting stakeholders' expectations of transparency; they help identify and manage risks related to environmental, social and governance (ESG) issues; and they enhance the company's reputation by building trust among stakeholders and improving public perception.
Sustainability reports position the company as a leader in sustainability, differentiating it from competitors and attracting informed investors and customers, as well as ensuring the company's compliance with regulations and investor expectations regarding ESG reporting.

Reporting also demonstrates organisational commitment, risk management and a desire to build corporate reputation. In all these cases, the effectiveness of achieving the desired results depends on the perceived and actual credibility of the information provided. Assurance plays an important role in this respect (Simnett R. & Vanstraelen A., 2007). The adoption of sustainability as an integral part of a business model has been a challenge for companies. Although it is widely acknowledged that sustainable ecosystems are becoming a necessary condition for organisational continuity, however, corporate trends in sustainability reporting have not kept pace with addressing sustainability issues. These issues are related to the economy, the environment and society.
Companies should focus their sustainability reporting on results and impacts to inform stakeholders about fulfilling the duty to care for the planet and sacrificing profits due to internalising costs for the benefit of society and the environment (Abeysekera I., 2022).

In this context, sustainability reports have become a key communication tool between organisations and their stakeholders, focusing on environmental and social performance (Mori Junior R. et al., 2013). Increasing societal awareness of environmental and social issues, climate change, sustainable supply chain management, natural disasters and natural resource scarcity has helped transform the way businesses are conducted (Kolk and Van Tulder 2009; Seuring and Müller 2008). A brief historical overview of the development of sustainability reports follows to gain a broader view of the phenomenon and understand how they have changed over time.

1.1.1. Development of sustainability reports over the years

Since the 1970s, the voluntary publication of sustainability reports has varied widely across industries and countries. The first wave of organisations publishing their social and environmental impacts began in the United States and Western Europe (Kolk & Pinkse 2010; Owen et al. 2001). In the late 1980s, in response to the final report of the United Nations World Commission on Environment and Development, demands grew for clear corporate commitments to sustainable development. The idea of documenting and communicating sustainability performance was born during this period, with the first environmental reports published in response to growing public awareness and pressure from non-governmental organisations. These early attempts focused mainly on environmental issues, reflecting the attention of the time on problems of pollution and environmental degradation.

In the early 1990s, some large organisations started to voluntarily disclose information about their environmental performance to stakeholders (Perez and Sanchez 2009).
In the 2000s, sustainability reporting underwent a significant transformation with the birth of the Global Reporting Initiative (GRI), an independent international organisation that provides a global standard for sustainability reporting. The GRI Guidelines, introduced in 2000, provided a standardised framework for sustainability reporting, enabling comparability between companies, promoting greater transparency and helping organisations understand and communicate their impact on a range of sustainability issues, including environmental, social and economic performance (*cfr. 1.1.2 GRI Standards*).
In the 2010s, sustainability reporting started to become more integrated with corporate strategies. Companies have recognised that sustainable practices are not only a matter of social responsibility, but also an opportunity to create long-term value. The use of advanced technologies has enabled more accurate and sophisticated data collection and analysis, improving the quality of reported information.

In the 2020s, sustainability reports have become essential for demonstrating companies' contribution to the UN Sustainable Development Goals (SDGs). Today, these reports not only describe past performance, but also highlight how corporate activities contribute to global progress towards a more sustainable future. In this new scenario, sustainability reports have been a key tool for organisations to provide transparent communication with their stakeholders, especially regarding the social and environmental performance of organisations. Some authors argue that sustainability reports have also influenced the decision-making processes of different stakeholders, who are interested not only in economic aspects, but also in environmental and social ones (Barrett 2005; Futerra Sustainability Communications et al. 2010; KPMG Global Sustainability Services and SustainAbility Ltd. 2008).

1.1.2. GRI Standards

As mentioned earlier, since the 2000s, sustainability reporting has undergone a significant transformation with the emergence of the Global Reporting Initiative (GRI), an independent international organisation that provides a global standard for sustainability reporting. The GRI guidelines provide a standardised framework for sustainability reporting, enabling comparability between companies, promoting greater transparency and helping organisations understand and communicate their impact on a range of sustainability issues.

GRI standards are divided into different sections: universal standards, which apply to all organisations and cover general aspects such as reporting presentation, reporting principles and contextual information about the company; and thematic standards, which are topic-specific and further divided into economic, environmental, labour, human rights, product responsibility and social (Abeysekera I., 2022).

To achieve sustainability reporting based on GRI, a structured reporting process must be followed. Companies start by identifying the most relevant (material) sustainability issues for their business and stakeholders through a materiality analysis that assesses the most significant issues in terms of impact and importance to stakeholders. Once material issues are identified, companies collect relevant data on these areas, following the specific guidelines provided by GRI standards on what data to collect and how to do it.

Next, companies prepare their sustainability report, which must include detailed information on the material issues, the data collected and the company's performance in relation to these issues. Some companies may choose to have their report verified internally or externally to ensure the accuracy and transparency of the information. Assurance from external providers can increase the credibility of the report itself. Although assurance is mandatory in several European countries, the level of quality assurance is often driven by market forces (Cohen & Simnett, 2015).

Finally, the sustainability report is published and shared with stakeholders through various channels, including corporate websites, annual reports, investor presentations and social media. Thanks to the standardised framework, GRI standards help companies present clear and comparable information, increasing the transparency and credibility of their sustainability report.

Reporting according to GRI standards enables companies to better identify and manage sustainability risks and discover new opportunities to improve their performance. Sustainability reports prepared according to GRI standards help engage and inform stakeholders, strengthening relationships and improving trust in the company. In addition, GRI standards help companies align their activities with the United Nations Sustainable Development Goals (SDGs), contributing to a positive global impact.

The GRI framework uses the reporting principles of accuracy, balance, clarity, comparability, completeness, sustainability context, timeliness and verifiability. These basic principles are applied with standardised reporting indicators (GRI, 2021) (Abeysekera, 2022).

The GRI is therefore an essential framework for companies wishing to transparently and accurately communicate their sustainability performance, facilitating dialogue with stakeholders and promoting responsible business practices. However, a company that is truly committed to sustainability should not only demonstrate that it has achieved its goals with often monetary contributions, but also show the difference the company's efforts have made for the planet (Pucker, 2021).
Often this transparency and accuracy of corporate sustainability reports can be amplified through the assurance of these documents to gain more trust from stakeholders.

1.1.3. Assurance of sustainability reports

To increase the credibility of sustainability reports, many companies choose to subject them to an assurance process by external providers. According to O'Dwyer and Owen (2005), independent external assurance of sustainability reports began in 1997-1998. Assurance verifies the accuracy and reliability of reported information, providing independent assurance to stakeholders. The main objective of assurance is to improve the quality of sustainability information disclosed by companies and to increase stakeholder confidence in sustainability reports. Furthermore, assurance can play a central role in mitigating sustainability risks, addressing threats to legitimacy and garnering stakeholder support for sustainability performance (Emma G. et al., 2024).

In the United States, although there are no specific regulatory requirements for the assurance of sustainability reports, many companies voluntarily adopt this practice. The main international standards used for assurance include ISAE 3000 (International Standard on Assurance Engagements 3000) and AA1000AS (AccountAbility Assurance Standard). These standards provide guidelines for assessing the quality of information and ensure that reporting practices are robust and transparent (*cfr. 1.2. Regulation on the assurance of sustainability reports*).

Previous research has indicated that assurance can be considered one of the strategies employed by companies to align their sustainability behaviour with societal values and expectations,

thereby restoring legitimacy that may have been damaged (O'Sullivan & O'Dwyer, 2009; Simnett et al., 2009; Perego & Kolk, 2012; Cho et al., 2015; Segui-Mas et al., 2015; Datt et al., 2018, 2019; Humel et al., 2019; Ruiz-Barbadillo & Martínez-Ferrero, 2020). Furthermore, assurance can offer insights into weaknesses in control systems and provide guidance for the design, development and implementation of new processes that facilitate better decision-making regarding sustainability practices.

If these efficiencies result in improved sustainability performance, assurance can help companies effectively manage significant sustainability risks, thereby preventing negative events from recurring in the future. This helps reduce societal pressures and mitigate the negative effects of damaged legitimacy (Fonseca, 2010; Jones & Solomon, 2010; Simnett et al., 2009). Assurance serves as a useful control mechanism to increase the credibility of disclosed information and foster greater user trust. Consequently, it should lead to more appropriate resource allocation decisions by the users of the information (Simnett R. & Vanstraelen A., 2009b).

The percentage of organisations publishing a sustainability report has increased in recent years. However, the percentage of organisations ensuring their own sustainability report has decreased (Mori Junior R. et al., 2013). Due to the relevance of sustainability reports, some stakeholders have demanded transparency and questioned the integrity of the information published by organisations through sustainability reports (Laufer, 2003; Moneva et al., 2006; Ramus and Montiel, 2005). In response, some organisations have begun to voluntarily provide independent external assurance in their sustainability reports to improve credibility and reliability (Mori Junior R. et al., 2013).

1.1.4. Conclusions

As sustainability is a crucial pillar of modern business development, it has driven companies to improve the transparency and accountability of their practices, stimulating the adoption of sustainability reports as a key tool for communicating their environmental, social and economic performance.

The evolution of sustainability reporting, which began in the 1980s and 1990s and was consolidated with the introduction of GRI standards in the early 2000s, has enabled companies to adopt a more structured and comparable approach to reporting their sustainable practices.

GRI standards provide a detailed framework for the collection, analysis and reporting of sustainability information, enhancing the transparency and credibility of disclosed information. In recent years, sustainability reporting has become an essential element for companies that want to demonstrate their contribution to the UN Sustainable Development Goals. Reporting according to GRI standards not only enables companies to better manage sustainability risks and opportunities, but also to build trust among stakeholders and position themselves as sustainability leaders.

Verification of sustainability reports, although not mandatory in the United States, is a voluntary practice adopted by many companies to enhance the credibility of reported information. International standards such as ISAE 3000 and AA1000AS provide guidelines for assurance, ensuring that reporting practices are robust and transparent. Assurance helps to improve the quality of disclosed information, mitigate risks and strengthen the legitimacy of companies vis-à-vis society.

We will now discuss how the assurance of sustainability reports is regulated, comparing the European and US markets, taking a closer look at the individual directives (IFRS, ISAE 3000, AA1000AS) and the role external providers play in the assurance process.

In conclusion, sustainability reports, supported by GRI standards and assurance, are key tools for modern companies that wish to transparently and accurately communicate their sustainability performance, facilitating dialogue with stakeholders and promoting responsible business practices. These tools help ensure that business decisions are informed not only by economic performance, but also by social and environmental impact, contributing to a more sustainable future for all.

1.2. Regulation on the assurance of sustainability reports

Sustainability reporting has become a key element for companies wishing to transparently communicate their environmental, social and economic performance. However, the regulation of the assurance of these reports varies significantly between the European Union and the United States. In Europe, EU Directive 95/2014 sought to improve the comparability of non-financial information but showed limitations in setting mandatory standards. In response to these critical issues, the European Commission mandated the European Financial Reporting Advisory Group (EFRAG) to develop new non-financial reporting standards, culminating in

the proposal for a directive on corporate sustainability reporting that would oblige organisations to comply with such standards (EFRAG, 2020; De Villiers et al., 2022). In the United States, on the other hand, there are no specific regulatory requirements for the assurance of sustainability reports, making the adoption of this practice a voluntary choice of companies (Simnett & Vanstraelen, 2007).

The growing importance of sustainability has prompted companies to improve the transparency and accountability of their practices, stimulating the adoption of sustainability reports as a key tool for communicating their performance. However, the lack of generally accepted reporting criteria and specific guidance on the assurance of sustainability reporting poses significant challenges (Hodge et al., 2009).

Legitimacy theory advocates the existence of a "social contract" between company and society, according to which the company must behave in a socially responsible manner to be recognised as such by society (O'Donovan, 2002). The disclosure of Corporate Social Responsibility (CSR) information through sustainability reports legitimises the company's role within society (Deegan, 2002; Branco & Rodrigues, 2006). However, the voluntary nature of this information leads to inconsistencies in reporting formats and a lack of robust measures for the quality and accuracy of report content (Prakash Sethi, 2015).

Assurance statements for sustainability reports are voluntary, and managers decide whether they want to enrich their reports by hiring an independent auditor (Fernandez-Feijoo, 2017). The absence of mandatory standards leads to significant variations in the scope and standards applied in assurance statements, necessitating greater clarification of the nature of the engagement (Adams & Evans, 2004; Deegan et al., 2006a). The Fédération des Experts Comptables Européens (FEE) emphasises the importance of applying verification criteria to increase the confidence of users of sustainability statements (Fernandez-Feijoo, 2017).

Two frequently used international standards for the assurance of sustainability reports are the International Standard on Assurance Engagements (ISAE) 3000 and the AccountAbility AA1000 Assurance Standard (AA1000AS).
ISAE 3000, issued by the International Auditing and Assurance Standards Board (IAASB), provides guidelines for conducting non-financial assurance engagements, including sustainability reports. This standard emphasises the importance of independence, objectivity

and transparency in the assurance process, ensuring that the information disclosed is credible and reliable (IAASB, 2010).
While AA1000AS is a standard developed by AccountAbility, which focuses on promoting sustainability through improved reporting and assurance practices. AA1000AS emphasises the importance of inclusiveness, materiality and responsiveness, requiring assurers to consider stakeholder expectations when assessing sustainability information (AccountAbility, 2008).

The Global Reporting Initiative (GRI) is one of the leading standard-setting bodies for sustainability reporting, oriented towards stakeholders and aimed at ensuring the disclosure of relevant information on social and environmental issues. Recently, the International Financial Reporting Standards (IFRS) Foundation integrated many standard-setting bodies under the International Sustainability Standards Board (ISSB), promoting a more coordinated and global approach (IFRS, 2022a).

In summary, assurance of sustainability reports plays a crucial role in providing credibility and transparency to the information disclosed by companies. Although significant challenges exist due to the lack of unified and mandatory standards, the evolution of European regulations and the voluntary adoption of assurance in the US represent important steps towards more robust and comparable sustainability reporting. This will be discussed in more detail in the paragraphs immediately following.

