

Unveiling the Intellectual Architecture of ESG Research: A Comprehensive Bibliometric Analysis, Utilizing the Web of Science Database

Zuzana Skorková and Hana Gažová Adamková

University of Economics in Bratislava, Faculty of Business Management,
Department of Management, Dolnozemska cesta 1, 852 35 Bratislava, Slovakia,
corresponding author: zuzana.skorkova@euba.sk, hana.gazova@euba.sk

Abstract: *In recent years, the field of Environmental, Social and Governance (ESG) has experienced significant growth and interest. The demand for non-financial information has increased. Investors now consider both financial and non-financial risks. The integration of corporate social responsibility (CSR) practices and the establishment of ESG reporting standards have become essential. This paper conducts a bibliometric analysis to explore the development and impact of ESG research. Our analysis covers 914 articles from 258 journals, utilizing data from the Web of Science database and the Biblioshiny Application. The study highlights the intellectual structure and evolution of ESG literature. It identifies key trends, influential authors, institutions, and emerging topics. By providing a comprehensive overview of the ESG research landscape, we aim to address gaps and clarify inconsistent findings in ESG and performance research. The results indicate that ESG research is frequently associated with topics such as financial performance, risk management, stakeholder trust and sustainability. However, challenges remain in standardization and transparency. This analysis contributes valuable insights into the academic development of ESG, supporting informed and responsible investment decisions.*

Keywords: ESG; ESG performance; Sustainability; Bibliometric Analysis, Biblioshiny App

1 Introduction

At the dawn of the new millennium, the demand for non-financial information has significantly increased. Socially Responsible Investment (SRI), defined as integrating social, environmental, and ethical considerations into investment decisions [1], emerged in the 1960s, challenging the traditional view that businesses are accountable solely to shareholders. Post-World War II industrial growth led to environmental and social issues, sparking public campaigns for environmental protection [2]. Investors now consider both financial and non-financial risks [3], [4]. They expect greater transparency from businesses.

A significant milestone was the establishment of Ethical Investment Research Services Ltd. in 1983 to support informed and responsible investment decisions. The term ESG (Environmental, Social, and Governance) first appeared in the 2004 UN report "Who Cares Wins," emphasizing the importance of these factors alongside traditional financial metrics [2]. ESG is now at the forefront of investor interests. Many studies show its positive impact on company performance. The 2005 UNEP-FI report by Freshfields highlighted the financial importance of ESG issues and fiduciary duties in investment decisions, a move that laid the foundation for the 2006 Principles for Responsible Investment (PRI).

PRI aims to promote sustainable investments, though there is significant heterogeneity in ESG practices among its signatories [5]. ESG encompasses environmental, social, and governance factors that can influence entities positively or negatively [6]. Sustainability is becoming a critical goal for governments, businesses, and society, representing a profound shift in human progress, potentially surpassing the industrial revolution's impact [7]. However, ESG practices show considerable variation, with different companies developing unique methodologies and measurement indicators. [8] argue that the "social origins" of data vendors influence ESG metrics, highlighting the importance of cultural factors in sustainability reporting [9].

With growing interest and ongoing uncertainties about ESG definitions, further research is needed. This article offers a bibliometric analysis of ESG issues, a quantitative method often used in systematic literature reviews [10]. It evaluates research productivity and impact and the contributions of various entities in the field, known as "performance analysis" [10]. In recent years, bibliometric analysis has gained popularity across various research fields due to its ability to track trends in topics, citations, authors, countries, and collaborations [11]. This technique uses statistical methods to analyze qualitative and quantitative changes in a specific research area, providing valuable insights into publication profiles and trends for scholars and academics [12].

Bibliometric analysis is a powerful tool for exploring and analyzing large volumes of scientific data. Several scholars have conducted numerous bibliometric reviews on the evolving ESG field to gain insights into this academic area. [13] analyzed ESG-related performance in the banking industry, while [14] examined the knowledge structure of ESG disclosure. These studies provided valuable insights into ESG's development within specific sectors like banking. [15] offered comprehensive insights into the ESG concept across academia using bibliometric methods. Using bibliometric techniques with CiteSpace, [16] gave an overview and found new trends in ESG research.

