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ESG ASSESSMENT AND REPORTING: A BIBLIOMETRIC ANALYSIS

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Abstract: *Within the past two decades, ESG (Environment, Social and Governance) dimensions transitioned from voluntary corporate initiatives to a regulated context fuelled by frameworks such as the UN's Principles for Responsible Investment (2006) and the EU's Corporate Sustainability Reporting Standard (2022). The paper aims to analyse how the literature developed over time in respect of ESG assessment and reporting within the last two decades, focusing mainly on how the trends shifted in time, but also how the key themes involving these key concepts progressed throughout the studied period. The article used bibliometric analysis of scientific periodicals from Web of Science database between 2004 and the current period. The scientific papers selected by the keyword plus function, searching by „ESG and assessment or reporting" were exported for processing in the R Studio (bibliometrix package) computer program. The results of the analysis show an increase in the publication counts coupled with the changing focus of the research which indicates the relevant role that ESG factors play in promoting sustainable business practices.*

Keywords: *ESG assessment, ESG reporting, reporting transparency, ESG factors, bibliometric analysis*

JEL classification: Q56

1. Introduction

In recent years, significant changes occurred in the ESG landscape, mainly driven by the adoption of mandatory sustainability reporting standards in the EU, the US, and the IFRS Foundation which highlighted the conceptual differences between sustainability and financial reporting (Wagenhofer, 2023). Unlike the early twenties, when disclosures about corporate social responsibility (CSR) were voluntary, nowadays there is a legislated requirement for companies to publish large sets of additional financial and non-financial data linked to ESG. In this evolving context, it is essential to understand the historical development of ESG and anticipate its future trajectory.

In recent years, several literature review studies have been carried out to explore several facets of ESG. According to Dwibedi et al. (2024), the main topics studied in recent years in this area are performance and content analysis of high-quality articles of ESG research, link between ESG and firm performance and trend, ESG disclosure and its impact on firm performance.

2. Data Sources and Analysis Method
To gain an understanding about the publication trends and key terms evolution involving "ESG assessment and reporting", we used bibliometric analysis. The study consistently examined Web of Science (WoS) Core Collection database, a multidisciplinary database of scholarly journal articles. Until two decades ago, namely the year 2004, WoS was the only international and multidisciplinary database available to obtain the literature. From 2004, Elsevier introduced Scopus, leading now to an alternative for researchers. We used WoS because it was noted that WoS has a strong coverage, considering also journals dating back to 1990. Adding to this, during our search stage, we used the "keyword plus" function in both databases. The completeness data report from biblioshiny identified the keyword plus field for Scopus database as missing in nearly 70% of the cases, marking the field as critical.
The sample of articles analysed was extracted as a result of the combination of the following keyword plus with Boolean operators "ESG AND assessment OR reporting". The first search generated 60,369 documents. After scrutinizing, cleaning up and filtering the data with additional fields such as: "publication years", "Web of Science Categories", "languages", "research areas", and "document types", we obtained a dataset of 1,202 articles.
We then uploaded the final dataset in R Studio, biblioshiny package, for analysing and visualising the shift and possible patterns in the technical literature, through a bibliometric research approach (Aria and Cuccurullo, 2017).
As an object-oriented and functional programming language, R allows for automated analyses and custom function creation (Aria and Cuccurullo, 2023). Its open-source nature fosters community support and continuous contributions from prominent statisticians.

3. Methodology
3.1. Annual scientific production
The analysis, shown in Figure 1, addresses the first research question, which in turn drives the research aim of this article: *What is the production trend for the topic of ESG assessment and reporting?* It depicts the increase in the number of studies related to ESG assessment and reporting from 2004 to 2024. This data can be subdivided, to visualize and explain better the evolution analysis, into the following four periods: 2004-2009, 2010-2014, 2015-2019 and 2020-2024, for which the total number of publications is 43, 170, 356, and 633 respectively, doubling or more the production in each time frame.
During the early period of data collection, the growth trend from 2004 to 2009 seems to have low content as there were few publications aiming to further investigate the area of interest and about the significance of the concept (Eccles et al. 2014). However, with the increasing popularity of sustainable development, the scholarly attention spiked as well leading to a significant increase in publications during the years 2010-2014. This period also marked a new stance on the topic that shifted the focus towards the incorporation of ESG factors into business and investment practices.
The years between 2015 to 2019 saw more studies on the impact of ESG parameters and how key players in the economy can utilize them, the total output then was 356

articles. This growth also coincided with the stressed regulation as well as growing concern towards climate change that attracted many scholars to research ESG disclosures and their influence on companies.
Starting from the year 2020 to 2024, there was a development in the number of publications with a total of 633 articles. A particularly sharp increase can be seen in the years of 2023 and 2024 where there are more than 150 articles published in each year.