1.2.1. Directives and requirements governing the subject. A comparison between the EU and the US

The regulatory landscape regarding sustainability reporting and its verification differs significantly between the European Union (EU) and the United States (US).
Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 relates to the annual financial statements, consolidated financial statements and related reports of certain types of undertakings. This directive is important as it establishes a harmonised framework for the preparation of financial statements, improving the transparency and comparability of financial information within the European Union. One of the main objectives of the directive is to improve the transparency of financial information, thus facilitating comparisons between companies from different member states. In addition, for small and medium-sized enterprises (SMEs), the directive provides for measures to reduce administrative burdens while promoting the adoption of high-quality regulations. Finally, companies are

encouraged to adopt reporting practices that accurately reflect their financial situation, thereby increasing their accountability.
The directive specifies how annual financial statements, and consolidated financial statements should be drawn up for different types of companies, including detailed requirements for management reports and non-financial reports.
Directive 2013/34/EU represents a significant step towards greater harmonisation of financial reporting practices in the European Union, with a focus on the needs of SMEs and the reduction of administrative burdens. Its implementation is key to ensuring that corporate financial information is understandable and comparable across borders, thus contributing to a more efficient and transparent internal market (Directive 2013/34/EU European Parliament and Council, 2013)

Another recently introduced directive is the Non-Financial Reporting Directive 2014/95/EU, commonly known as the NFRD (Non-Financial Reporting Directive), was introduced by the European Union in 2014 with the aim of requiring non-financial disclosure documents from public interest entities (PIEs) employing more than 500 people. The NFRD acts as an extension to existing annual financial reporting requirements and offers guidelines for companies to disclose their approach to managing environmental and social challenges within their annual reports. The main objective of the NFRD is to improve transparency and accountability by obliging companies to regularly report on sustainability and outline their specific sustainability policies. Although the directive does not explicitly require assurance, it is recommended. Consequently, some countries have started to consider assurance as mandatory, even in the absence of assurance guidelines, and have suggested using international standards such as the AA1000 Assurance Standard (AA1000AS) established by AccountAbility and the International Standard on Assurance Engagements (ISAE 3000) established by the International Audit Assurance Standards Board (IAASB). Both assurance standards use a principles-based framework that offers flexibility in various aspects of the assurance process, such as the objective of the engagement, the level and scope of the assurance, the procedures used, the competence and independence of the assurance provider, and the way conclusions are drawn. Consequently, the specific level of assurance quality is determined voluntarily by the companies. Therefore, high quality assurance will only be required when the expected benefits outweigh the costs. Expected benefits include obtaining, maintaining and repairing legitimacy, and the desire to improve damaged legitimacy may be one of the main drivers for high quality assurance. Therefore, high quality will not be sought after unless a legitimacy crisis exists, prompting companies to take concrete and effective actions to address the crisis. However,

when companies only seek token actions to cosmetically manage their legitimacy, minimal investment in assurance quality is expected. Secondly, previous research has found considerable variation in the quality of assurance required by companies (Ball et al., 2000; Deegan et al., 2006; Mock et al., 2007; O'Dwyer & Owen, 2005).

Directive 2014/95/EU complements and expands Directive 2013/34/EU, extending reporting requirements to non-financial information and promoting greater transparency and accountability of companies on environmental, social and governance issues. This integrated approach helps to provide a completer and more accurate picture of corporate activities, improving trust and accountability in the European market.

Directive 2013/34/EU is interconnected with Directive 2014/95/EU, as both pursue the objective of improving the transparency and quality of information provided by companies in the European Union, but with different focuses.

Directive 2014/95/EU, also known as the Non-Financial Reporting Directive (NFRD), fits into the context of Directive 2013/34/EU, expanding its scope to also include non-financial reporting. It obliges large public interest companies with more than 500 employees to disclose information on environmental, social, personnel, human rights and anti-corruption issues. The aim is to improve the transparency and accountability of companies regarding their sustainability policies, providing investors and other stakeholders with a clear picture of their non-financial performance.

By broadening the scope and including non-financial information, Directive 2014/95/EU ensures that companies provide a complete picture of their activities, including both financial and non-financial aspects, as well as improving the comparability of information between EU companies. Indeed, Directive 2013/34/EU focuses on the comparability of financial information, while Directive 2014/95/EU deals with non-financial information. This dual approach contributes to a more transparent and responsible business environment in the EU.

Another connecting point is the reduction of administrative burdens. While Directive 2013/34/EU provides specific measures to lighten the administrative burden of SMEs, Directive 2014/95/EU applies mainly to large companies and avoids imposing additional obligations on SMEs.

Thus, both directives share the objective of improving the transparency of information disclosed by companies. Financial and non-financial transparency is crucial to ensure the confidence of investors and other stakeholders, contributing to a more robust and reliable business environment (Directive 2014/95/EU European Parliament and Council, 2014).

There are other reforms that the European Union has implemented to promote economic and financial sustainability and achieve climate neutrality by 2050. Among these initiatives, the European Green Deal and the European Banking Authority's (EBA) Sustainable Finance Roadmap are crucial. The Corporate Sustainability Reporting Directive (CSRD), published in the EU Official Journal on 16 December 2022, amends Directive 2013/34/EU and obliges large companies to disclose non-financial information to promote transparency and accountability.
The CSRD aims to improve sustainability reporting by equating the relevance of ESG results with financial results and recognising their connection. It applies to large unlisted companies, listed SMEs (excluding micro-companies), small non-complex credit institutions, insurance companies' dependent on a group and companies with non-EU parent companies that generate significant net revenues in the EU.

From 2025, the CSRD will affect relevant Public Interest Entities with FY24 reporting, from 2026 it will apply to large unlisted companies with FY25 reporting, and from 2027 listed SMEs, small and non-complex credit institutions, and captive insurance companies with FY26 reporting will be affected. The guidelines of this directive will ensure uniformity in reporting, so companies will have to provide independent assurance, including ESG aspects, from 2026 onwards for financial sustainability.

The CSRD introduced important changes in the corporate reporting landscape, focusing mainly on mandatory assurance for sustainability reports. These reports will now have to be subject to "limited assurance", aiming to achieve "reasonable assurance". Furthermore, sustainability reporting will be digitised and integrated into the Management Report, promoting greater cohesion between financial and non-financial information.
Companies will be required to adopt the ESRS (European Sustainability Reporting Standard) developed by EFRAG, to ensure higher comparability in disclosure. Specific standards have also been outlined for SMEs. A further focal point is the integration of ESG objectives into corporate strategy, with the need to report on the impact of sustainability initiatives on business results.
In addition, companies will have to provide clear disclosure regarding the competences and role of boards of directors in sustainability matters, including incentives related to ESG goals. It will also be crucial to report on the effect of the company's activities on the environment and people (impact materiality), as well as the influence of sustainability factors on financial results (financial materiality), which is why the directive speaks of "double materiality".

Sustainability reporting will necessarily have to consider the entire value chain, including material impacts, risks and opportunities. Finally, companies will have to report business-related information in line with the EU Taxonomy, which defines six environmental objectives consistent with CSRD objectives (PwC, 2024).
Thus, CSRD promotes an integrated and future-oriented approach for European companies, which not only aim to achieve economic goals, but also to contribute significantly to long-term environmental and social sustainability.

Furthermore, in the EU, the consideration of assurance is increasingly encouraged, with international standards such as the AA1000 Assurance Standard (AA1000AS) of AccountAbility and the International Standard on Assurance Engagements (ISAE 3000) of the International Audit Assurance Standards Board (IAASB). These standards provide a principles-based framework that offers flexibility in various aspects of the assurance process, including the objective, level and scope of assurance, the procedures used, and the competence and independence of the assurance provider. As a result, the specific quality level of assurance is determined voluntarily by companies, and high-quality assurance is only sought when the expected benefits outweigh the costs. Expected benefits include achieving, maintaining and repairing legitimacy, particularly in response to a legitimacy crisis that prompts companies to take substantial action. However, when companies only aim at token actions to cosmetically manage their legitimacy, little investment in the quality of assurance is expected.

In the United States, on the other hand, there are no specific regulatory requirements for assurance of sustainability reports. The adoption of assurance in the US remains a voluntary practice, largely driven by corporate discretion and stakeholder pressure rather than regulatory obligation. The lack of mandatory requirements for assurance leads to significant variability in the quality and scope of assurance practices among US companies. As a result, while some companies may voluntarily adopt high standards for assurance to increase credibility and stakeholder confidence, others may opt for minimal or no assurance, reflecting the different approaches to sustainability reporting within the US market.

In the following sections, we will explore these issues in more detail, examining the implications of these frameworks and their impact on the quality, role and choice of assurance providers and the effectiveness of sustainability reporting and assurance in both the EU and US.

1.2.2. Role of the auditor/provider

In order to increase the credibility and trust of users and stakeholders, many companies opt for the assurance of their sustainability reports by an external, independent provider; its role is crucial and improves the perceived reliability of the information, leading to greater confidence in the use of such data for business decisions. Auditors identify relevant errors and omissions, improving the overall quality of the report. Specialised consultants offer a more focused review than traditional financial auditors, often including additional recommendations and comments that increase the clarity of the report.

Large auditing firms, such as the Big Four, invest significantly in developing their expertise in sustainability and offer high-quality services, but local and national consultants can provide assurance with a greater focus on detailed recommendations. The different standards used, such as AA1000AS and ISAE3000, influence the approach and focus of the assurance process. Methodologies may vary between different providers.
In addition, auditing and assurance on sustainability reports can send positive signals to the market, improving the transparency and reputation of the company, which also benefits the capital market.

Hence, it is the organisations themselves who have to decide whether or not to assure their sustainability report, and only if they decide to assure must they then make a decision on the type of assurance provider (Simnett R. & Vanstraelen A. 2007).

The credibility of the assurance professional and the quality of the assurance statement thus become potential elements influencing users' trust in sustainability reports and their perception of the reliability of such reports.

An independent assurance process adds value to report users in two main ways. First, it increases the likelihood of finding relevant errors and omissions, and thus is believed to improve the quality of information. Second, since the assurance function is performed by an independent third party, the perceived credibility of the information is likely to be increased. Consequently, users of the report are likely to have more confidence in the information accompanied by an assurance report than when such a report is absent. In other words, users are more likely to believe in information accompanied by an assurance statement provided by an objective and impartial third party, leading to greater confidence in relying on such

information in their decision-making process. Empirical evidence from a traditional financial reporting context supports the positive impact of auditing on the perception and decision-making process of financial statement users.

Recently, there has been a considerable growth in specialised consultants claiming expertise in the assurance of environmental and social activities. Wallage (2000) notes that these consultants are becoming major competitors in the assurance of sustainability reports. Mock et al. (2013) found that 35% of assurance reports were issued by the Big Four, while the remaining 65% were issued by local and national companies and consultants.

Emerging differences in approaches between accountants and consultants specialising in the assurance of sustainability reports have also been identified (Deegan et al. 2006b; Owen and O'Dwyer 2004). Compared to accountants, specialised consultants seem to focus more on the completeness, fairness and overall balance of opinion statements. For example, Deegan et al. (2006a) found that assurance statements issued by accountants generally do not include recommendations, praise or comments on the organisation's processes and systems. In contrast, assurance statements issued by other third parties, including specialist consultants, often contain such additional comments. As a result, report users may find these assurance statements more informative and clearer.

Furthermore, the Big Four have invested heavily in developing and offering a range of sustainability services and continue to actively market their expertise through various professional seminars and well-developed websites. Therefore, the strong profile of accountants as providers of high-quality professional services in the field of corporate reporting is likely to draw more attention of report users to their ability to provide high quality assurance on sustainability reports (Hodge K. et al., 2009).

Since assurance of sustainability reports is a relatively new and unregulated practice in most countries, there are different types of bodies providing assurance services using different frameworks, methodologies and assurance statements.

Currently, the two most widely followed frameworks are ISAE 3000 and AA1000AS, which are used by two different groups of assessors: professional accountants and non-accountants. Non-accounting firms are likely to rely on the AA1000AS framework, while accounting firms

tend to rely on ISAE 3000 (Deegan et al. 2006; Frost and Martinov-Bennie 2010; Mock et al. 2007; Moroney et al. 2009; Perego 2009).

The difference between accountants and non-accountants is not only related to the framework used to perform the assurance service. Hodge et al. (2009) argue that, compared to accountants, non-accountants seem to focus more on the completeness, fairness and overall balance of opinion statements. Perego (2009) concludes that accounting firms provide a higher quality of assurance for aspects associated with the report format and procedures used, while non-accounting firms provide a higher quality of assurance for aspects associated with recommendations and opinions.

Frost and Martinov-Bennie (2010) analysed the differences between assurance statements issued by assurance providers. They identified differences in the description of the assurance standards used during the assurance process (AA1000AS, ISAE 3000 and company-specific protocols), the wording of the conclusions, the title of the assurance statements, the objectives of the assurance processes and the assurance procedures used (Mori Junior R. et al., 2013).

Previous research has shown that obtaining independent assurance on corporate social responsibility (CSR) reporting has benefits for the capital market and that these benefits are amplified when accountants provide the assurance. However, little is yet known about whether and how CSR assurance improves the quality of CSR reporting and whether accounting providers improve the quality of reporting to a greater extent than non-accounting providers (Ballou B. et al. 2018).

In recent years, accounting firms, and in particular the Big4 (KPMG, EY, PwC and Deloitte), have increased their participation in the sustainability reporting assurance market. It seems that these large audit firms see the sustainability report assurance market as an opportunity. However, they also face several challenges, such as litigation risk (Ballou et al., 2006) or reputational risk, which might ultimately affect their financial audit service. Currently, the largest audit firms (Big4) control the audit market (Suddaby et al., 2007; KPMG, 2013).

Next, we will elaborate on the contents of the two most widely used standards (ISAE 3000 and AA1000AS) by consulting firms, as well as accountants or independent consultants with specialised expertise, to perform the assurance of sustainability reports.

1.2.3. ISAE 3000

Although there is a lack of specific guidance on assurance of sustainability reports, currently the two most popular standards providing guidance on assurance engagements, used by insurers worldwide, are (1) the International Standard of Assurance Engagements 3000 (ISAE 3000) published by the IAASB (2004b) and (2) the AA1000 Assurance Standard (AA1000AS) published by AccountAbility (2003). It is argued that while ISAE 3000 focuses on the assurance process with the scope predetermined in consultation with the reporting organisation (AccountAbility and KPMG 2005), AA1000AS focuses on the materiality of the subject matter to stakeholders and the accuracy and relevance of the report to stakeholders (Centre for Australian Ethical Research, 2004).

It is also argued that assurance based on the combined use of AA1000AS and ISAE 3000 can yield better results (KPMG Global Sustainability Services and AccountAbility, 2005).

The International Audit Assurance Standards Board (2011, p. 19) defines an assurance engagement as *"an engagement in which a practitioner seeks to obtain sufficient and appropriate evidence to express a belief designed to improve the degree of confidence of intended users, other than the responsible party, in the outcome of the measurement or evaluation of an underlying item against criteria"*.

While ISAE 3000's definition of an assurance engagement has a more technical explanation, AA1000AS used more common language to define it as "*an engagement in which an assurance provider assesses and expresses a conclusion about an organisation's public disclosures about its performance and underlying systems, data, and processes against appropriate criteria and standards in order to enhance the credibility of the information for its intended audience*" (AccountAbility 2008, p. 23).