Our study introduces an innovative framework to address gaps in ESG and performance research. We aim to clarify inconsistent findings. Unlike traditional reviews, this bibliometric analysis highlights the intellectual structure and evolution of ESG literature. We used data from the Web of Science database and the Biblioshiny Application. It covers 914 articles from 258 journals. We provide a

comprehensive understanding of the ESG research landscape. This study addresses the following research questions:

- RQ1:** What are the principal contributors to ESG research in terms of publication quantity and scholarly impact, and what is the extent of international collaboration in this context?
- RQ2:** What are the comparative publication volumes and scholarly impacts of leading journals in the ESG research field, as measured by both the h-index and g-index, and how do these metrics reveal the nuanced influences of individual articles on overall journal impact?
- RQ3:** What are the citation patterns of the most highly cited articles within the ESG research corpus elucidate the prevailing trends, scholarly impact, and evolving priorities in the field?

These questions aim to provide a systematic analysis of the current state and development in ESG research, identifying major trends, key themes, primary contributors, and geographical dynamics.

2 Methods

We investigated the knowledge framework of ESG research to pinpoint essential components within the knowledge base to establish connections. Our study uses bibliometric analysis to understand the organized network of relationships within the ESG domain, as outlined in the relevant subsections of this section.

Data retrieval process and Data Scrubbing: We utilized the Web of Science database for our research. The research was done in May 2024. The Web of Science (WOS) is commonly utilized in bibliometric analyses due to its reputation as a dependable bibliographic indexing tool that captures scientific knowledge effectively [17]. Articles were searched using "ESG" in the Topic field. The system looked for this term in the title, abstract, keyword plus, and author keywords. This search yielded 5,794 results. However, we focused on articles published within the specific Web of Science Categories: Business Finance, Management, and Business. Based on these criteria, our selection was refined to 914 results.

Sources of data and analytical tools: For our bibliometric analysis in this study, we retrieved datasets from the Web of Science database. We used the Biblioshiny application, which utilizes an R package tailored for bibliometric research. Web of Science was selected due to its extensive coverage of academic literature spanning various disciplines such as business, finance, and sustainability, encompassing scholarly journals, conference proceedings, and books. Biblioshiny, designed for non-coders, provides an intuitive interface with advanced bibliometric tools, enhancing user accessibility. Biblioshiny integrates data from diverse databases including Web of Science, Scopus, Dimensions, Lens.org, PubMed, and the

Cochrane Library. It features organized menus for statistical and graphical analysis across multiple metrics and knowledge structures [18]. Our methodology included various review approaches such as citation dynamics, keyword analysis, thematic evolution and chronological evaluation.

3 Results and Discussion

The study offers critical insights into the relationship between various performance metrics and ESG. Descriptive statistics of the sample data highlight key dataset elements, providing detailed information on publishing and citation trends, as well as average annual citations. Table 1 showcases the descriptive statistics of the sample and its parameters.

Descriptive attributes: The analysis spans from 2007 to 2024, encompassing 914 items from 258 sources. The research landscape is marked by recent contributions (average document age: 1.9 years) and significant influence (average citations per document: 22.49), with an annual growth rate of 37%. The participation of 2,459 authors, indicates strong collaboration, with 37.42% of documents involving international co-authorship. Document types are varied, with 746 articles being the most common. The extensive use of 1,197 Keywords Plus and 2,529 Author's Keywords enriches the study, providing a deeper analysis of the research field. This comprehensive investigation portrays a dynamic, internationally collaborative, and impactful research environment, underscoring the field's vibrancy and significance.

Table 1
Summary statistics of the sample data

CATEGORIES	DESCRIPTIONS	RESULTS
Main Data Information	Timespan	2007:2024
	Sources (Journals, Books, etc.)	258
	Documents	914
	Annual Growth Rate %	37
	Document Average Age	1.9
	Average citations per doc	22.49
	References	37,429
Document Contents	Keywords Plus (ID)	1,197
	Author's Keywords (DE)	2,529
Authors	Authors	2,459
	Authors of single-authored docs	100
Authors Collaboration	Single-authored docs	112
	Co-Authors per Doc	3.05
	International co-authorships %	37.42
Document Types	Article	746
	Article; Book Chapter	6
	Article; Early Access	79
	Correction	1
	Editorial Material	16
	Letter	1
	Proceedings Paper	23
	Review	38
	Review; Early Access	4

Source: Authors' elaboration based on Web of Science data

Annual publication trends: Interest in publishing on ESG topics is growing due to its critical impact on financial performance, risk management, and corporate sustainability. We can see a significant surge in awareness over the past two decades. Initially marked by a single article in 2007 and 2008, awareness of ESG has grown substantially. Notably, after 2018 with 19 articles, the growth rate surged, and it culminated in 294 articles in 2023. This increasing trend confirms the significance of the study topic and highlights the increased research and scholarly contributions in the ESG field. This is spurred by a global focus on environmental sustainability and corporate social responsibility. Figure 1 illustrates the annual scientific production.