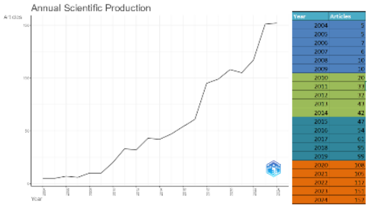


Figure 1: Annual scientific production of publications, 2004-2024
Source: Authors' computation in R.

3.2. Thematic keywords evolution

Figure 2 provides a classification of the previous body of research which directly answers our second research question: *Which key themes contain the ESG assessment and reporting?* It, in fact, gives more information about the focuses of the different themes within the scope of ESG research throughout the years. The figure illustrates the evolution of the ESG research themes from one time range, as used in 3.1, to another, indicating a change in trends of the academic, in line with the growth of the discipline.
In the first time frame, from 2004 to 2009, different themes dominate research which include "corporate annual-reports", "earnings", "self-reports", and "transformational leadership" among others. These themes are focused on comprehending the basic mechanisms and motivation that drive the compilation of corporate reports, with particular interest on frameworks that motivate report disclosures (Gray, 2006).
In the period from 2010 to 2014 more themes began to be central issues such as "financial-reporting standards" and "model". This indicates that during this period, scholars' focus was adjusted towards the interest in modelling, standardization, and the understanding of how corporate decisions might be influenced by practices aligned with ESG principles.
Between 2015 and 2019, the emphasis shifted to assessing "the impact" of sustainable practices together with "self-reported affect" and "reporting quality". In this regard, there was more focus on the impact of ESG factors on the companies' "performance" and also on the credibility and the accuracy and transparency of the data that was reported (Khan, Serafeim, & Yoon, 2016).
In the most recent period from 2020 to 2024, focus areas include "reporting practices". In addition, "impact," "annual-report readability", and "financial-reporting standards" emerged as key areas of focus. The presence of themes like "fees" further enforces the motivation about the costs of capital for ESG compliance requirements (Boffo & Patalano 2020). Therefore, this period highlights an important stage of development of ESG research where the focus is now on the reporting quality and the economic costs of reporting.

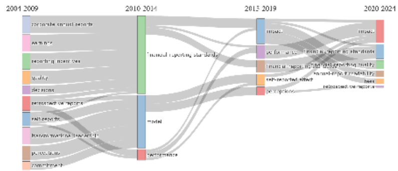


Figure 2: Thematic evolution of the keywords, four-time intervals (2004-2024)
Source: Authors' computation in R.

3.3. Most frequent keywords

As shown in Figure 3, from 2004 to 2024, publications on ESG had a number of core keywords, the most common of which were ranked on the basis of frequency of usage in the publication.

The most occurring keywords were "impact," "performance," and "quality", with over 180 occurrences for each, which points to the fact that a significant amount of research has been done seeking to find out what are the results and effectiveness of various ESG practices used.

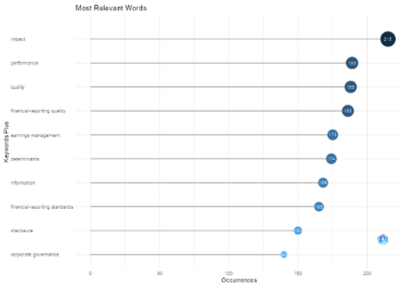
Noting the most common keyword "impact" which appeared in the publications for 215 times, impact and effectiveness appear to be the main focus in most research, this emphasis is in investigating how ESG factors can influence various aspects of corporate behaviour, stakeholder perceptions, and even environmental outcomes. This is important when evaluating measurable outcomes and how ESG practices can improve companies' performance.