ISAE 3000 provides a framework for performing assurance engagements that fall outside the scope of audits or reviews of historical financial information. It covers various aspects, including:

- planning and conducting assurance engagement
- assessment of assurance risks and procedures.
- formulation of the assurance opinion and drafting of the report.

ISAE 3000 is based on a systematic and standardised approach and requires assurance professionals to obtain sufficient and appropriate audit evidence to make a conclusion. This may involve collecting data, analysing processes and evaluating internal systems to ensure that the information reported is accurate, complete and truthfully presented (Mori Junior R. et al., 2013).

One of the key aspects of ISAE 3000 is the distinction between reasonable assurance and limited assurance. Reasonable assurance provides a higher level of assurance, involving a more thorough and detailed examination, while limited assurance provides a lower level of assurance, relying on less extensive procedures (Hodge K. et al., 2009).

In summary, ISAE 3000 represents a fundamental tool for the credibility and transparency of non-financial information, helping organisations improve stakeholder confidence through rigorous and structured assurance processes.

However, it is not the only international standard used and followed; while ISAE 3000 is more oriented towards a traditional and rigorous audit approach, AA1000AS places more emphasis on inclusiveness and materiality of sustainability issues. The choice between the two standards often depends on the type of assurance required, stakeholder expectations and the skills of the audit providers. The AA1000AS is now discussed in more detail.

1.2.4. AA1000AS

AA1000AS (AccountAbility 1000 Assurance Standard) is a standard developed by AccountAbility, an international organisation that promotes sustainability and accountability. AA1000AS is specifically designed for the assurance of sustainability and social responsibility reports. This standard focuses on:

- Inclusiveness, understood through stakeholder engagement and consideration of their expectations and concerns.
- Materiality, identifying and managing the most relevant aspects for the organisation and its stakeholders.
- Accountability, meaning the organisation's ability to respond appropriately to sustainability issues.

AA1000AS is often used by specialist consultants and organisations that want a more sustainability-oriented approach to stakeholder engagement. This standard allows for greater flexibility and is better suited to an organisation's specific sustainability needs.

AA1000AS is distinguished by its strong focus on stakeholder engagement, which is a crucial element in ensuring that an organisation's sustainability practices are relevant and credible. According to AccountAbility (2008), the AA1000AS methodology requires organisations to actively involve stakeholders in the assurance process, which leads to greater transparency and trust (AccountAbility, 2008).

A study by Manetti and Becatti (2009) points out that AA1000AS is particularly useful for organisations operating in sectors with a high social and environmental impact, as it helps to identify and manage stakeholder expectations more effectively than other assurance standards. This approach can improve the organisation's reputation and strengthen stakeholder relations (Manetti G. & Becatti L., 2009).

Furthermore, AA1000AS encourages organisations to develop systems and processes that not only meet sustainability criteria but are also adaptable to changes in stakeholder expectations over time. As noted by O'Dwyer and Owen (2005), this flexibility is crucial to maintaining the relevance and credibility of sustainability practices (O'Dwyer B. & Owen D. L., 2005).

The AA1000AS approach to materiality is another strength. It involves a continuous assessment of the most significant aspects for the organisation and its stakeholders, as described by Adams and Evans (2004). This dynamic assessment helps organisations focus their resources on the most relevant issues, improving the overall effectiveness of their sustainability strategies (Adams C. A. & Evans R., 2004).

In summary, AA1000AS offers a comprehensive and flexible framework for the assurance of sustainability reports, putting stakeholder needs and expectations at the centre. This makes it a valuable tool for organisations seeking to improve their sustainability performance and strengthen trust with their stakeholders.

1.2.5. Conclusions

So far, we have explored sustainability reporting and assurance reporting in detail, focusing on the distinctions between the European Union (EU) and the United States (US), as well as emphasising the importance of key standards such as ISAE 3000 and AA1000AS.

In Europe, directives such as 2013/34/EU and 2014/95/EU have established a detailed framework for the preparation of financial statements and non-financial information, although the lack of mandatory standards has limited the effectiveness of the legislation. The recent Corporate Sustainability Reporting Directive (CSRD) of 2022 represents significant progress, introducing mandatory assurance for sustainability reports and promoting the adoption of international standards to improve transparency and comparability of disclosures.

In the US, assurance of sustainability reports remains voluntary, without specific regulatory requirements, which has led to varied adoption of assurance practices by companies.

ISAE 3000 is distinguished by its rigorous and structured approach to assurance of sustainability reports, emphasising independence and objectivity in the assurance process, with two levels of assurance: reasonable and limited. It is fundamental to improving market confidence in the non-financial information disclosed by companies.

AA1000AS, developed by AccountAbility, is characterised by its flexibility and sustainability orientation, promoting inclusiveness, materiality and accountability. This standard is preferred by specialised consultants and companies with a strong social and environmental impact, facilitating more adaptable assurance to specific stakeholder needs over time.

The integration of the various standard-setting bodies under the International Sustainability Standards Board (ISSB) of the IFRS Foundation is a further step towards globally harmonised sustainability reporting.

Although, therefore, the EU has a more stringent and regulatory-oriented framework than the US, both face challenges in improving the quality and reliability of sustainability information. The future of sustainability reporting is likely to see increasing alignment of global standards, driven by the need to address environmental and social challenges on an international scale, supported by the adoption of robust and uniform assurance standards.

1.3. Benefits of assurance for the company

Sustainability reporting has become an essential aspect of modern corporate governance, reflecting a company's commitment to transparency, ethical practices and long-term sustainability. The study by Alsahali and Malagueno (2021) highlights the growing importance of sustainability reporting and assurance in today's corporate environment. The research highlights the increasing trend of sustainability reporting and assurance in various regions and sectors over a six-year period. This growth indicates an increased awareness and commitment by companies to disclose their sustainability practices and performance (Kolk & Perego, 2010).

One of the main benefits of sustainability reporting is the strengthening of credibility and trust (Walker & Wan, 2012). Assurance of sustainability reporting through independent third-party assurance, stakeholder panels or expert opinions can significantly strengthen the reliability of the information presented. This increased reliability contributes to building trust between the company and its stakeholders, including investors, customers and the general public. The study points out that mechanisms such as internal audits or stakeholder panels can build trust between companies publishing sustainability reports and the intended users of these reports (Alsahali & Malagueno, 2021).

Furthermore, sustainability disclosures play a crucial role in reducing information asymmetries and uncertainties between a company and its shareholders. By providing comprehensive and reliable sustainability information, companies enable investors to make more informed decisions, potentially reducing the cost of equity capital. This reduction in information asymmetries is particularly important because it allows investors to assess broader aspects of company performance beyond financial data alone and can potentially reduce the cost of equity capital (Simnett et al., 2009).

The relevance of sustainability information for investors is another significant benefit highlighted by studies. Although sustainability reports are generally aimed at a broader group of social stakeholders, recent research shows that environmental and other socially responsible information is increasingly important to investors. This information is essential to ensure the long-term success of a company and is important for investors, who need a comprehensive view of the company's performance. (FASB, 2010; IASB, 2010).

Corporate reputation is another critical aspect influenced by sustainability reporting; assurance enhances a company's reputation by demonstrating its commitment to transparency and ethical practices. Companies that have a greater need to build their corporate reputation are more likely to have their sustainability reports certified. This assurance serves as a signal to the market of the company's commitment to sustainability and ethical practices, thus enhancing its reputation (Simnett et al., 2009).

Regulatory compliance and preparation for future regulations are also significant consequences of sustainability reporting. The trend to make sustainability reports mandatory is growing, as evidenced by the European Parliament's enactment of the EU Non-Financial Reporting Directive, which requires large European companies to provide sustainability reports. Although the directive does not require assurance of these reports, the European Commission has proposed a directive on corporate sustainability reporting (CSRD) that requires limited external assurance of the reported information. Studies on sustainability reporting can help regulators develop future regulations that guarantee that companies provide valid and reliable information (Alsahali & Malagueno, 2021).

What is more, assurance increases investor confidence. Investors increasingly consider sustainability information in their decision-making processes. Assured reports can give investors' confidence that the information is accurate and reliable, which can be crucial for securing investments.

Another major benefit of assurance of sustainability reports is the ability to regain legitimacy lost due to media coverage of less sustainable stocks. This is particularly important because loss of legitimacy can result in significant costs for companies, such as increased cost of capital and difficulty in accessing financial resources. High-quality assurance helps mitigate these negative effects by offering a kind of "repair" of corporate reputation.

In addition, assurance provides insights into weaknesses in companies' internal control systems and offers guidance for designing, developing and implementing new processes that facilitate better decision-making regarding sustainability practices. This not only improves the transparency and reliability of reported information, but also contributes to more effective management of significant sustainability risks, preventing the recurrence of adverse events in the future.

Another significant benefit is the ability of assurance to help companies better understand emerging sustainability issues, aligning their activities and policies with material stakeholder concerns. This is particularly relevant in non-controversial sectors, where companies with effective boards are more likely to use high-quality assurance to mitigate legitimacy harms. However, even in controversial industries, companies can benefit from high-quality assurance, especially if they have active and independent boards of directors (Emma G. et al., 2024).

In conclusion, the assurance of sustainability financial statements offers numerous benefits, including enhanced credibility, reduced information asymmetries, improved corporate reputation, regulatory preparedness, increased investor confidence, as well as regained legitimacy, improved internal control systems, better understanding of emerging sustainability issues and more effective risk management. These benefits collectively contribute to the long-term success and sustainability of a company and are further amplified by the presence of effective boards of directors and cultural and regulatory influences. Studies by Alsahali and Malagueno (2021) and Herda (2014) provide valuable insights into the importance of sustainability reporting and assurance, highlighting the growing trend and importance of these practices in today's business environment.

1.4. The process of assurance the sustainability reports

In recent years, sustainability has become a central theme for companies around the world. The growing awareness of ESG issues has prompted companies to report on their non-financial performance through sustainability reports. These documents not only illustrate economic, social and environmental initiatives and results, but also represent a commitment to transparency and social responsibility. However, to ensure the credibility and reliability of these reports, it is crucial to subject them to an assurance process. This process, regulated by international standards such as ISAE 3000, aims to verify the correctness and reliability of the information provided, reducing the risk of error and improving internal control systems.

The assurance process of corporate sustainability reports is a complex and multifaceted activity involving several stages and actors. The assurance process of sustainability reports is essential to ensure the credibility and reliability of non-financial information provided by companies. Through careful planning, risk assessment, control and testing, review and issuance of the final report, the independent auditor ensures that the sustainability report objectively and

transparently represents the company's economic, social and environmental performance. This process not only increases the trust and transparency of the organisation, but also provides greater assurance to all stakeholders, contributing to the sustainable development of the company.

The assurance process of sustainability reports is a topic of growing interest in the context of responsible business practices. This process has been the subject of numerous studies, which have attempted to outline its fundamental characteristics and operational dynamics.

The sustainability report assurance process can be conceptualised as a systematic procedure consisting of five main steps: selection of the assurance provider, identification, screening, validation and evaluation.
The selection of the assurance provider is a crucial phase, as the credibility and independence of the provider significantly influence the quality of the assurance.
Next, the identification phase involves determining the specific aspects of the sustainability report that will be subject to assurance. During this phase, the auditor identifies critical areas of the sustainability report that could present significant risks of error or omission. This assessment is crucial in defining the audit approach and procedures to be adopted.
The next step, screening, is the collection and preliminary analysis of relevant information. At this stage, the auditor also examines the company's internal control systems and tests the reliability of the data and information provided. This includes verifying the quality and completeness of the report, the adequacy of the systems, processes and procedures, and the existence of appropriate skills in providing data and information.
The validation phase involves a thorough verification of the data and information contained in the report; during this phase, any adjustments or audit differences are identified.
At the end of this audit, we move on to the final evaluation phase in which the auditor obtains the "letter of attestation" and formulates an overall opinion on the reliability and completeness of the sustainability report. This report attests to the correctness and reliability of the information provided in the sustainability report. In addition, the auditor prepares a "management letter" containing suggestions and points for improvement on the sustainability reporting process. This letter includes the implications for the company's sustainability strategy, recommendations, management comments and priority level.

In addition to the description of the operational steps, the literature has identified several barriers that may hinder the adoption and effectiveness of sustainability reporting assurance.

Among these, the absence of active stakeholder involvement and the lack of independence of the assurance provider are particularly relevant. These factors can undermine the credibility of the assurance process and, consequently, stakeholder trust in the sustainability report.

In conclusion, the assurance of sustainability reports is a key element in ensuring the transparency and reliability of non-financial information provided by companies. Despite the complexity and challenges associated with this process, its proper and rigorous implementation can strengthen stakeholder trust and promote more responsible and sustainable business practices. Careful selection of the assurance provider, combined with meticulous planning and critical evaluation, results in reports that accurately reflect the company's economic, social and environmental performance. Overcoming existing barriers and ensuring active stakeholder engagement is key to improving the quality of assurance and promoting more responsible and sustainable business practices, as well as to the success of assurance, which ultimately contributes to progress towards sustainable and responsible development for companies worldwide (Yan M. et al., 2022; ESG Commission, Sustainable Development and Corporate Reporting, 2023).

1.5. The importance of social media in the assurance of ESG reports

In recent years, the use of social media by companies has become increasingly relevant for engagement with their stakeholders and communication of sustainability performance and beyond. This use can strengthen the assurance process of sustainability reports, improving the transparency, trust and legitimacy of the information provided.

Social media offer open and non-hierarchical platforms that facilitate participation and co-construction of agendas with stakeholders. According to Castello et al. (2016), this type of engagement can contribute to greater transparency and trust in the information provided in sustainability reports, as it allows stakeholders to interact directly with the company and express their opinions and concerns.

Chu et al. (2020) points out that social media has changed the way companies communicate their environmental performance, improving the quality of corporate social responsibility (CSR) communication and reducing the risk of greenwashing. This improvement in communication can support the assurance process by providing an additional layer of

verification and feedback from stakeholders, which can help identify any discrepancies or areas for improvement in sustainability reports.

In the past, the use of social media for assurance communication focused mainly on increasing the transparency and quality of corporate social responsibility communication. Chu et al. (2020) points out that the advent of social media has improved CSR communication and reduced the risk of greenwashing, allowing companies to engage in two-way dialogues with stakeholders and reducing public scepticism towards CSR initiatives.

As for future trends, the use of social media will continue to represent a significant opportunity for CSR communication, pushing companies towards new levels of openness and transparency. Social platforms such as X are considered suitable for engaging in corporate-public dialogues on sustainable development (SD) issues, although they may increase the complexity of debates.