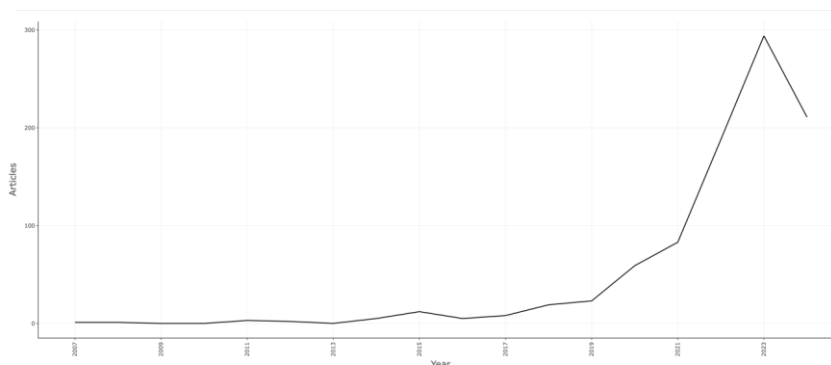


Figure 1
Annual Scientific Production in the Field of ESG in Web of Science

Source: Web of Science

Citation dynamics: Researchers have introduced several bibliometric performance metrics aimed at assessing the influence of individual scholarly publications or groups of publications. One of them includes citation-based metrics, where the number of citations serves as the predominant index for evaluating the scholarly impact of an article [19]. [20] proposed a correlation between how long a publication remains relevant and the number of times it gets cited, providing a perspective on understanding research themes through citation patterns. [21] indicated that citation count correlates with a publication's age and serves as a metric for gauging its visibility in scholarly discourse. Their study offers a dynamic view of scholarly impact over time. For instance, early recognition was evident with an average of 31 citations per paper in 2007. Subsequent years revealed varied but notable patterns, with 2014 standing out as a transformative year where 5 publications received an average of 369.40 total citations each, indicating a substantial impact. This trend continued with fluctuations; it reached a peak in 2023 when an article received an average of 7.16 citations. This analysis illuminates the evolving scholarly landscape. It highlighted key years as crucial milestones in terms of influence and recognition. Figure 2 illustrates the citation dynamics during the study period.

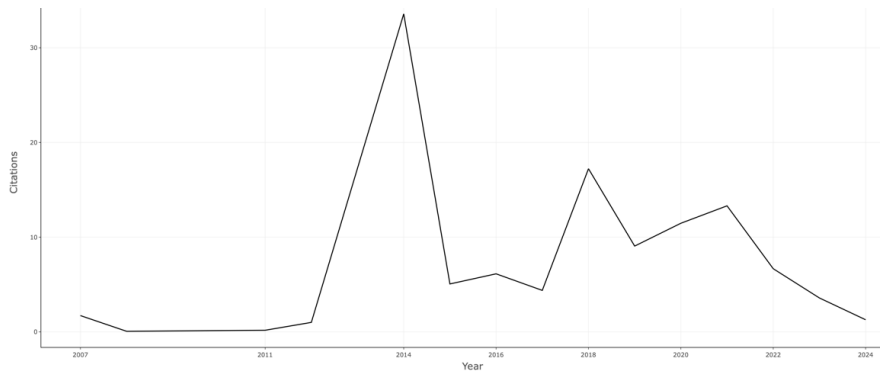


Figure 2
Average Citation per Year
Source: Web of Science

The three-field plot strategically positions countries, authors, and sources to visually represent the relationships analyzed in ESG and its impact on performance. It divides into three sections: *countries* are emphasized on the left, *authors* are highlighted in the middle, and *sources* are focused on the right. We utilized a Sankey diagram approach — a visualization method depicting the flow between different values — the plot illustrates the connections and interactions among countries, authors, and sources. The height of rectangular nodes indicates the frequency of each country, author, or source within the collaboration network, while the thickness of connecting lines adjacent to countries signifies the strength of these connections [22].