"Performance" and "quality," as mentioned, appear to be the second and third most mentioned terms with 189 and 188 mentions occurred respectively. This implies that the two mentioned terms seem to add focus where the key pillars of examining how corporations are performing and how useful ESG standards are enhancing the quality of reporting non-financial performance. This trend of "financial-reporting quality" (186 occurrences) and "financial-reporting standards" (165 occurrences) highlights a researchers' concern trend focusing on the frameworks for enhancing transparency, precision, and consistency in ESG reporting.

"Earnings management", "determinants", and "information" are other important keywords that are in top ten given the occurrence of more than 160 times.

"Earnings management" applies to the studies that are interested in how companies are able to employ the use of ESG reporting to achieve better or good financial results or influence stakeholders. The keywords "information" and "determinants" suggest that there are factors of interest that are driving the requirement and the type of corporate practices that require ESG reporting.

The mention of "disclosure" (150 occurrences) and "corporate governance" (140 occurrences) also underscore the relationship between the amount of transparency and the governance structures which are in place for reporting ESG company's performance. These themes are consistent with thinking on the need for accountability, investors, and the growing regulatory demands for more uniformed and standardized ESG reports (Schoenmaker & Schramade, 2019).



Words	Occurrences
impact	215
performance	189
quality	188
financial-reporting quality	186
earnings management	175
determinants	174
information	168
financial-reporting standards	165
disclosure	150
corporate governance	140

Figure 3: Most occurred keywords since 2004 to 2024.
Source: Authors' computation in R.

As the Figure 3, the Figure 4 highlights the most relevant keywords connected with ESG assessment and reporting in the publications of the over past two decades. It confirms and makes more robust the most occurred keywords analysis, giving the same result for number of frequency and adding the percentage of frequency based on the total amount of the publications in our collected dataset.
The analysis is represented as a treemap which categorizes keywords based on the occurrence frequency and proportion in the dataset. It is like the Figure 3 but the treemap format can offer a better visual distribution of keyword importance, with larger blocks signifying more often occurring terms, reflecting their relative importance in the field of ESG assessment and reporting literature. The frequency, stated in percent terms, highlights the importance of the ESG-related argument relative to the number of all the articles collected, giving us a better understand and visual of the keywords' occurrence.

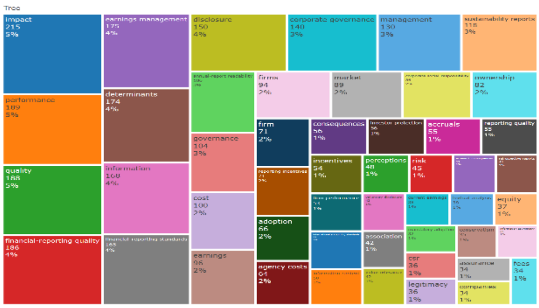


Figure 4: Tree map relevant keywords.
Source: Authors' computation in R.

3.4. Co-occurrence keywords network

The keywords related to assessing and reporting on ESG have also been analysed and their interconnections have been highlighted in a network (Figure 5). The nodes in the networks are keywords, the size of each node, from the greatest to the lowest dived in coloured clusters, corresponds to the frequency of their occurrence in the literature, and the edges between the nodes with the lines depict the relationship between the themes. The greater the edge, the stronger the relationship, or the greater the number of times the more the two themes appear to be connected together (the red cluster).

At the centre of the network there are the keywords, “impact”, “quality”, “performance”, and “disclosure” thereby suggesting that these themes are central to ESG studies. The finding that the keywords, “impact” and “performance”, are highly dependable with the focus on measuring and evaluating what is achieved through ESG practices (Eccles, Ioannou, & Serafeim, 2014; Friede, Busch, & Bassen, 2015). These words are in high correlation with “management”, “information”, and “determinants” meaning that those words assess how managerial actions or informational determinants affect the impact of ESG.

ESG research has been subdivided into distinct clusters in which specific sub-fields are incorporated. The blue cluster consisting of “financial-reporting quality”, “earnings management”, and “corporate governance” demonstrates the specific area of research focusing on governance mechanisms that enhance trust and transparency of ESG reports. The above is consistent with efforts aimed at mapping companies’ governance structures with a focus on eliminating greenwashing and enhancing report credibility.

The orange cluster, centred on “financial-reporting standards”, includes terms such as “adoption” and “economic consequences”, and shows concern over the regulatory regimes and their economic effects, which is crucial for the companies in the adoption of the ESG standards across the sectors, as stated by the European Commission (2020).