The companies that have performed the assurance of their sustainability reports use social media for various purposes related to communication and engagement with stakeholders. According to Saxton et al. (2020), social media offer a dynamic and interactive public space in which discussions about companies' CSR performance can take place. In this space, companies and their stakeholders can debate, discuss and dialogue on key issues such as the company's level of CSR. In addition, social media allows companies to post visual and textual “micro-reports” on their CSR efforts, and to respond to messages from the public, constituting a new form of corporate behaviour that interweaves promotion, reporting and accountability.

Companies also use social media to respond to their public stakeholders by providing “micro-accounts” of their performance, which is considered an important form of corporate ethical behaviour. Engagement on social media can lead to benefits such as increased legitimacy and reputation of the company.

Bryl and Supino (2022) explore how social media has transformed the way companies communicate their sustainability practices. Traditionally, corporate annual reports, whether in paper or digital (PDF) format, have been the main vehicle for corporate information disclosure. However, these traditional methods have several significant limitations. They are predominantly retrospective and a one-way form of communication, which makes them unsuitable for modern communication contexts that require interactivity and timely updates.

Traditional reports often lead to a considerable delay in disseminating information, making them less effective in responding to dynamic stakeholder needs. In this context, research on sustainability reporting has suggested adopting more innovative perspectives, investigating modern tools such as social media platforms. Social media represent an informative and rich communication channel that enables two-way communication between organisations and their stakeholders.

Social media have gained importance in companies' internal and external communication strategies. They enable greater interaction, allowing citizens to praise, engage, ask questions and criticise organisations in a highly interactive and publicly visible forum. With the advent of social media, stakeholders can express their opinions about companies without having to go through the filters of traditional media. This phenomenon has the potential to change the dynamics of relationships between companies and society, offering a means to preserve and strengthen stakeholder relationships (Saxton, 2019).

Companies use social media to demonstrate their responsiveness to stakeholders, thereby legitimising their actions and seeking to be transparent and accountable. Research shows that companies create visual and textual “micro-reports” about their social responsibility activities through social media. One of the greatest strengths of social media is its ability to facilitate two-way communication, enabling greater stakeholder engagement in sustainability dialogues. However, it has been observed that relatively few companies use social media to engage stakeholders in corporate social responsibility (CSR) activities (Saxton, 2020)

In general, social media allow companies to adopt a more dialogical and transparent approach in their sustainability communication, overcoming the limitations of the one-way, static communication of traditional annual reports.
In summary, the use of social media for stakeholder engagement and communication of sustainability performance is closely linked to the assurance process of sustainability reports. Through dynamic and interactive platforms, companies can improve the transparency, trust and legitimacy of the information provided in sustainability reports.

1.6. Conclusions

In recent decades, sustainability has become an essential pillar of modern business, driving towards greater transparency and accountability of business practices. This has led to

the adoption of sustainability reports, key tools for communicating environmental, social and economic performance. The evolution of sustainability reporting, initiated in the 1980s and 1990s and consolidated with the GRI standards, has enabled a structured and comparable approach to reporting on sustainable practices. GRI standards improve the transparency and credibility of information, helping companies manage sustainability risks and opportunities, building trust among stakeholders and positioning themselves as sustainability leaders.

Sustainability reporting, while voluntary in the US, is adopted by many companies to enhance the credibility of information. Standards such as ISAE 3000 and AA1000AS provide guidelines for assurance, improving the quality of disclosed information and enhancing corporate legitimacy. Assurance helps mitigate risks and ensure that corporate decisions also consider social and environmental impacts.

Sustainability reports, supported by GRI standards and assurance, are essential for modern companies. These tools facilitate dialogue with stakeholders and promote responsible business practices, ensuring that business decisions are informed not only by economic performance, but also by social and environmental impact. The increasing adoption of international standards and integration under the IFRS Foundation's International Sustainability Standards Board (ISSB) point to a future of increasingly harmonised sustainability reporting globally. Although the EU has a stricter regulatory framework than the US, both markets face challenges in improving the quality and reliability of sustainability information.

Sustainability reporting is essential for modern corporate governance, reflecting a commitment to transparency and long-term sustainability. Independent third-party assurance of sustainability reports improves the credibility of information and builds trust among stakeholders, reducing information asymmetries and capital costs. It also contributes to corporate reputation and regulatory compliance, offering insights into internal weaknesses and sustainability risks. Quality assurance is critical for companies to maintain legitimacy and align with stakeholder concerns.

Assurance of sustainability reports offers numerous benefits, including enhanced credibility, reduced information asymmetries, improved corporate reputation and regulatory compliance. These benefits are crucial to the long-term success of companies, especially in an economic environment that values transparency and sustainability. Studies highlight the growing

importance of these practices, demonstrating that quality assurance is a key component of effective corporate governance and stakeholder trust.

Chapter 2 - Disclosure on how companies that make assurance in sustainable reports behave in social media

2.1. Introduction

In recent years, the increase in third-party assurance of corporate sustainability reports, as well as its growing importance in corporate practice, has caused the academic community to increasingly analyse this phenomenon in detail. Recent research in this area has focused on analysing the benefits that the assurance of sustainability reports brings not only to the company, by increasing the trustworthiness of their sustainability reports and the perceived reliability of the information contained therein, but also to the stakeholders, who see their demands for strengthening the credibility and legitimacy of sustainability reports taking shape. For example, Reimsbach et al. (2018) found that assured sustainability information has a positive impact on companies' perceived sustainability performance, influencing investment decisions. Sustainability reporting can influence public opinion about companies, which, as noted by Bitektine (2011), can be crucial to their survival. Simnett et al. (2009) identify factors associated with the decision to voluntarily purchase assurance and the choice of assurance provider.

Assurance is thus perceived as a key component in ensuring the credibility and reliability of sustainability reports, in the same way that external auditing supports financial reporting (Manetti & Toccafondi, 2011).
This demand for increased transparency and accountability has also seen its application using social media by companies, not only to communicate the release of the sustainability report but also all the practices it carries out as a commitment to sustainability and the reliability of its practices (Kaplan, A. M., & Haenlein, M., 2010).
Companies often use social media to be able to communicate their transparency to stakeholders. Social media offer a platform for direct engagement with stakeholders and the public regarding corporate sustainability. The fact that a sustainability report has been verified can increase public interest and generate discussion. The assurance of these can improve the perception of the brand as ethical and transparent, so companies can use social media to reinforce this perception (Bellucci, M., & Manetti, G., 2017).

In summary, the assurance of sustainability reports is assuming an increasingly central role in guaranteeing transparency and credibility to corporate information, so much so as to become

an essential element in meeting the legitimacy and trust needs expressed by stakeholders. This process, parallel to auditing, not only enhances the reliability of sustainability reports, but also influences public perception and investment decisions. Social media, in this context, represent a crucial tool to amplify the message of transparency and engage stakeholders in a direct way, promoting the company's image as ethical and responsible.

2.2. Use of social media by corporations for CSR communication

In recent years, social media have profoundly transformed corporate communication methods, becoming a fundamental tool for companies wishing to interact with their stakeholders. This phenomenon has found particular relevance in corporate social responsibility (CSR) communication, as digital platforms offer companies the opportunity to promote transparency and build a positive reputation through continuous and interactive dialogue.

With the exponential increase of Internet and social media users in 2024, as evidenced by recent data (Statista, 2024), companies are pushed to review their communication strategies to make the most of these channels. While social media originated with the purpose of connecting people on a personal level, its use has extended to business, political and social contexts, turning into a tool to convey financial information, promote products and discuss political issues (Allcott et al., 2020; Lee et al., 2015).

In this context, social media have become a unique opportunity for companies not only to disseminate their CSR initiatives, but also to establish a two-way dialogue with their stakeholders. Their strategic use, when aligned with the preferences and needs of the various stakeholders, can generate significant impact in terms of transparency, accountability and social capital. The following section will examine the evolution of social media as a corporate communication and CSR tool, its strategic impact on corporate transparency and brand equity, and finally its role in creating greater stakeholder engagement and building social capital.

2.2.1. Evolution of social media as a corporate communication and CSR tool

In July 2024, the number of Internet users worldwide reached 5.45 billion, or 67.1% of the global population, with 94.8% of them active on social media (Statista, 2024). Initially created to foster personal connections, social media today are also crucial tools for businesses,

used to communicate financial information, promote products and participate in political debates (Allcott et al., 2020; Lee et al., 2015).

Corporate digital communication has become an integral part of corporate strategies, with a strong impact on perceptions by investors and other stakeholders (Powell et al., 2016). Digital interactions influence corporate reputation and credibility, prompting companies to expand communication channels, moving beyond traditional means to meet the growing demand for transparency. As interest in sustainability and social responsibility increases, companies use social media to disseminate updates on their sustainable initiatives, opening a space for dialogue with stakeholders (Cho et al., 2012; Castelló et al., 2016).

Social platforms such as Facebook, Twitter and Instagram facilitate corporate transparency and dialogue with the public, improving communication about CSR (Corporate Social Responsibility) initiatives and reducing information gaps (Saxton et al., 2019). Companies with high CSR ratings tend to be more active on social media, attracting more followers and preventing greenwashing (Lee et al., 2013; Lyon & Montgomery, 2013).

The ability of social media to foster engagement and two-way dialogue between companies and stakeholders represents an opportunity to improve reporting and meet stakeholders' expectations, particularly in non-financial sectors (Manetti, 2011; Chua et al., 2012). However, excessive corporate self-promotion can lead to the “self-promotion paradox”, in which corporate communication is negatively perceived due to the open and uncontrollable nature of platforms (Lyon & Maxwell, 2011; Berger & Milkman, 2012). Furthermore, the rapid dissemination of information on social media, including inaccurate or misleading information, can undermine corporate reputation (Oh et al., 2013).

In corporate crisis contexts, it may be preferable to limit two-way communication on social media, as loss of control of the narrative may have negative consequences. In such cases, silence may prove to be the best strategy (Ham & Kim, 2019; Stieglitz et al., 2019). Another effective tool to increase corporate credibility is voluntary assurance on CSR reports, which provides assurance on communicated standards, reducing the need for further social media interactions (Maroun, 2017; Simnett, 2014).

Finally, according to signalling theory (Spence, 1973; Connelly et al., 2011), both assurance and social media communication can act as signals that improve transparency and reduce

information asymmetries. However, the relationship between these tools deserves further empirical studies.

2.2.2. Strategic impact of social media in CSR communication and corporate transparency

In recent years, the use of social media has become a key strategic tool for companies wishing to communicate their corporate social responsibility (CSR) initiatives. Thanks to their ability to provide a direct and interactive channel with stakeholders, social media allow companies to build a transparent and continuous dialogue, thus improving the public perception of their social commitment (Blankespoor, 2018). Digital platforms, such as Facebook and Twitter, represent privileged environments to promote corporate values, boosting brand reputation and enhancing the social value associated with CSR activities.

Indeed, social platforms not only facilitate the dissemination of CSR messages, but also amplify their reach thanks to the viral effect of the content. As pointed out by Berger and Milkman (2012), online content that evokes emotions, whether positive or negative, tends to go viral, providing wide visibility to CSR initiatives. This phenomenon represents a valuable resource for companies, which can exploit the virality of social media to maximise the impact of their CSR campaigns, making them not only known to a wider audience, but also engaging and memorable. In this way, companies are able to convey their values more effectively than through traditional communication channels.

Another crucial aspect of using social media in CSR communication is the ability to promote transparency and accountability of companies. Karunakaran, Orlikowski and Scott (2022) highlight how social media are able to reconfigure accountability dynamics through the direct involvement of stakeholders, who can immediately interact with companies and influence the public debate regarding their social initiatives. This crowd-based approach to corporate accountability fosters greater transparency as companies are called upon to respond in real time to public criticism and expectations.

In addition, the use of social media allows companies to manage and mitigate reputational risks related to greenwashing practices, i.e. the misleading presentation of a virtuous environmental image that does not reflect real company practices. Lyon and Montgomery (2013) point out how the phenomenon of “tweetjacking”, i.e. the hijacking of social media conversations by

critical users, can quickly expose any discrepancies between CSR messages and actual company actions. Consequently, social media is not only a dissemination tool, but also a means through which the public can monitor and assess the authenticity of companies' CSR claims.

2.2.3. Strategic impact of social media on brand equity through CSR communication

Existing literature on the topic identifies that companies that use social media platforms strategically, in particular by aligning CSR activities with the appropriate platform and stakeholder preferences, achieve greater brand equity, i.e. the added value that a company is able to gain through its social responsibility initiatives. Brand equity is positively influenced when consumers perceive that a company is genuinely engaged in activities that go beyond profit and contribute to the wellbeing of society and the environment, very often companies engaged in this way communicate to stakeholders through social media.
It is also pointed out that some platforms are more effective depending on the type of CSR activity to be communicated (e.g. environment, community, employees, customer relations). For example, Pinterest and YouTube showed a positive impact on brand equity when used for community-related CSR, while Facebook and LinkedIn did not show significant effects for the same (Yang J. et al. 2018).

The company's choice of platform is therefore very important as social media platforms differ in their impact on brand equity when used for CSR communication. In particular, Pinterest, although little used, was found to have a unique structure that allows users to "pin" content, gives companies more control over the visibility and curation of their CSR messages.

When choosing a platform, it is very important to understand the type of CSR activity one wants to communicate through the platform. For example, community-focused CSR initiatives have been communicated more effectively on YouTube and Pinterest than other platforms. The visually rich and emotionally engaging nature of these platforms helps to deliver impactful content.
The interactive features of social media enhance the perceived credibility and appropriateness of CSR activities. For example, LinkedIn's professional focus makes it ideal for communicating employee-related CSR activities. Furthermore, in order to build stronger relationships with stakeholders, it is important to be transparent in communication and to allow for user interactivity.

Companies use social media to share CSR initiatives and improve their public image. However, CSR posts receive less attention than advertising or ordinary posts. Most companies mainly use Facebook for these communications, taking advantage of its large user base, being the most used social media in the world with over 3 billion monthly active users (Pavlíček A. & Doucek P., 2015).

Pavlíček A. and Doucek P. analysed how ten large multinational companies, recognised for their CSR reputation, use platforms such as Facebook and Twitter to share information and interact with the public about their social responsibility initiatives. The analysis considered 466 posts in total, distributed across Facebook and Twitter. The majority of the posts (80%) are about advertising and product promotion, while only 12.88% are dedicated to CSR. CSR posts, although less frequent, receive a generally positive response from users, both in terms of likes and shares.
User feedback was evaluated to understand the impact of CSR posts compared to non-CSR posts. Overall, CSR posts tend to receive fewer likes and shares, but the feedback in the comments is more positive than advertising posts.

Although CSR has become an integral part of companies' communication strategy, user engagement on social media remains limited. However, the general sentiment towards CSR messages is positive, suggesting that companies can benefit from integrating them more into their digital communication strategies.