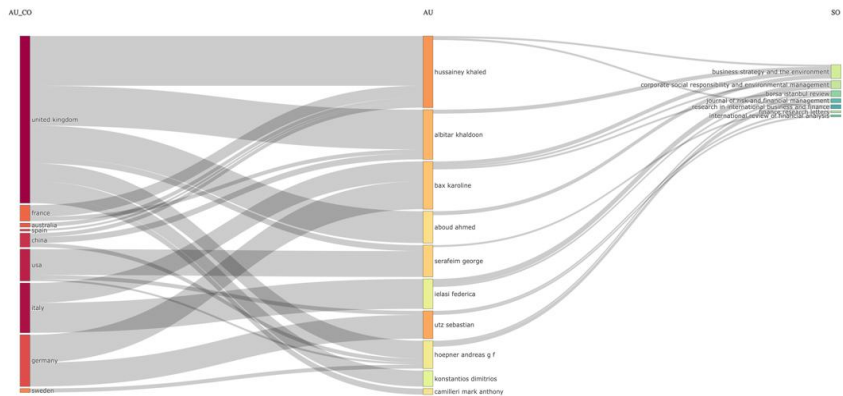


Figure 3
A three-field plot or Sankey diagram
Source: Authors’ elaboration based on Web of Science data, processed via Biblioshiny

The United Kingdom emerges as the primary contributor, prominently represented by both node height and the thickness of connecting lines, followed by France, Australia, Spain, China, USA, Italy, Germany, and Sweden. Within this context, leading authors from the United Kingdom, specifically Hussainey Khaled followed by Albitar Khaldoun, stand out, highlighting their significant roles in the collaborative network. Significant connections are also observed with journals such as *Business Strategy and the Environment* and *Corporate Social Responsibility and Environmental Management*. This visual representation effectively captures the relationships among major contributing countries, key authors, and influential sources, providing valuable insights into the dynamics of collaboration in ESG research. For more details, refer to Figure 3.

Analysis of sources: In the resource analysis, we observe that up to 56 articles were published in *Business Strategy and the Environment*, which represents as much as 6.127% of research sample. Next is *Corporate Social Responsibility and Environmental Management* with 52 articles (5.69%). In third place is *Finance Research Letters*, with 41 articles (4.48%). In Table 2, the data such as the h-index and g-index is included. H-index is the largest number h such that a researcher has h papers with at least h citations each. It serves as a valuable measure to quantify a researcher's scholarly output [23]. Hirsch argued that the h-index is effective for comparing researchers within the same field. If two researchers have a similar h-index, their overall influence in the scientific community is comparable, regardless of the number of papers they have published or their total citation count. Additionally, an individual's h-index typically increases steadily over time [24]. The data collected from this study is interesting - we notice that h-index is maximum for the journal *Business Strategy and the Environment* standing at 22, followed by *Corporate Social Responsibility and Environmental Management* which has an h-index of 19. Despite publishing different numbers of articles, both *Finance Research Letters* (41 articles) and *Journal of Sustainable Finance & Investment* (26 articles) have the same h-index of 12. It indicates a similar level of influence and citation recognition.

The g-index was introduced by Leo Egghe in 2006 [25]. This indicator improves upon the h-index by considering the number of citations received by an author's (or journal's) most highly cited publications. The value of the g-index increases with the total citations received by these top publications. A set of publications has a g-index value of g if g is the highest rank (order) such that the top g publications collectively received at least g^2 citations. Using this index, we can discern differences between the h-index and g-index of the journal *Research in International Business and Finance*, where the g-index is relatively high primarily due to the article 'Greenwashing in environmental, social, and governance disclosures,' [26] which has accumulated up to 236 citations. However, the overall h-index of the journal stands at 7, indicating that only 7 articles have been cited 7 times or more. Although the g-index has not yet attracted much attention or empirical verification, it would seem to be a very useful complement to the h-index.

Table 2
Sources per Articles and sources local impact

Sources	Articles	h index	g index	TC
Business Strategy and the Environment	56	22	44	1978
Corporate Social Responsibility and Environmental Manag.	52	19	38	1467
Finance Research Letters	41	12	34	1177
Journal of Sustainable Finance & Investment	26	12	20	438
Borsa Istanbul Review	24	10	17	328
Cogent Business & Management	23	7	11	147
International Review of Financial Analysis	22	7	13	203
Journal of Risk and Financial Management	21	11	17	318
Research In International Business and Finance	17	7	17	437
Risks	15	5	10	116

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Prominent authors, institutions, and countries making significant contributions to the field of ESG literature: In the following table 3, we see the number of published contributions by authors. Hussainey Khaled has published 9 contributions, followed by Utz Sebastian with 8 contributions, and Albitar Khaldoon, Bax Karoline, and Serafeim George with 6 papers each. For further ranking details, refer to Table 3.