Other minor clusters, such as the purple one, which incorporates “sustainability reports” and “corporate social responsibility”, as well as the green cluster, which incorporates “annual-report readability” and “information-content”, point to further dimensions of research. These clusters encompass the topics of CSR and practices related to sustainability disclosures and attempts to improve the readability of reports for stakeholders.

This network analysis, therefore, accentuates the interconnection of ESG themes, highlighting both foundational and emergent topics in the literature. The centrality of impact and performance keywords shows a continued focus on the effectiveness and outcomes of ESG practices, while the thematic clusters define the nature of ESG research, analysing and studying governance, regulatory frameworks, and report readability.

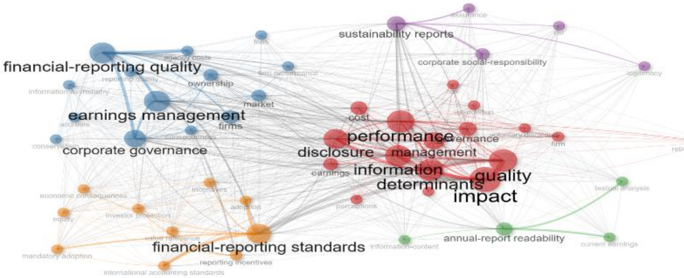


Figure 5: Co-occurrence keywords network.
Source: Authors’ computation in R.

3.5. Thematic map of keywords

The analysis showed in the Figure 6 provides two complementary views of the keyword's investigation. On the left, a thematic map organizes keywords based on two axes, density and centrality. Thematic maps are mainly useful in bibliometric analyses to decide which themes are well developed and fundamental to the field and which instead are emerging or marginal. In fact, themes like "performance", "impact", "financial-reporting quality", and "sustainability reports" appear in the upper-right part of the map, indicating that they are both very central and with much density. This suggests that these themes are well developed and central in the field of ESG assessment and reporting, reflecting a well-known literature and a fundamental part in current research, as highlighted by Friede, Busch, & Bassen (2015). Otherwise, topics in the lower-left part of the map, such as "reporting quality" and "annual-report readability", are showed as emerging themes that may require further investigation and development.

On the right part of the Figure 6, the keyword co-occurrence network represents and illustrates visually the interconnections between various topics. Therefore, keywords such as “performance”, “impact”, and “quality” appear fundamental and are centrally located, confirming their importance in ESG research. As the Figure 5, the network is structured by colours, highlighting different thematic clusters: for example, the green cluster around “sustainability reports” and “quality” specifies a theme focused on reporting quality and sustainability outcomes. In the same way, the orange cluster around “financial-reporting standards” includes related keywords like “adoption” and “regulation”, reflecting interest in the adoption and standardization of ESG reporting practices.

These pictures together support the importance of the central themes such as impact, performance, and reporting quality in ESG research, signalling, in the meanwhile, areas of growing interest that may outline the future direction of this field.

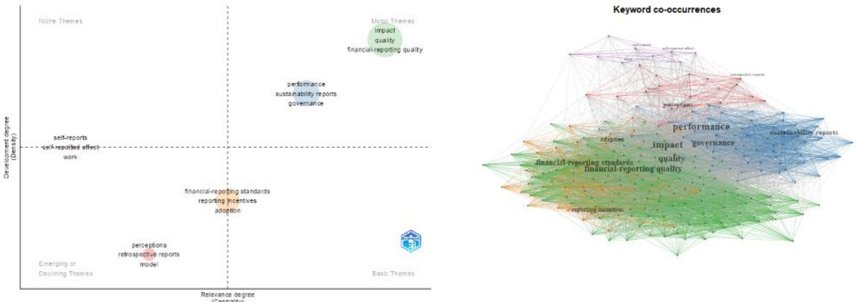


Figure 6: Thematic map of keywords.
Source: Authors' computation in R.

3.6. Most cited documents

This analysis provides a classification of the most cited articles which directly answers our last research question: *Which are the most relevant articles about ESG assessment and reporting?*

In the past two decades, a growing interest was placed on ESG and how these influence the existence of the businesses. By reviewing the most quoted 15 articles, we tried to understand what the focal points are, trying to cluster the main topics covered and analyse the concepts presented.