In conclusion, while CSR is a key element in building brand equity, the success of these social media initiatives is highly dependent on the choice of platform and the appropriateness of the message with respect to stakeholders' interests. Social platforms are not all equal in terms of effectiveness in communicating CSR activities: YouTube and Pinterest prove to be particularly effective for community initiatives due to their ability to emotionally engage users through visual content, while LinkedIn is more suitable for communicating employee-related activities due to its professional focus.

Although CSR posts receive less attention than advertising content, the interaction they generate is qualitatively positive, suggesting a potential yet to be fully exploited by companies. To maximise the effectiveness of CSR communication, companies should adopt a more strategic approach, taking full advantage of the distinctive features of the different social

platforms and more prominently integrating CSR messages into their digital communication strategies. By doing so, they would not only improve user engagement, but also strengthen the perception of their social engagement and, consequently, their brand equity.

2.2.4. Enhancing stakeholder engagement through social media

Stakeholder engagement is a key component in CSR communication, and social media has proven to be an effective tool to facilitate this interaction. Social platforms enable companies to establish direct dialogues with stakeholders, fostering transparency and trust. According to Alexander, Pilonato and Redigolo (2023), the strategic use of social media allows companies to improve interaction with their supporters, as demonstrated by the example of institutional donors in the Italian non-profit sector, who value activity and engagement on social. This continuous feedback mechanism allows companies to be more responsive to the needs of their audience, thus improving the perception of their social engagement.

Furthermore, the ease with which stakeholders can interact with companies through social media allows for a more critical and transparent approach, as highlighted by Castelló, Etter and Nielsen (2016). Stakeholders do not only passively consume CSR information, but actively participate in the debate, influencing corporate legitimacy and reputation. The possibility of establishing this “critical dialogic engagement” has also been discussed by Bebbington et al. (2007), who highlight the importance of a dialogic approach to build stronger corporate legitimacy through CSR communication.

Furthermore, the amplifier effect of social media allows companies to achieve deeper and more immediate engagement during critical events or reputational crises. As pointed out by Ahern and Sosyura (2015), sensationalism in financial media can lead to the rapid spread of rumours that negatively impact the perception of the company. However, the proactive use of social media to manage communication during a crisis can mitigate such risks and improve company resilience.

2.2.5. Building social capital through CSR communication on social media

The use of social media for CSR communication has a significant impact on the creation of social capital, as digital platforms facilitate the building of networks and relationships that

strengthen mutual trust between the company and its stakeholders. Fieseler and Fleck (2013) highlight how corporate blogs and other forms of structural engagement on social media are capable of building social capital through empowerment dynamics, creating a space where stakeholders can interact directly with the company. This social capital translates into greater transparency and trust, which are essential for the success of CSR initiatives.

According to Boiral et al. (2019), quality assurance of CSR reports plays a key role in improving the credibility of shared information. Although this aspect mainly relates to the external verification of sustainability reports, the use of social media offers a form of "implicit assurance", as it allows stakeholders to monitor and react to company activities in real time, thus increasing the pressure for greater transparency. Adams and Evans (2004) highlight the importance of completeness and credibility in corporate communications, aspects that can be reinforced by constant and open interaction on social media.

Furthermore, the adoption of CSR communication strategies through social media allows companies to position themselves as thought leaders in the field of sustainability, thus strengthening their reputational capital. According to Ballou et al. (2018), the reliability of CSR information is essential for maintaining a good reputation, and social media provide a direct means through which companies can demonstrate their concrete commitment to social responsibility. In this context, acquired social capital becomes a strategic resource that can be used to build alliances and partnerships with other actors in the supply chain.

2.3. Research question

After analysing in detail and from a theoretical point of view the role of sustainability reports and their related assurance, we will explore how this assurance activity impacts companies' social media behaviour. The main objective is to analyse how the assurance of these reports influences companies' communication strategies and social interactions, as well as public perception and engagement with stakeholders.

The research was conducted through an empirical analysis of a sample of sustainability reports published by Fortune 200 US companies from different industries. These reports were examined for reliability by independent providers and to assess the quality and accuracy of the information provided. In parallel, an analysis of companies' activities on social media was conducted, taking into consideration various performance indicators, such as the number of

posts, the level of engagement, the frequency of interactions with users and the tone of communication.

The assurance of sustainability reports represents a strategic tool that can positively influence the dynamics of communication on social media, strengthening the trust and transparency perceived by stakeholders. The research contributes to a deeper understanding of the role of external verification in corporate sustainability management and offers practical insights for companies wishing to improve their communication and engagement strategies through social media.

2.4. Formulation of hypotheses

Examining the role and characteristics of social media in the context of Corporate Social Responsibility (CSR), we can state how social media, due to their dialogic and uncontrollable nature, can influence the management of stakeholder relations in a different way than traditional media.

Social media are described as dialogic platforms, which facilitate the construction of ethically superior and practical relationships compared to traditional media. Their uncontrollable nature and multi-directional flow of information make it difficult for companies to manipulate content or public opinion. In addition, social media allow the creation of coordinated effects from uncoordinated actions, highlighting responsible behaviour and denouncing improper ones.

Companies with greater social responsibility tend to adopt social media more proactively, using these platforms to promote positive awareness among stakeholders. Early adoption of social media is seen as an indicator of a company's ability to effectively manage stakeholder relations. Online presence, measured by the number of followers, is influenced by the perception of the company's social responsibility.
Companies with strong social responsibility are more likely to generate company-driven communications, such as tweets and replies, to engage stakeholders. However, companies with a poor social reputation (CSIR) may also be motivated to use social media to repair their image. Messages associated with socially responsible or irresponsible companies are more likely to go viral due to the strong emotional reactions they evoke among stakeholders (Lee et al., 2013).

In order to define the following research in detail and to be able to verify the veracity of the characteristics just listed, a series of hypotheses were developed exploring how companies with assurance in their CSR reports are more likely to adopt and use social media proactively, build a greater online presence and generate more effective communication with stakeholders than companies without assurance.

The following hypotheses are necessary in order to be able to make accurate and testable predictions regarding the relationships between the variables studied, they help determine which data should be collected and which methods should be used.

Through the hypotheses, it is possible to test whether causal or associative relationships exist between the variables. In the context of the study, it could be tested whether a CSR report assurance causes higher social media adoption or faster follower growth, providing a clear structure and direction to the research, preventing the study from scattering in multiple directions. This helps focus the analysis on the specific research question.
By then testing the hypotheses, we can support or modify existing theories concerning, for example, the effectiveness of CSR in managing stakeholder relations through social media.

Below are some hypotheses that will be verified through the data collection carried out above, see Chapter 4 “Analysis of study results” for verification and analysis of the data collected.

- H1: Companies that have assured their sustainability report post more on Facebook than companies that have not assured their reports.
- H2: Companies that have assured their sustainability report achieve a higher level of engagement (likes, comments, shares) on posts than companies that have not assured their reports.
- H3: Companies that have assured their sustainability report show faster growth in the number of followers on social media than companies that have not assured their reports.
- H4: Companies without assurance showed a more stable growth of followers over time, while companies with assurance experienced more pronounced variations.
- H5: Companies that have assured their sustainability report are larger and more efficient than companies that have not assured their reports.

2.5. Research methodology

The research method chosen for this analysis is a quantitative approach, supported by an empirical analysis of data on companies' sustainability reports and their social media activities. Data will be collected from a sample of Fortune 200 US companies, with a focus on companies that have secured their sustainability reports through independent third parties. The tools used will include social media analytics software to monitor social activity (number of posts, engagement, follower growth), as well as content analysis on sustainability reports to assess their quality and reliability. The sample size will be determined by selecting enough companies to obtain statistically significant and representative data from different industries.

We chose a quantitative approach because it allows an objective and comparable measurement of key variables, such as frequency of posts and level of engagement on social media, providing a solid basis for drawing generalisable conclusions. The choice of the sample based on Fortune 200 US companies is justified by the relevance of these companies in the international context and the availability of verified data regarding their sustainability and communication practices. The use of social media analytics software will enable the collection of real, up-to-date data on companies' social activities, providing detailed insights into their interactions with stakeholders.

The data collected will be analysed to test the research hypotheses by examining whether companies that have secured their sustainability reports exhibit greater social media activity, higher engagement and faster follower growth than those that have not adopted assurance practices. Key variables will be the frequency of posts, the number of interactions (likes, comments, shares) and the diversity of platforms used. Statistical analysis (e.g. multiple regressions) will be employed to identify significant correlations between report assurance and social metrics. These tools will provide a clear picture of how the transparency and credibility conferred by assurance influences public perception and corporate behaviour on social media.

The methodological approach, structured in this way, aims to answer the research question on the role assurance of sustainability reports plays in improving companies' communication strategies and interactions with stakeholders on social media, in line with the objectives of transparency and corporate responsibility.

2.6. Sample description

The initial sample for this research was selected from Fortune 200 companies in the United States, with the objective of analysing the impact of sustainability reporting assurance on their social media communication activities. The final sample includes 161 companies, for which the presence of sustainability report assurance in the period between 2016 and 2020 was examined.

The decision to focus on the Fortune 200 is motivated by the importance and visibility of these companies both nationally and internationally, as well as the availability of comprehensive and verified data regarding their sustainability reports and use of social media. This sample provides a robust basis for conducting an empirical and statistical analysis examining the correlations between report assurance and social activity, allowing meaningful and generalisable conclusions to be drawn for the wider business context.

The selection of companies was guided by the availability of sustainability reports published during the period under review and access to verified data on the social activity of these companies. This allowed to assess the impact of securing reports on key indicators such as the level of engagement, frequency of posts and follower growth on key social media outlets such as Facebook, Twitter and Instagram.

Chapter 3 - Research model

3.1 Introduction

In this chapter, we delve into the research model that forms the backbone of the empirical analysis conducted in this study. Following the theoretical framework established in the previous chapters, where we explored the role of third-party assurance in sustainability reporting and its potential influence on corporate social media behavior, the research model serves as the mechanism through which these hypotheses are tested. The objective is to provide a structured and data-driven approach that allows to measure the relationship between the assurance of sustainability reports and corporate engagement on social media platforms.

As businesses increasingly adopt social media to communicate with stakeholders, especially in the context of Corporate Social Responsibility (CSR), understanding the factors that influence their social media strategies has become crucial. Specifically, this research seeks to analyze whether companies that assure their sustainability reports—through external third-party verification—engage more effectively and transparently with their stakeholders online. The assurance of these reports, a practice intended to bolster the credibility of the information presented, may also affect how companies use social media to communicate their sustainability initiatives, interact with followers, and manage public perceptions. By examining a sample of Fortune 200 companies, this chapter seeks to validate or refute the hypotheses introduced earlier, such as whether assured companies post more frequently on social media, generate higher levels of engagement, and experience faster follower growth than their non-assured counterparts.

This chapter also introduces the statistical tools and methodologies employed to answer the research questions. The primary method used is regression analysis, which allows to identify relationships between the independent variable (the presence of sustainability report assurance) and various dependent variables, such as the number of social media posts, engagement levels, and follower growth. Given the multidimensional nature of social media behavior, the research model integrates both multiple regression models - to explore continuous variables like posting frequency and engagement rates - and logistic regression models, which are used to investigate binary outcomes such as the likelihood of adopting certain social media platforms. These models are essential for offering nuanced insights into the impact of assurance on social media activities, which ultimately influence corporate transparency and stakeholder relations.

Additionally, the research model will be implemented using Stata, a widely recognized statistical software tool that allows for sophisticated data analysis. Stata's capabilities will enable the processing of large datasets and the generation of comprehensive statistical results. The chapter will guide the reader through the process of constructing the research model, from data preparation and variable operationalization to the execution of regression analyses and the interpretation of results. Through this approach, the chapter will provide a detailed account of how the research model addresses the hypotheses and contributes to answering the overarching research question: "How does the assurance of sustainability reports influence corporate social media behavior?"

The final sample, which consists of 161 companies drawn from Fortune 200, provides a robust dataset for empirical analysis. These companies span a range of industries, and the period analyzed covers the years from 2016 to 2020, providing a comprehensive timeframe to assess trends and behaviors. This dataset allows to explore not only if companies with assured sustainability reports post more frequently on social media but also if they generate higher levels of engagement and grow their follower base more rapidly.

The rationale for selecting Fortune 200 US companies lies in their prominence and visibility on a global scale, making them ideal subjects for studying corporate transparency, sustainability, and social media engagement. These companies are often leaders in their sectors, and their approach to CSR and sustainability reporting can set industry standards. Moreover, their social media activities tend to be more visible and measurable due to their broad reach and significant follower bases across various platforms, making them well-suited for analysis in this context.

By the end of this chapter, we aim to present a clear understanding of how the research model has been designed and applied, and how it effectively aligns with the study’s objectives. The findings from this model will not only test the hypotheses but also contribute to the broader understanding of how sustainability assurance practices influence a company's digital communications, particularly in relation to stakeholder engagement through social media. The analysis will also offer practical insights for companies looking to optimize their CSR communication strategies and improve their online presence.

3.2. Structure of the research model

This chapter focuses on the development and structuring of the research model that will be used to test the hypotheses formulated in the previous chapter. The structure of the research model is designed to answer the main question: How does the assurance of sustainability reports affect companies' social media behaviour? Specifically, our objective is to determine whether companies that choose to obtain assurance for their sustainability reports exhibit higher engagement on social media, both in terms of publication frequency, interactions (likes, shares, comments) and growth in the number of followers.

3.2.1. Nature of the data

The dataset used for this research comes from a sample of 161 companies taken from the Fortune 200 list in the United States. The data covers a five-year period, from 2016 to 2020. Each company is observed along various metrics related to its social media presence, such as the number of posts per day, likes and shares per post, growth in the number of followers, and other financial and operational variables. Among the latter, we considered relevant variables such as logarithm of assets (ln_at), market-to-book ratio (mtb), leverage (lev) and return on assets (roa). These data allow to explore the relationship between the choice of sustainability reporting and social media activity.

The data are organised in a panel data structure (longitudinal data), which means that we have repeated observations for each company over several years. This type of data is particularly useful for capturing variations over time and for dealing with unobservable heterogeneity between companies, which could influence the results.

3.2.2. Definition of variables

The core model involves both dependent variables (social media engagement metrics such as number of posts, likes, comments, shares, and follower growth) and independent variable (presence of third-party assurance for sustainability reports). Several control variables are also included in the model to account for firm-specific and market-level factors, ensuring that the analysis accounts for industry differences and variations in company size or market capitalization.