Table 3
Most relevant author by number of published articles

Authors	Articles
Hussainey Khaled	9
Utz Sebastian	8
Albitar Khaldoon	6
Bax Karoline	6
Serafeim George	6
Aboud Ahmed	5
Treepongkaruna S	5
Camilleri Mark Anthony	4
Hoepner Andreas G F	4
Ielasi Federica	4

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Table 4 presents the ranking of authors based on local impact, considering the h-index. According to this metric, the most influential author is Serafeim George, with 2,504 citations. Although he has participated in only 6 articles, his work – in which he participated as co-author "Corporate Social Responsibility and Access to Finance" [27] has garnered 1,646 citations. In table 4 we can observe the results for m-index as well. The m-index is a variation of the h-index that shows the h-index per year since a researcher's first publication. While the h-index tends to grow with the duration of the career, the m-index addresses this limitation since it allows comparisons among researchers in the same field with different career durations. This index assumes a continuous research work effort from the earliest publication. It allows for a comparison between researchers irrespective of their stage in their careers [28].

Table 4

Author's local impact

Author	h Index	g Index	m Index	Py Start
Serafeim George	6	6	0.545	2014
Utz Sebastian	6	7	0.6	2015
Albitar Khaldoon	5	6	1	2020
Hussainey Khaled	5	8	1	2020
Aboud Ahmed	4	5	0.571	2018
Hoepner Andreas G F	4	4	0.571	2018
Starks Laura T	4	4	0.8	2020
Yu Ellen Pei-Yi	4	4	0.571	2018
Alkaraan Fadi	3	3	1	2022
Bax Karoline	3	5	1	2022

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Figure 4 illustrates the results of authors' productivity over time for our research sample. An author's productivity is measured by the number of articles published within a given timeframe, while impact is gauged by the annual number of citations received. The visualization uses circles to represent each year, with size indicating the number of articles published and darkness indicating citation volume. Circles on the left represent early career work, those on the right show recent work, and middle circles indicate sustained or fluctuating productivity. This method captures the evolution of an author's output and impact over time, providing a comprehensive view of their scholarly contributions. Referring to Figure 1, which showed Annual Scientific Production per sources, we can observe a clear correlation. Both graphs demonstrate that these authors published extensively in 2023, coinciding with the peak shown in Figure 1. For instance, Hussainey Khaled published four articles in 2023 and published two articles in 2024.

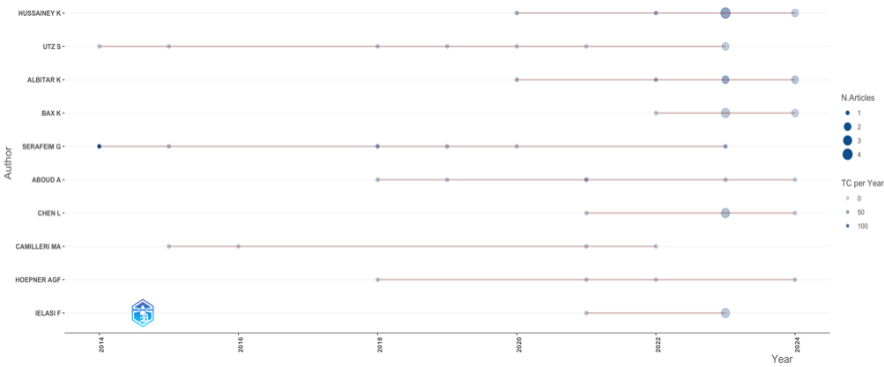


Figure 4

Authors' Production over Time

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Table 5 shows Affiliations' production over time. It is crucial to measure the most relevant institutions and their production over time. It helps to identify leading centers of excellence and to track research trends. It informs resource allocation and collaboration opportunities, ensuring strategic investments and partnerships. Additionally, this analysis aids in benchmarking institutional performance, fostering competition, and guiding policy and decision-making in research and development. Based on the data, we see that the leader in this category is the University of Portsmouth with a total of 26 articles, followed by the University of Oxford with 23 articles, and both Bucharest University of Economic Studies and the University of Lisbon with 18 papers each.

Table 5
Affiliations' Production over Time - cumulative

Affiliation	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Univ Portsmouth	0	0	0	2	4	7	9	10	20	26
Univ Oxford	2	2	3	5	5	12	15	19	21	23
Bucharest Univ Econ Studies	0	0	0	0	0	0	0	6	18	18
Univ Lisbon	0	0	0	0	0	0	0	3	9	18
Univ Bath	0	0	0	0	0	0	1	1	9	17
Univ Santiago De Compostela	0	0	0	0	0	0	0	0	5	16
Sapienza Univ Rome	0	0	0	1	1	2	5	10	13	15
Erasmus Univ	0	0	0	1	3	4	6	8	10	14
Hse Univ	0	0	0	0	0	0	5	13	14	14
Univ Sao Paulo	0	0	0	0	0	0	4	6	10	14
Univ Gavle	0	0	0	0	0	0	0	5	10	14
Brunel Univ London	0	0	0	0	0	0	0	4	9	14