Recently, investors, governments, and shareholders have viewed ESG (Environmental, Social, and Governance) issues as a critical risk management issue. Companies are now incorporating these considerations into their competitive strategies (Galbreath, 2013). In his assessment of ESG performance over time, Galbreath (2013) analyses the progression of ESG performance utilising ESG ratings for the selected companies.

Numerous authors have studied ESG ratings in their studies, highlighting various aspects of how these ratings are calculated and their impact on issues such as financial performance, comparative analysis, and discrepancies across different rating agencies (Berg et al., 2022; Christensen et al., 2022; Avramov et al., 2022). Both Berg et al. (2022) and Christensen et al. (2019) examine the inconsistencies in ESG ratings among different agencies, attributing these to differences in measurement methods, scope, and weighting. Berg et al. identify measurement as the primary factor, while Christensen et al. suggest that increased disclosure may worsen disagreements rather than resolve them.

In addition to measurement methods, scope, disclosure size, and weighting, company size seems to also influence ESG ratings. Drempetic et al. (2019) found that larger firms tend to achieve higher ESG scores due to their greater resources for disclosure, raising concerns about potential rating biases. Tamimi and Sebastianelli (2017) conducted an empirical analysis of S&P 500 companies, revealing that larger firms with superior governance practices have higher ESG disclosure scores, thereby supporting Drempetic et al.'s findings.

Avramov et al. (2021) analysed how uncertainty in ESG ratings affects asset pricing, showing that increased rating uncertainty raises market premiums and impacts the risk-return profile of stocks.

ESG ratings are important as they represent the expression of the ESG performance and are used by stakeholders in evaluating and classifying companies from a sustainable point of view. Tan and Zhu (2019) link ESG ratings to increased corporate green innovation, particularly in China, where higher ratings alleviate financial constraints and boost managerial environmental awareness.

Both Chen and Xie (2020) and Giese et al. (2019) find a positive relationship between ESG disclosures and financial performance, with the latter identifying specific transmission channels through which ESG ratings influence equity valuation. Chen and Xie (2020) extend this theme, showing that ESG disclosures attract investors with ESG preferences, which in turn positively moderates the relationship between ESG ratings and financial performance.

Researchers argue that that superior CSR performance, particularly through better stakeholder engagement and increased transparency, reduces capital constraints, enhancing access to finance. The impact spans across both social and environmental dimensions (Cheng et al., 2013). In the same direction, showing how better ESG scores can influence the financial performance, Eliwa et al. (2021) find that both ESG performance and disclosure are valued by lending institutions, leading to lower debt costs. Their study differentiates between substantive performance and symbolic disclosures, emphasizing how both aspects influence lending decisions.

Eliwa et al. (2021) and Cheng et al. (2013) suggest direct financial benefits from enhanced ESG performance. However, Chen and Xie emphasize the role of investor preferences, implying that the financial benefits may be contingent upon investor attitudes towards ESG.

4. Conclusions

According to the data, ESG research will continue to develop because of new reporting frameworks and the increasing pressure from stakeholders for robust and transparent disclosures. This evolution indicates that since the field advanced, the academics' attention in the practice of ESG has now shifted towards an investigation of the interrelation of ESG mechanisms on business practices and their functioning within them, taking into consideration the issues of accountability and transparency in corporations (Sustainable Finance Disclosure Regulation [SFDR], 2021).

The development of the field of knowledge about ESG research and its application will remain a key area of interest including its qualitative and quantitative aspects concerning the reporting, governance and performance of firms.

Researchers emphasized quality and accountability in reporting, preparing the way for a more structured approach to ESG disclosure.

Therefore, as research developed, the importance of the themes covered in this article have been critical in forecasting on what ESG practice as well as research will focus in the future.

In conclusion, this analysis illustrates a field that has moved from basic reporting to a comprehensive, impactful framework designed to support sustainable corporate behaviour and stakeholder trust. The emphasis on transparency, accountability, and comparability aligns with global efforts to standardize ESG practices. However, the persistence of themes related to management indicates ongoing challenges in achieving transparent and honest reporting. As ESG research continues to mature, the focus on standardization, transparency, and impact measurement will remain central for scholars and researchers.

In this connection, other roles will be included, providing future research direction, which could include exploring the long-term effects of regulatory changes, the costs and benefits of ESG compliance, and ESG rating and ranking.

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