3.2.2.1. Dependent variables

The dependent variables in this study represent the various measures of social media activity and engagement, capturing how companies interact with their audience over time. These variables are critical in understanding whether companies with third-party assurance in their sustainability reports exhibit different patterns of behavior on social media compared to those that do not. The specific metrics analyzed are as follows:

- Number of social media posts (postsperday): this variable tracks the frequency with which a company posts content on social media platforms (e.g., Facebook, Twitter). The frequency of posting is an important indicator of how active a company is in engaging its stakeholders through social media.
- Engagement rates (likes, comments, shares per post): engagement rate metrics are crucial indicators of how well the company's content resonates with its audience. Metrics such as the number of likes, comments, and shares per post help gauge the level of interaction and engagement the posts receive. These measures are important as they reflect the audience's interest, participation, and trust in the company.
- Follower growth (follow_growth): this variable measure the percentage increase in a company's followers over time. Growth in follower numbers indicates increasing interest in the company's activities, particularly those related to Corporate Social Responsibility (CSR) and sustainability efforts. A higher follower growth rate could suggest that the company's CSR communication strategy is attracting a broader audience.

These dependent variables are designed to capture both quantitative aspects (number of posts) and qualitative aspects (engagement and growth) of corporate social media activity, enabling a robust analysis of how companies communicate their CSR activities and how this communication resonates with the public.

3.2.2.2. Independent variable

The main independent variable of interest in this study is the presence of third-party assurance for sustainability reports. This variable is crucial in determining whether external verification of sustainability claims affects companies' social media behaviour. The presence of assurance is treated as a binary variable:

- Assurance: takes the value 1 if the company has obtained third-party assurance for its sustainability reports and 0 otherwise. The underlying hypothesis is that companies with assured sustainability reports present higher levels of engagement on social media, as the assurance could serve as a signal of transparency, credibility and commitment to sustainability, thus improving their reputational capital.

The independent variable provides a basis for testing whether companies with verified sustainability reports show a stronger social media presence, higher engagement and faster follower growth than those without such an assurance.

3.2.2.3. Control variables

Control variables include indicators such as company size, market capitalisation and ROA. These variables were introduced into the model to isolate the effect of the independent variable and ensure that any differences in results are not attributable to structural or market factors. In this way, a more accurate analysis of the influence of collateral on the social media behaviour of companies will be functioned.

Therefore, several financial indicators were included in the model to assess their impact on social media behaviour and engagement. These control variables provide a better understanding of how the financial characteristics of companies influence communication strategies, particularly in relation to sustainability reporting.

- ln_at (logarithm of assets): the natural logarithm of total assets is used as a proxy for company size. Larger companies are expected to have more resources to devote to social media campaigns, which may translate into higher publication frequency and engagement rates. This variable captures the effects of scale on social media behaviour, assuming that larger companies with greater assets may use social platforms more effectively for stakeholder engagement.
- mtb (Market-to-Book Ratio): this ratio measures the market value of the company against its book value. A higher market-to-book value ratio indicates that the market perceives the company as having greater growth potential, which may be related to a more proactive social media presence. Companies that are highly valued by the market may use their reputation to engage more actively on social media, especially to promote CSR initiatives.

- lev1 (leverage): leverage is the percentage of debt to equity or share capital. This variable gives an indication of the company's financial structure and risk profile. Companies with higher leverage may show more conservative communication strategies due to financial constraints, while those with lower leverage may have more flexibility to invest in social media campaigns and CSR communication.
- roa (Return on Assets): return on assets is an efficiency metric that shows how much profit a company generates compared to its total assets. A higher ROA suggests better financial health and operational efficiency, which could translate into a more positive corporate image and more resources to engage stakeholders through social media. The hypothesis is that companies with a higher ROA will demonstrate more robust social media engagement, as they are likely to have more compelling CSR stories to share.

These financial variables are key to explain how a company's size, valuation and financial health influence its social media behaviour and engagement levels. The interaction between these financial indicators and the presence of assurance provides a more nuanced view of the factors that drive corporate communication strategies. Control variables were included in the model to isolate the effect of assurance on sustainability reports, considering other company characteristics that might affect social media behaviour.

3.2.3. Description of the econometric model

The econometric approach is based on panel regression models, which are ideal for analysing longitudinal data such as those in this study. Panel models allow for unobservable differences between companies (such as corporate culture or other intrinsic characteristics) that could influence both the decision to obtain assurance on sustainability reports and social media behaviour.

The basic model used is a fixed-effects or random-effects regression. Depending on the test results, it will be determined whether it is preferable to control for unobserved differences between companies (fixed effects) or whether these differences can be considered random (random effects). The general model can be expressed as follows:

Equation 1: Regression model

$$Y_{it} = \alpha + \beta_1 \text{Assurance}_{it} + \beta_2 \text{X}_{it} + u_i + \epsilon_{it}$$

Where:

- Y_{it} represents the dependent variables for the company in the year t (such as posts per day, likes per post, etc.).
- α is the model constant.
- β_1 is the coefficient measuring the effect of the sustainability report assurance $Assurance_{it}$ on the dependent variables.
- β_2 represents the coefficients of the control variables X_{it}, such as *ln_at*, *mtb*, *lev1*, *roa*, which also affect the dependent variables.
- u_i represents the unobservable fixed effects for each firm.
- ϵ_{it} is the error term.

This model makes it possible to assess the marginal effect of ensuring sustainability reports on the social behaviour of companies, controlling for other relevant variables.

3.2.4. Aims of the research model

The main objective of this model is to check whether companies that have obtained assurance on their sustainability reports are more active on social media and achieve greater engagement than companies that have not opted for assurance. The panel model allows to control for unobserved heterogeneity between companies and to capture the evolution of their communication strategies over time.

The hypotheses tested include:

- H1: Companies that have assured their sustainability report post more on Facebook than companies that have not assured their reports.
- H2: Companies that have assured their sustainability report achieve a higher level of engagement (likes, comments, shares) on posts than companies that have not assured their reports.
- H3: Companies that have assured their sustainability report show faster growth in the number of followers on social media than companies that have not assured their reports.

- H4: Companies without assurance showed a more stable growth of followers over time, while companies with assurance experienced more pronounced variations.
- H5: Companies that have assured their sustainability report are larger and more efficient than companies that have not assured their reports.

In conclusion, the proposed model offers an analytical framework for measuring the impact of sustainability reporting assurance in social media engagement strategies, with a specific focus on key variables such as post frequency and follower growth. This model will allow to robustly answer the research questions and test the proposed hypotheses.

3.3. Model implementation using Stata

This section provides a comprehensive overview of the model implementation process using Stata software, detailing the various steps involved in preparing the data and running the model. The process ensures that research hypotheses are systematically tested using the appropriate econometric models, guaranteeing methodological rigour and accuracy. The main objective of this analysis is to assess the relationships between the assurance of sustainability reports and companies‘social media activity, with a focus on understanding how third-party assurance influences companies’ online engagement.

3.3.1. Data preparation

The first and most important step in the analysis is the preparation of the data set for modelling. As the data comes from a combination of social media metrics and financial performance indicators, the data preparation process ensures accuracy, completeness and consistency, making it suitable for running various econometric models in Stata. The key steps in this phase are described subsequently:

- *Outliers and data transformation*

Outliers can have a significant impact on the results of regression models, particularly when they distort the relationship between variables. Therefore, before running the regression models, outliers were identified using summary statistics and visual tools such as box plots. Variables that showed significant skewness were log-transformed to normalise their

distribution. This transformation ensures that the variables meet the assumptions of linear regression, particularly with regard to normality and homoscedasticity.

- *Creating dummy variable for assurance*

In this research, the key independent variables is the presence of third-party assurance on corporate sustainability reports. Since the assurance status is a categorical variable (either a company has assurance or it does not), it was necessary to transform this categorical information into a binary (dummy) variable for use in the regression models. Dummy variables are particularly useful in regression analysis as they allow to assess the impact of categorical data within a linear model framework.

The dummy variable for third-party assurance, named *assurance_dummy*, was created to reflect whether a company had its sustainability report assured by a third-party auditor or not. The variable was coded as follows:

- 1 for companies that have third-party assurance on their sustainability reports.
- 0 for companies that do not have third-party assurance on their sustainability reports.

This transformation allows for a straightforward comparison between companies with and without assurance, making it easier to analyze the potential influence of assurance on various outcomes such as social media activity, engagement levels, and overall transparency.

The inclusion of this dummy variable in the regression model helps answer important research questions such as whether companies with assured sustainability reports post more frequently, engage more effectively with their audience, or exhibit higher levels of transparency and credibility on social media compared to those without assurance. It also allows to explore whether third-party assurance impacts follower growth, engagement rates, and other metrics of online visibility.

The use of a dummy variable for assurance ensures that this categorical information is appropriately integrated into the regression models, providing meaningful insights into the relationship between assurance and corporate social media behavior. By isolating the effect of assurance, we can better understand its role in enhancing company transparency and stakeholder engagement, as well as its broader impact on corporate communication strategies.

3.3.2. Running the regression models in Stata

Once the data was prepared, the core analysis involved running various statistical models to test the hypotheses and explore the relationships between sustainability report assurance and corporate social media activity.

3.3.2.1. Descriptive statistics

The table below provides descriptive statistics of the main variables considered in the study. These data are key to understanding the central trends and variability of the variables used in the analysis, including the number of posts per day, social media engagement, and business economic variables. Stata's “tabstat” command was used to generate these descriptive statistics, which include, in addition to the number of observations, mean, standard deviation and percentiles (25th, 50th, 75th).

Table 1: Descriptive statistics

Variables	***N***	***Mean***	***SD***	***p25***	***p50***	***p75***
Post/day	720	0.6771	0.6944	0.2216	0.5027	0.9015
Like/post	720	1287.8463	7094.859	27.0683	115.8214	509.3752
Share/post	720	176.3364	867.5370	4.7134	22.1167	93.9206
Follower growth	731	0.6785	5.8168	0	0.0290	0.1515
Assurance	731	0.2996	0.4584	0	0	1
Company size	731	10.7001	1.1238	9.9044	10.6507	11.3692
M-t-b ratio	731	9.3150	37.9557	1.6996	2.9634	5.7240
Leverage	727	0.3541	0.1789	0.2267	0.3346	0.4616
ROA	726	0.1325	0.0767	0.0834	0.1264	0.1692

The average number of posts per day is 0.6771, which indicates that the companies in the sample publish less than one post per day on average. However, with a median value of 0.5027, we can say that a considerable proportion of the companies have a posting frequency close to one post every two days, although some publish more frequently (75th percentile = 0.9015).

The companies in the sample get on average 1287.85 likes per post, with a very high standard deviation (7094.86), which suggests a strong variability in user engagement between companies. This is also evident from the value of the different percentiles.

Shares per post have an average of 176.34, but with a strong variability as indicated by the standard deviation of 867.54. This highlights that some companies generate a high level of virality with their posts. The median value is 22.12, which suggests that most companies do not get many shares, but there are companies with a significantly higher performance in terms of content dissemination (75th percentile = 93.92).

The growth rate of followers has an average of 0.6785, suggesting moderate growth in the number of followers.

Assurance is a dummy variable indicating whether a company has opted for third-party assurance on sustainability reports. The mean of 0.2996 suggests that about 30% of the companies in the sample have adopted this practice, while the remaining 70% have not. The percentiles show that the majority of companies have not obtained assurance (percentiles 25 and 50 = 0), with a value of 1 only at the 75th percentile, reflecting that only a minority of companies have chosen to implement this practice.

Firm size, measured as the logarithm of total assets, has a mean of 10.70 with a standard deviation of 1.12, suggesting moderate variability in firm size.

The market-to-book ratio has a mean of 9.3150, but the high standard deviation (37.96) indicates a strong skewness in the data, with some companies showing extremely high values, distorting the mean. The distribution is more concentrated in the lower percentiles, with the 25th percentile at 1.70 and the 75th percentile at 5.72, suggesting that most companies have relatively low values, but with some exceptions.

Leverage, measured as the ratio of debt to equity, averaged 0.3541, indicating that companies on average use 35% debt to equity. The standard deviation of 0.18 suggests moderate variability in the use of debt among companies.

Return on assets averages 0.1325, indicating that, on average, companies generate a 13% return on their assets. The standard deviation of 0.0767 reflects relatively little variability, with most companies falling within a range of 0.0834 to 0.1692 (percentiles 25 and 75).
The descriptive statistics provided give a clear overview of the distribution of the key variables used in the model. In general, the companies in the sample show moderate activity on social media, with significant differences in engagement (likes and shares per post). The economic variables show variability in company size, leverage and profitability, while the practice of assurance on sustainability reports is not widespread, involving only a minority of the companies in the sample.

3.3.2.2. Correlation matrix

A correlation matrix was generated to assess the relationships between independent, dependent, and control variables. This helped identify multicollinearity and other potential issues. Here below the first table that reported the correlation coefficients between four variables related to social media activity: postsperday, likesperpost, sharesperpost and follow_growth.

Table 2: Correlation matrix dependent variables

Variables	*Post/day*	*Like/post*	*Share/post*	*Follower growth*
Post/day	1			
Like/post	- 0.0490	1		
Share/post	- 0.0349	0.5808	1	
Follower growth	- 0.0243	0	0.0006	1

We can see that the correlations between the variables are very close to zero, in this respect follower growth appears to be independent of the number of posts per day, likes per post and shares per post. This might suggest that follower growth is influenced by other factors not captured by the variables considered in this analysis.

The matrix shows generally low correlations between the variables examined, apart from the moderate positive correlation between likesperpost and sharesperpost (0.5808). This implies that the posts with the most likes also tend to be the most shared.

In contrast, there is no evidence that follower growth is directly related to post frequency, number of likes or shares per post. These results suggest that follower growth may depend on other factors, such as content quality or external promotional strategies.

The other correlation matrix presented below shows the relationships between several variables used in the analysis: assurance, ln_at (logarithm of assets), mtb (market-to-book ratio), lev1 (leverage) and roa (return on assets). Alongside the correlation coefficients, p-values (significance) are also reported, indicating whether the correlation is statistically significant.

Table 3: Correlation matrix independent variable and control variables (numbers in brackets represent the associated p-values)

Variables	*Assurance*	*Company size*	*M-t-b ratio*	*Leverage*	*ROA*
Assurance	1.0000				
Company size	0.1181 (0.0010)	1.0000			
M-t-b ratio	0.0258 (0.4862)	-0.0211 (0.5683)	1.0000		
Leverage	0.0012 (0.9740)	-0.0844 (0.0195)	0.0817 (0.0277)	1.0000	
ROA	0.1324 (0.0003)	-0.0743 (0.0428)	0.1902 (0.0000)	0.1632 (0.0000)	1.0000

The assurance variable has a positive and significant correlation with both company size (ln_at) and return on assets (roa). This indicates that larger and more efficient companies tend to be more likely to have third-party verification of their sustainability reports.

Other significant correlations include the one between market-to-book ratio and return on assets, which suggests that a higher market value ratio is associated with higher corporate efficiency.
In general, correlations are weak to moderate, implying that the variables at play have rather distinct effects on each other and none of them completely dominates the behaviour of the others.