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Table 6 displays author productivity by country. The distinction between Single Country Production (SCP) and Multiple Country Production (MCP) provides interesting insights. The United Kingdom leads with 111 articles, of which 68.5% are MCP. Italy ranks second with 96 articles, but only 25% of them are MCP. Notably, France produced 24 articles, with 17 of them, or nearly 71%, written through MCP. Tracking author productivity by country, including SCP and MCP distinctions, highlights international collaboration patterns and identifies leading research nations. This analysis can inform funding agencies and policymakers about where to allocate resources for maximum impact. Additionally, it fosters global partnerships by revealing which countries are most engaged in collaborative research efforts.

Table 6
Authors' countries

Country	Articles	Articles %	SCP	MCP	MCP %
United Kingdom	111	12.1	35	76	68.5
Italy	96	10.5	72	24	25
USA	75	8.2	55	20	26.7
Spain	53	5.8	37	16	30.2
Germany	51	5.6	30	21	41.2
China	48	5.3	25	23	47.9
Australia	26	2.8	21	5	19.2
Brazil	26	2.8	24	2	7.7
France	24	2.6	7	17	70.8
Canada	23	2.5	13	10	43.5

Source: Authors' elaboration based on Web of Science data, processed via Biblioshiny

Documents analysis: Citations serve as indicators of how a researcher's work influences and contributes to a specific field or topic, reflecting its impact and quality. This analysis involves examining how frequently other researchers reference a particular article in their own publications. The outcomes of citation analysis offer valuable insights into the impact and caliber of research articles, aiding researchers in making informed judgments about their scholarly endeavors. In our study, we closely examined the top 10 most cited works in the field of ESG. We provide a brief characterization of each, including the number of total citations (TC) as well as the number of total citations per year (TC/Y):

[27], (TC – 1,646; TC/Y – 149.64), explore the relationship between corporate social responsibility performance and access to financing. They found that organizations with higher CSR performance face fewer capital constraints due to increased stakeholder engagement, which enhances trust and reduces agency costs, and greater transparency, which lowers investor uncertainty about firm risks and opportunities. The results confirm that a robust CSR strategy can facilitate access to finance, driven by both its social and environmental dimensions.

[29], (TC – 543; TC/Y – 108.60) examine the relationship between financial consequences of climate risks and firms' ESG orientation. Long-term and larger investors focused on ESG engage in active management of climate risks rather than divestment. Motives include protecting reputation, moral and legal considerations, and belief in their impact on returns. Investor's view climate risks as significant investment risks.

[30], (TC – 492; TC/Y – 123) investigated the impact of ESG investments on performance during financial crises. ESG investments mitigate risks and support stability, they highlighted the growing importance of responsible investing during crises and challenging market conditions.

[31], (TC – 417; TC/Y – 59.57) focus on the reasons and methods investors use ESG information for investment decisions. Results show that investors

primarily use ESG information for its impact on investment performance, client demand, and product strategy, with ethical factors being less significant. Lack of reporting standards poses a barrier to effective use of ESG information.

[6], (TC – 397; TC/Y – 56.71) examined the impact of disclosing ESG information on firm value. They find a positive correlation, indicating that investors value firms that are transparent and responsible in ESG, thereby enhancing mutual trust among stakeholders. Disclosure of ESG information is an effective tool for increasing firm value, especially when actively supported by the CEO.

[32], (TC – 384; TC/Y – 96) assessed the impact of ESG investments on expected returns, performance, investment sector size, and social impact. Their findings indicate that ESG factors play a crucial role in the investment process and sustainable investing can have a positive impact on the environment, society, and making firms more environmentally friendly.

[33], (TC – 378; TC/Y – 94.5) attempted to reconcile conflicting information on how firms should incorporate ESG into portfolio selection. Their study proposes a new theory linking ESG scores with firm fundamentals and investor preferences, offering a fresh approach to responsible investing to achieve an optimal risk-return ratio for investors.

[34], (TC – 366; TC/Y – 122) explored the causes of divergence in ESG rating agency assessments through factors like scope, measurement, and weighting. Results highlight that measurement methods have the most significant impact on rating divergence, followed by the scope of ESG factors assessed and their weighting. The study underscores the need for greater transparency and harmonization in ESG assessment methodologies and data generation for improved comparability and informed ESG performance.

[35], (TC – 365; TC/Y – 60.83) investigated the relationship between business efficiency and sustainability, questioning whether ESG-focused firms achieve better efficiency and profitability. Results show that the impact of ESG can vary depending on the level of disclosure and type of activity. Moderate disclosure levels influence firm efficiency, whereas low disclosure levels do not show significant impact. Additionally, disclosing ESG information and implementing ESG activities can positively impact firm financial performance.

[36], (TC – 352; TC/Y – 88) studied the relationship between firm financial performance and ESG scores in Latin American multinational companies. Results reveal a statistically significant negative relationship between ESG scores and financial performance. Firms with higher ESG scores tend to have poorer overall financial performance, including individual ESG components. This relationship is partially offset by financial gap and international geographical diversification.

4 Conclusions

The shift from profit maximization to sustainability has made ESG a crucial aspect of organizational success. Companies now prioritize social, environmental, and governance factors to ensure long-term viability. Our study analyzed ESG research in 914 articles from the Web of Science database. The first ESG-related publication appeared in 2007, with slow growth until 2018 (19 articles) and a surge in 2023 (294 articles). This upward trend is expected to continue.

RQ1: Key Contributors and International Collaboration

Our dataset includes 914 documents authored by 2,459 individuals, with 100 being single authored. The most productive authors are Khaled Hussainey (9 articles), Sebastian Utz (8), and Khaldoun Albitar, Karoline Bax, and George Serafeim (6 each). Among institutions, the University of Portsmouth leads with 26 papers, followed by Oxford University (23). The UK has the highest output (111 articles), with 68.5% involving international collaboration. France has the highest collaboration rate (70.8%), while Brazil has the lowest (7.7%). These findings highlight ESG's global relevance and the role of prestigious universities in advancing research.

RQ2: Leading Journals and Scholarly Impact

The most influential journal is Business Strategy and the Environment (56 articles), followed by Corporate Social Responsibility and Environmental Management (52) and Finance Research Letters (41). Business Strategy and the Environment has the highest h-index (22), followed by Corporate Social Responsibility and Environmental Management (19). The g-index highlights highly cited works like [26], which examines greenwashing in ESG disclosures and has 236 citations.

RQ3: Citation Patterns

The most cited studies show ESG's impact on financial performance [6], [27], risk management [29], stakeholder trust [31], and social sustainability [32]. Challenges include high implementation costs [35], inconsistent standards [34], and transparency issues [33].

A key issue is the lack of standardized definitions, as noted by [22]. ESG interpretations vary across investors, companies, and regulators, making clear communication essential. Future research should explore how different stakeholders perceive ESG and use its data to foster mutual understanding. With growing concerns like climate change and biodiversity loss, ESG research is expected to expand further, reinforcing its significance in business and policymaking.

Limitations

Even though this study provides comprehensive insights into ESG research trends, it has several limitations. First, the analysis is based exclusively on the Web of Science database. This may not include all relevant publications, particularly those indexed in other databases. This can introduce a degree of selection bias and limit the global representativeness of the findings. Second, bibliometric methods primarily capture quantitative indicators such as citations and productivity, which may not fully reflect the qualitative impact or theoretical depth of individual studies. Finally, the dynamic and rapidly evolving nature of ESG research means that the results represent a snapshot in time and may require continuous update to remain fully accurate.

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References

- [1] Renneboog, L., Ter Horst, J., & Zhang, C. (2008). Socially responsible investments: Institutional aspects, performance, and investor behavior. *Journal of Banking & Finance*, 32(9), 1723–1742. <https://doi.org/10.1016/j.jbankfin.2007.12.039>
- [2] Khurshid, R., & Islam, A. U. (2024). ESG literature mapping: Insights from bibliometric analysis. *International Journal of Disclosure and Governance*. <https://doi.org/10.1057/s41310-024-00244-5>
- [3] Garai-Fodor, M., & Huszák, N. (2024). Consumer Awareness: Environmental Consciousness, Conscious Lifestyle among Generation Z based on Primary Data. *Acta Polytechnica Hungarica*, 21(12), 73–87. <https://doi.org/10.12700/APH.21.12.2024.12.5>
- [4] Tóth, Z., Józsa, L., Seres Huszárik, E., Fam, K.-S., Salehuddin Sharipudin, M.-N., & Ayub, S. H. (2024). The Changing Business Ethics and Etiquette, in Slovakia and Hungary, due to Globalization. *Acta Polytechnica Hungarica*, 21(6), 89–106. <https://doi.org/10.12700/APH.21.6.2024.6.5>
- [5] Majoch, A. A. A., Hoepner, A. G. F., & Hebb, T. (2017). Sources of Stakeholder Salience in the Responsible Investment Movement: Why Do Investors Sign the Principles for Responsible Investment? *Journal of Business Ethics*, 140(4), 723–741. <https://doi.org/10.1007/s10551-016-3057-2>
- [6] Li, Y., Gong, M., Zhang, X.-Y., & Koh, L. (2018). The impact of environmental, social, and governance disclosure on firm value: The role of CEO power. *The British Accounting Review*, 50(1), 60–75. <https://doi.org/10.1016/j.bar.2017.09.007>
- [7] Câmara, P. (2022). The Systemic Interaction Between Corporate Governance and ESG. In P. Câmara & F. Morais (Eds.), *The Palgrave Handbook of ESG and Corporate Governance* (pp. 3–40). Springer International Publishing. https://doi.org/10.1007/978-3-030-99468-6_1
- [8] Eccles, R., & Strohle, J. (2018). *Exploring Social Origins in the Construction of ESG Measures Working Paper*.