The analysis suggests that the presence of assurance is linked to specific company characteristics such as size and profitability, while other factors, such as leverage, do not seem

to significantly influence the choice of having a third-party verification for sustainability reports.

3.3.2.3. Univariate analysis

Univariate analysis involved running simple regressions to examine the relationship between each independent variable and the dependent variable individually. This analysis helps to understand how individual factors like third-party assurance influence social media behavior without the confounding effects of other variables.

The following t-test tables compare groups of companies with and without sustainability report assurance in relation to key social media engagement variables.

Table 4: T-test follower growth

Group	*Obs*	*Mean*	*St. error*	*SD*	*[95% conf. interval]*
0	671	0.485735	0.1990062	5.15499	0.0949843 to 0.8764858
1	261	2.073411	1.383048	22.34382	-0.6499893 to 4.796812
Combined	932	0.9303526	0.4131128	12.61179	0.1196123 to 1.741093
Diff.		- 1.587676	0.9190534		-3.391335 to 0.2159825

Test Results:

- diff = mean (0) - mean (1) = -1.587676
- t = -1.7275
- Degrees of freedom = 930

Test Results	*p-value*
Ha: diff < 0	0.0422
Ha: diff! = 0	0.0844
Ha: diff > 0	0.9578

Regarding follower growth, companies with assurance show significantly higher average growth, with an average value of 2.07, compared to those without assurance, which have an average growth of 0.48. The p-value of 0.0422 indicates that this difference is statistically significant at the 5% level, suggesting that companies that assure their sustainability reports tend to experience faster follower growth on social media. This could be due to increased trust on the part of the public, leading to a faster increase in the number of followers.

Table 5: T-test share per post

Group	***Obs***	***Mean***	***St. error***	***SD***	***[95% conf. interval]***
0	661	104.1364	14.232	365.9037	76.1099 to 132.0818
1	256	260.9952	83.36374	1333.82	96.82616 to 425.1643
Combined	917	147.9268	25.5088	772.4578	97.86436 to 197.9893
Diff.		-156.8589	56.65843		-268.0544 to -45.66332

Test Results

- diff = mean (0) - mean(1) = -156.8589
- t = -2.7685
- Degrees of freedom = 915

Hypothesis	***p-value***
Ha: diff < 0	0.0029
Ha: diff! = 0	0.0057
Ha: diff > 0	0.9971

In terms of shares per post, companies with assurance achieve an average of 260 shares per post, compared to 104 shares per post for companies without assurance. The t-test shows a significant difference between the two groups, with a p-value of 0.0029, indicating that the content published by companies with assurance is perceived as more trustworthy and shareable. This could explain why users tend to share posts from companies with assurance more.

Table 6: T-test like per post

Group	***Obs***	***Mean***	***St. error***	***SD***	***[95% conf. interval]***
0	661	713.536	100.2623	2577.736	516.6645 to 910.4076
1	256	2147.175	701.9359	11230.97	764.8449 to 3529.505
Combined	917	1113.767	209.6777	6349.463	702.2621 to 1525.271
Diff.		-1433.639	465.2608		-2346.741 to -520.5365

Test Results

- diff = mean (0) - mean(1) = -1433.639
- t = -3.0814
- Degrees of freedom = 915

Hypothesis	*p-value*
Ha: diff < 0	0.0011
Ha: diff! = 0	0.0021
Ha: diff > 0	0.9989

A similar result emerges for likes per post, where companies with assurance receive an average of 2,147 likes per post, compared to 713 for companies without assurance. Again, the t-test shows a significant difference, with a p-value of 0.0011, suggesting that assurance has a positive impact on users' perception and appreciation of posts. This could be the result of an improvement in the perceived reputation and trustworthiness of companies that assure their sustainability reports.

Table 7: T-test post per day

Group	*Obs*	*Mean*	*St. error*	*SD*	*[95% conf. interval]*
0	661	0.6805253	0.0301773	0.7758551	0.6212703 to 0.7397803
1	256	0.6205006	0.0332045	0.5312721	0.5551106 to 0.6858906
Combined	917	0.6637681	0.0236528	0.7162542	0.6173482 to 0.7101881
Diff.		0.0600247	0.0527182		-0.043438 to 0.1634874

Test Results

- diff = mean(0) - mean(1) = 0.0600247
- t = 1.1386
- Degrees of freedom = 915

Hypothesis	*p-value*
Ha: diff < 0	0.8724
Ha: diff! = 0	0.2552
Ha: diff > 0	0.1276

Finally, regarding posts per day, companies with assurance publish an average of 0.62 posts per day, while those without assurance publish slightly more, with an average of 0.68 posts per day. However, the t-test does not show a significant difference between the two groups, with a p-value of 0.8724. This suggests that the presence or absence of assurance in sustainability reports does not significantly influence the frequency of posting on social media.

In summary, the results show that follower growth, likes and shares per post differ significantly between companies with and without assurance, suggesting that assurance in sustainability reports can have a positive impact on engagement and public perception on social media. In contrast, publication frequency does not appear to be affected by the presence of assurance, indicating that assurance affects the perceived quality of content and interaction with users more than the quantity of content published. These results suggest that assurance of sustainability reports could be a strategic factor in improving user engagement and corporate reputation on social media.

3.3.2.4. Univariate analysis by year to show possible trends

Univariate analysis by year is a key tool for examining changes in a single variable over time and identifying any significant trends. In this context, the objective is to analyse how follower growth differs between companies that assure their sustainability reports and those that do not, focusing on changes over time. This type of analysis is particularly useful for understanding whether assurance has had an increasing or varying impact on social media engagement (as measured by follower growth) over specific periods.

Using annual t-tests, it was possible to compare the average follower growth between companies with and without assurance for each year from 2016 to 2020. The analysis provides information on any significant differences between the groups, making it possible to identify whether there were any years in which companies with assurance had a greater advantage in terms of growth on social media. See tables below:

Table 8: T-test follower growth per year (from 2016 to 2020)

T- test 1: 2016

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	148	.1765945	.0399542	.4860636	.0976357	.2555533
1	39	.1158012	.0778192	.4859808	-.0417356	.2733379
Combined	187	.1639157	.0354938	.4853704	.0938935	.2339378
diff		.0607933	.0874854		-.111804	.2333906

```
    diff = mean(0) - mean(1)                                t =   0.6949
H0: diff = 0                               Degrees of freedom =      185

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.7560       Pr(|T| > |t|) = 0.4880      Pr(T > t) = 0.2440
```

T- test 2: 2017

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	145	.1704963	.036864	.443901	.0976319	.2433607
1	42	.1456454	.0487539	.3159617	.0471848	.244106
Combined	187	.1649148	.0305622	.4179323	.1046216	.225208
diff		.0248509	.0734098		-.1199772	.1696789

```
    diff = mean(0) - mean(1)                                t =   0.3385
H0: diff = 0                               Degrees of freedom =      185

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.6323       Pr(|T| > |t|) = 0.7354      Pr(T > t) = 0.3677
```

T- test 3: 2018

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	133	1.580985	.9241061	10.65731	-.2469884	3.408958
1	53	.569226	.2329255	1.695723	.1018268	1.036625
Combined	186	1.292688	.6642061	9.058564	-.0177044	2.60308
diff		1.011759	1.473579		-1.895525	3.919042

```
    diff = mean(0) - mean(1)                                t =   0.6866
H0: diff = 0                               Degrees of freedom =      184

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.7534       Pr(|T| > |t|) = 0.4932      Pr(T > t) = 0.2466
```

T- test 4: 2019

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	126	.4521391	.4013631	4.50529	-.3422083	1.246487
1	59	6.359443	5.961643	45.79225	-5.574081	18.29297
Combined	185	2.33609	1.920584	26.12277	-1.453108	6.125288
diff		-5.907304	4.109021		-14.01445	2.199844

```
    diff = mean(0) - mean(1)                                t =  -1.4376
H0: diff = 0                               Degrees of freedom =      183

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.0761       Pr(|T| > |t|) = 0.1522      Pr(T > t) = 0.9239
```

T- test 5: 2020

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	119	.0657965	.0137587	.1500899	.0385504	.0930425
1	68	1.840454	1.19504	9.854553	-.5448558	4.225764
Combined	187	.7111265	.4371045	5.977314	-.1511932	1.573446
diff		-1.774658	.9017165		-3.553627	.0043117

```
    diff = mean(0) - mean(1)                                t =  -1.9681
H0: diff = 0                               Degrees of freedom =      185

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.0253       Pr(|T| > |t|) = 0.0506      Pr(T > t) = 0.9747
```

Each table presents the average follower growth for the two groups (with and without assurance) each year, with an analysis of the statistical significance of the observed differences.

In 2020, the t-test reveals a statistically significant difference (p-value = 0.0253) in favour of companies with assurance, suggesting that these companies experienced higher follower growth than those without assurance in that year. This result is particularly relevant as it highlights an effect of assurance in a crucial period for corporate transparency and accountability.

In 2019, although not statistically significant (p-value = 0.0761), a trend emerges showing higher growth for companies with assurance than those without. However, the difference in the averages is marked, suggesting the possible influence of external factors on the results.

In 2018, 2017 and 2016, no significant differences in follower growth are observed between the two groups. This could indicate that the effect of assurance on follower growth became more apparent in more recent years, or that other factors influenced the interaction with followers in those years.

In general, the most evident temporal trend emerges in 2020, while in the earlier years there is more variability without a clear and statistically significant trend. The analysis suggests a possible increase in the perceived value of assurance over time, with a more pronounced impact on engagement in 2020.

3.3.2.5. Multivariate regression analysis

Multivariate regression models were used to explore the relationships between social media metrics and independent variables. The table below shows the results of two models with the number of daily Facebook posts (posts per day) as the dependent variable, while the independent variable includes assurance on sustainability reports and the others are considered control variables.

Table 9: Multivariate regression post per day model (1) & (2) (numbers in brackets represent the associated p-values)

Variables	(1)	(2)
Assurance	- 0.0353899 (0.542)	0.1501091 (0.034)
Company size	0.0597855 (0.010)	0.0335189 (0.232)
M-t-b ratio	- 0.0006077 (0.527)	0.0003323 (0.455)
Leverage	0.2727678 (0.063)	0.2794244 (0.229)
ROA	- 0.344685 (0.028)	-1.528594 (0.000)
Number of Obs	715	652
Statistics F (5, 709)	2.43	4.39
Prob. > F	0.0340	0.0011
R-squared	0.0168	0.2595
Adj R-squared	0.0099	0.0887
Root MSE	0.69292	0.0286
Within R-squared	-	0.6798
Number of clusters	-	118

In the first model, the coefficient for assurance is -0.0353899, but it is not statistically significant (P>|t| = 0.542), indicating that assurance does not significantly influence the frequency of publication. Company size, with a coefficient of 0.0597855 and a significant p-value (0.010), suggests that larger companies tend to publish more frequently, with an increase of about 0.06 posts for each unit increase in the logarithm of assets. The other variables, such as market-to-book ratio and leverage, are not significant, although the latter has a p-value of 0.063, close to the significance threshold. ROA has a negative coefficient (-0.344685) and is significant (P>|t| = 0.028), indicating that more profitable companies publish less frequently.

In the second model, the coefficient for assurance becomes positive and significant (0.1501091, P>|t| = 0.034), suggesting that companies with assured reports publish about 0.15 more posts per day than those without assurance. Company size, with a coefficient of 0.0335189, is not significant in this model (P>|t| = 0.232). Market-to-book ratio and leverage also remain non-significant, with the latter having a coefficient of 0.2794244. ROA becomes strongly negative (-1.528594) and highly significant (P>|t| = 0.000), suggesting an inverse relationship between profitability and publication frequency.

In terms of statistics, the first model presents an R-squared of 0.0168, indicating that it explains a very small part of the variance in daily postings, while the second model, with an R-squared of 0.2595, explains 26% of the variance. However, the Adjusted R-squared of the second model (0.0887) indicates that the explanatory power remains limited. The use of sector- and year-specific fixed effects, together with error clustering, improves the robustness of the estimates.

In the first model, assurance has no significant impact, while firm size and ROA influence the publication frequency. In the second model, assurance becomes significant, indicating more social media activity for companies with certified reports, while ROA shows a negative and significant influence. To further improve the model, it might be useful to add variables such as digital marketing spend or number of followers on social media and explore possible interactions between the variables to better understand the effect of assurance.

3.3.3. Summary of statistical findings

This section provided an overview of the model implementation process using Stata, detailing the steps involved in preparing the data and running the model. The purpose of this analysis is to assess the relationships between the assurance of sustainability reports and companies' social media activity, focusing on how third-party assurance influences online engagement metrics.

Data preparation is the crucial first step of the analysis, as it ensures that the data set is suitable for econometric modelling. This ensures accuracy and prevents bias in the data set. Outliers were treated using summary statistics and box plots, and variables such as total assets were log-transformed to normalise skewed distributions. This step ensures that the assumptions of linear regression, in particular normality and homoscedasticity, are met.

The descriptive summary of the variables, including ln_at (logarithm of assets), mtb (market-to-book ratio), lev1 (leverage), and roa (return on assets), reveals some interesting insights. The average logarithm of assets (ln_at) is 10.70, indicating that most companies are large, with minimal deviation, as reflected by the standard deviation of 1.12. The mtb variable shows significant variance, with an average of 9.3150 and a standard deviation of 37.96, suggesting the presence of high-performing companies that skew the mean. Leverage (lev1) averages 0.3541, indicating moderate reliance on debt, while roa averages 0.1325, reflecting moderate efficiency in generating returns from assets.

A key independent variable, third-party assurance, is operated as a dummy variable (assurance_dummy), where firms with third-party insurance are coded as 1 and those without are coded as 0. This transformation allows a direct analysis of the potential influence of insurance on outcomes such as social media engagement, post frequency, and audience growth.

Applying descriptive statistics to social media activity variables, the data shows that companies publish an average of 0.6771 posts per day. Engagement metrics are strong, with companies receiving an average of 1287.85 likes and 176.34 shares per post. Furthermore, the average follower growth is 0.6785, indicating a steady increase in the number of followers over time. These data suggest that the companies in the sample maintain a constant presence on social media and effectively engage their audience.

The descriptive statistics of the assurance variable show that 28% of the companies in the sample use third-party assurance for their sustainability reports. The majority of companies do not use assurance, as indicated by the percentiles.

Correlation matrices were used to assess the relationships between social media metrics and other variables. Correlations between variables are low, except for a moderate positive relationship between likes and shares per post. This suggests that posts that receive more likes also tend to be shared more frequently. Follower growth appears to be independent of other variables such as post frequency and engagement metrics, indicating that other factors may be driving follower growth.

A second correlation matrix examining financial and assurance variables shows a positive correlation between assurance, firm size and return on assets, implying that larger and more profitable firms are more likely to obtain third-party insurance. However, leverage and market-to-book ratio show little influence on assurance choices.

The univariate analysis, using t-tests, compares companies with and without assurance on sustainability reports. Companies with assurance experience significantly higher follower growth, with an average of 2.07 compared to 0.48 for companies without insurance. This difference is statistically significant at the 5% level. Similarly, companies with assurance get more shares and likes per post, indicating that assurance positively influences user engagement on social media. In contrast, the frequency of daily posts did not differ significantly between

the two groups, suggesting that assurance influences the quality of engagement rather than quantity.

Finally, the multivariate regression performed aimed to explore the relationships between social media metrics and the independent variable. In the first model, the assurance variable is not significant (coefficient = -0.0353899, p-value = 0.542), indicating that the presence of assurance in sustainability reports does not significantly affect the number of posts per day. Company size has a positive and significant impact (coefficient = 0.0597855, p-value = 0.01), suggesting that larger companies tend to publish more posts per day. However, other variables such as market-to-book ratio (coefficient = -0.0006077, p-value = 0.527) and leverage (coefficient = 0.2727678, p-value = 0.063) do not have a statistically significant impact. Finally, ROA has a negative and significant coefficient (coefficient = -0.344685, p-value = 0.028), suggesting that more profitable companies may not feel the same need to publish frequently. As the R-squared of this model is very low (0.0168), it indicates that the model explains only a small part of the variability in the number of daily posts.

Therefore, a second model was developed with fixed effects and clustering of errors, the assurance coefficient becomes significant (coefficient = 0.1501091, p-value = 0.034), indicating that companies that assure their sustainability reports publish approximately 0.15 more posts per day than those that do not. However, other variables such as company size (coefficient = 0.0335189, p-value = 0.232), market-to-book ratio (coefficient = 0.0003323, p-value = 0.455) and leverage (coefficient = 0.2794244, p-value = 0.229) were not significant. ROA continues to have a negative and highly significant effect (coefficient = -1.528594, p-value = 0.000), suggesting that an increase in profitability is associated with a reduction in the frequency of daily postings. The fixed effects model has a higher R-square (0.2595), implying that approximately 25.95% of the variability in the number of daily posts is explained by the independent variables included in the model, and the overall model is statistically significant with an F-test of 4.39 (p-value = 0.0011).

In conclusion, the use of assurance for sustainability reporting has a significant and positive impact on the frequency of social media posts, although the effect is small. Larger companies tend to post more, but this effect is not always significant in all models. ROA has a negative impact, suggesting that more profitable companies tend to be less active on social media. However, the low R-squared indicates that there are many other factors not considered in the model that could influence the publication behaviour of companies. Therefore, to improve the

robustness of the model and address limitations, it would be useful to add additional explanatory variables, such as digital marketing spend or number of followers on social media, and to explore potential interactions between variables, e.g. between ln_at and assurance, to better understand the effect of assurance on daily publication.

Chapter 4 - Analysis of study results

4.1. Outcomes highlighted by the model

The empirical analysis conducted in this study mainly focused on understanding the impact of third-party assurance of sustainability reports on companies' social media behaviour. The results were derived from multivariate regression models aimed at testing the hypotheses presented earlier in the research. Specifically, the analysis focused on dependent variables such as the number of posts per day, engagement metrics (likes, shares per post) and follower growth.

In the first model performed, the results did not show a statistically significant effect of collateral on the frequency of social media posts. However, company size had a positive and significant impact on the number of posts per day, while return on assets (ROA) showed a negative effect on the frequency of posts. In the second model, after applying fixed effects and error clustering by industry and year, the coefficient for assurance became positive and statistically significant. This result suggests that companies with third-party assurance tend to post more frequently on social media than companies without such assurance.

In addition to the key variable, other control variables such as company size and market/book ratio had a non-significant impact, although the results were more robust when unobserved heterogeneity between companies was considered. ROA remained consistently negative, indicating that more profitable companies may publish less frequently, potentially because their financial performance reduces the need for constant engagement with stakeholders.

Overall, the results revealed by the models support the idea that third-party assurance of sustainability reports positively influences the frequency of social media posts, albeit with a small effect size.

4.2. Interpretation of results

The results of the empirical analysis offer several insights into the role of sustainability report assurance in shaping companies' social media behaviour. First, the positive relationship between assurance and publication frequency found in the fixed effects model suggests that companies with assured sustainability reports may perceive a greater need to maintain an active social media presence. This could be attributed to the signalling effect of assurance, which

increases company transparency and legitimacy, prompting companies to engage more frequently with stakeholders.

Company size, while showing a positive correlation with the frequency of posting, did not always yield significant results. This could mean that although larger companies generally have more resources to devote to social media strategies, other factors - such as marketing priorities or specific communication goals - may moderate the extent of their social media activity. In contrast, the consistently negative and significant ROA effect suggests that highly profitable companies may rely less on social media for stakeholder engagement, perhaps because their financial performance already reinforces their corporate reputation.

The non-significant effects of market-to-book ratio and leverage might indicate that financial valuation metrics do not necessarily dictate social media strategies. This could reflect the fact that social media engagement is driven more by non-financial considerations, such as branding, corporate culture and public relations.

4.2.1. Analysis of the hypothesis

The hypotheses outlined in the previous chapter were systematically tested using empirical models as well as correlation matrices, t-tests and regression models.

The first hypothesis (H1: companies that have assured their sustainability report post more on Facebook than companies that have not assured their reports) is supported by the results of the fixed effects model. The variable assurance, which became statistically significant due to the modification of the initial model, indicates a direct relationship between third-party verification and increased publication frequency. However, the effect size is quite small, suggesting that although assurance influences publication behaviour, it may not be the dominant factor. Thus, the hypothesis can only be considered partially accepted as the statistical model confirms a positive link between assurance and publication frequency, but acceptance is conditional on the fact that this effect is small. In academic terms, it is recognised that assurance influences publication behaviour, but it is probably not the sole or main determinant.

The second hypothesis (H2: companies that have assured their sustainability report achieve a higher level of engagement (likes, comments, shares) on posts than companies that have not assured their reports) found partial support in descriptive statistics and univariate analyses,

where companies with assured reports showed a higher average engagement. However, multivariate models accounting for control variables and possible confounders did not show significant results for engagement metrics, suggesting that other factors might influence these variables more heavily than assurance alone. Since the results of the multivariate models do not significantly support the relationship between assurance and engagement, the hypothesis cannot be conclusively accepted. It could be said that the hypothesis found partial support in preliminary (descriptive and univariate) analyses but is not confirmed when considering more complex models that control for other factors. Therefore, the hypothesis is not accepted.

Regarding the third hypothesis (H3: companies that have assured their sustainability report show faster growth in the number of followers on social media than companies that have not assured their reports) the results were mixed. The descriptive statistics show a significantly higher average growth in followers for companies with assurance (average of 2.07) than for those without assurance (average of 0.48). This suggests a positive relationship between assurance and follower growth. The significance test with a p-value of 0.0422 indicates that the difference in follower growth between companies with and without assurance is statistically significant at the 5% level. This implies that there is a relatively low probability that this difference is due to chance, and thus we can conclude that assurance positively influences follower growth. However, the regression models do not robustly confirm this effect, suggesting that there may be other external factors not included in the model that influence follower growth. This may indicate that assurance is not the only determining factor and that other variables may play a more relevant role. The hypothesis can therefore be partially accepted.

The data for the fourth hypothesis (H4: companies without assurance showed a more stable growth of followers over time, while companies with assurance experienced more pronounced variations) indicate that companies with assurance experienced more dynamic follower growth, with significant increases in certain periods and slowdowns in others, suggesting greater volatility. In contrast, companies without assurance showed slower but steady growth. However, multivariate models do not offer sufficient evidence to state that assurance is the main determinant of variations in the growth rate of followers. Consequently, the hypothesis can only be partially accepted. The univariate analysis by year shows that the actual impact of assurance on follower growth becomes more evident in 2020, with statistically significant differences in favour of companies with assurance. In earlier years, however, no significant differences emerge, suggesting that the importance of assurance has grown over time, especially in contexts

of increased focus on transparency and social responsibility, such as during the pandemic. In terms of growth stability, companies without assurance show a more constant trend over the years, while those with assurance have experienced more variable growth, with peaks in specific years, such as 2020. This partially supports the hypothesis that companies with assurance have more pronounced variations in follower growth, while those without assurance maintain more regular growth. This suggests that assurance may indirectly influence growth, but other factors such as communication strategies, external events or marketing campaigns may be more influential in explaining variations in the growth rate. Thus, the data indicate that companies with assurance experienced a more pronounced growth in 2020, while in previous years no consistent or significant differences are observed. Companies without assurance showed more stable, but less dynamic growth.

The fifth and final hypothesis (H5: companies that have assured their sustainability reports are larger and more efficient than companies that have not assured their reports) found clear support from the measure of the logarithm of assets, as an indicator of company size, and from ROA, a measure of company profitability. Multivariate models support this relationship, showing a positive and significant correlation between assurance, company size and profitability. Larger and more profitable companies are more likely to invest in assurance to strengthen their image and transparency towards stakeholders. The hypothesis can therefore be accepted. The results clearly indicate that companies with assurance tend to be larger and more efficient than those without assurance. Both descriptive statistics and multivariate models support the idea that assurance is more common among larger companies with better financial performance. This is consistent with the idea that larger and financially sound companies see assurance as an investment in improving their transparency and social responsibility.

The empirical analysis conducted allowed the five hypotheses presented to be tested, providing interesting and, in some cases, contrasting results. Each hypothesis found some degree of support, although some were only partially confirmed. Below is a summary table of the main results and a brief commentary.

Table 10: Summary of validation of the hypotesis

Hypothesis	***Result***	***Comment***
H1: Companies that have assured their sustainability report post more on Facebook than companies that have not assured their reports.	Partially accepted	Assurance has a positive effect, but the impact is modest.
H2: Companies that have assured their sustainability report achieve a higher level of engagement (likes, comments, shares) on posts than companies that have not assured their reports.	Rejected	Assurance does not have a significant effect on engagement; other factors are more influential.
H3: Companies that have assured their sustainability report show faster growth in the number of followers on social media than companies that have not assured their reports.	Partially accepted	Companies with assurance have higher follower growth, but regression models do not robustly confirm this.
H4: Companies without assurance showed a more stable growth of followers over time, while companies with assurance experienced more pronounced variations.	Partially accepted	Companies with assurance exhibit more variable growth, with significant peaks in 2020.
H5: Companies that have assured their sustainability reports are larger and more efficient than companies that have not assured their reports.	Accepted	Companies with assurance are larger and more profitable.

4.3. Limitations of the study

Despite the robustness of the models used, this study has several limitations. The first limitation concerns the relatively low R-square values found in the models, especially in the first model, which indicate that a substantial part of the variance in social media behaviour remains unexplained. This suggests the presence of additional factors, not included in the model, that may influence corporate social media strategies. Variables such as industry-specific practices, corporate culture or external economic conditions could play a significant role in shaping corporate communication behaviour.

A second limitation is the reliance on data from a specific sample - the Fortune 200 US companies - for a limited period (2016-2020). This limits the generalisability of the results to other contexts, such as smaller or non-US companies. Furthermore, focusing on Facebook and Twitter metrics alone may not capture the full spectrum of engagement across all social media, as companies may show different behaviour on platforms such as LinkedIn or Instagram.

Finally, the fact that the study relies on secondary data poses problems in terms of data accuracy and completeness. Although measures have been taken to ensure the consistency of the data, the lack or incompleteness of the data for some companies or for some years may have introduced bias into the analysis.

4.4. Future projections

Based on the results of this study, future research could deepen several areas. First, extending the analysis to more diverse samples, both in terms of company size and geographic scope, could provide a more comprehensive view of how assurance influences social media strategies in different business environments. The inclusion of companies from sectors other than those typically represented in the Fortune 200 could provide insights into how different sectors prioritise sustainability reporting and social media engagement.

In addition, the inclusion of other social media platforms in the analysis could provide a more nuanced understanding of how companies tailor their communication strategies to different audiences. Given the rise of visual and interactive platforms such as Instagram and TikTok, it would be useful to explore whether securing sustainability reports has similar effects on engagement in these contexts.

Another promising avenue for future research is the inclusion of more detailed financial and non-financial variables in the models. Factors such as digital marketing spend, the role of public relations departments or the presence of corporate social responsibility (CSR) campaigns could provide insights into the motivations behind social media strategies. Furthermore, the exploration of interactions between variables, such as the interplay between company size and collateral, could better reveal how different factors jointly influence social media behaviour.

In conclusion, the analysis confirms that third-party assurance of sustainability reports has a measurable, albeit modest, impact on companies' social media behaviour. Companies with assurance tend to post more frequently, although other metrics such as engagement and follower growth show more mixed results. The results suggest that while enhancing company transparency and legitimacy, collateral is not the sole determinant of social media strategies. To improve the explanatory power of the model, future research should include more diverse variables and explore the role of industry-specific factors and alternative platforms. Ultimately, the study contributes to the growing literature on sustainability reporting and corporate transparency, offering practical insights for companies seeking to improve their stakeholder engagement through social media.

Conclusions

This thesis explored the relationship between sustainability reporting assurance and companies' social media behaviour, focusing on how third-party verification influences engagement, post frequency and follower growth. Although assurance can positively influence social media presence, it is not the only determining factor.

Analysis has shown that companies with assured sustainability relationships tend to be more active on social media, in terms of post frequency and follower growth. However, these effects are contextual and not always significant. In particular, the influence of assurance seems to depend on company resources and strategic communication goals. For example, companies with higher profitability (as measured by ROA) tend to rely less on social media, probably because their financial success already consolidates their reputation. The average engagement of companies with assurance is higher, but multivariate models suggest that factors other than assurance heavily influence these metrics.

The analysis of follower growth revealed a similar trend: although companies with assurance show a more pronounced average increase, not all models confirm this result, suggesting that other elements, such as marketing strategy or external events, may be relevant. However, 2020 showed a significant increase in follower growth for companies with assurance, indicating a potentially growing role for this practice in contexts of increased transparency and social responsibility. In general, companies without assurance showed more stable follower growth over the years, while those with assurance experienced more pronounced peaks in specific years, such as 2020. Finally, larger and more profitable companies tend to invest in assurance, probably to improve their image and transparency towards stakeholders. This is consistent with the idea that stronger companies see assurance as a strategic investment to strengthen their reputation.

In summary, sustainability reporting assurance has a positive impact on companies' social media behaviour, but this effect is often indirect and influenced by other business factors. To maximise the effectiveness of assurance, companies should consider it as part of a broader strategy, including strategic communication, transparency and adaptability to external changes. This study offers useful insights into how assurance can improve corporate transparency and promote stakeholder trust in an increasingly digital environment.

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