- [9] Romero, S., Ruiz, S., & Fernandez-Feijoo, B. (2019). Sustainability reporting and stakeholder engagement in SPAIN: Different instruments, different quality. *Business Strategy and the Environment*, 28(1), 221–232. <https://doi.org/10.1002/bse.2251>
- [10] Lim, W. M., & Kumar, S. (2024). Guidelines for interpreting the results of bibliometric analysis: A sensemaking approach. *Global Business and Organizational Excellence*, 43(2), 17–26. <https://doi.org/10.1002/joe.22229>
- [11] Donthu, N., Kumar, S., Pandey, N., & Lim, W. M. (2021). Research Constituents, Intellectual Structure, and Collaboration Patterns in *Journal of International Marketing*: An Analytical Retrospective. *Journal of International Marketing*, 29(2), 1–25. <https://doi.org/10.1177/1069031X211004234>
- [12] De Bakker, F. G. A., Groenewegen, P., & Den Hond, F. (2005). A Bibliometric Analysis of 30 Years of Research and Theory on Corporate Social Responsibility and Corporate Social Performance. *Business & Society*, 44(3), 283–317. <https://doi.org/10.1177/0007650305278086>
- [13] Galletta, S., Mazzù, S., & Naciti, V. (2022). A bibliometric analysis of ESG performance in the banking industry: From the current status to future directions. *Research in International Business and Finance*, 62, 101684. <https://doi.org/10.1016/j.ribaf.2022.101684>
- [14] Ellili, N. O. D. (2022). Bibliometric analysis and systematic review of environmental, social, and governance disclosure papers: Current topics and recommendations for future research. *Environmental Research Communications*, 4(9), 092001. <https://doi.org/10.1088/2515-7620/ac8b67>
- [15] Gao, S., Meng, F., Gu, Z., Liu, Z., & Farrukh, M. (2021). Mapping and Clustering Analysis on Environmental, Social and Governance Field a Bibliometric Analysis Using Scopus. *Sustainability*, 13(13), 7304. <https://doi.org/10.3390/su13137304>
- [16] Zhao, X., Nan, D., Chen, C., Zhang, S., Che, S., & Kim, J. H. (2023). Bibliometric study on environmental, social, and governance research using CiteSpace. *Frontiers in Environmental Science*, 10, 1087493. <https://doi.org/10.3389/fenvs.2022.1087493>
- [17] Chen, X., & Liu, Y. (2020). Visualization analysis of high-speed railway research based on CiteSpace. *Transport Policy*, 85, 1–17. <https://doi.org/10.1016/j.tranpol.2019.10.004>
- [18] Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- [19] Šubelj, L., Fiala, D., & Bajec, M. (2014). Network-based statistical comparison of citation topology of bibliographic databases. *Scientific Reports*, 4(1), 6496. <https://doi.org/10.1038/srep06496>
- [20] Chuang, K.-Y., Huang, Y.-L., & Ho, Y.-S. (2007). A bibliometric and citation analysis of stroke-related research in Taiwan. *Scientometrics*, 72(2), 201–212. <https://doi.org/10.1007/s11192-007-1721-0>
- [21] Senadheera, S. S., Gregory, R., Rinklebe, J., Farrukh, M., Rhee, J. H., & Ok, Y. S. (2022). The development of research on environmental, social, and governance (ESG): A bibliometric analysis. *Sustainable Environment*, 8(1), 2125869. <https://doi.org/10.1080/27658511.2022.2125869>

- [22] Koo, M. (2021). Systemic Lupus Erythematosus Research: A Bibliometric Analysis over a 50-Year Period. *International Journal of Environmental Research and Public Health*, 18(13), Article 13. <https://doi.org/10.3390/ijerph18137095>
- [23] Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences*, 102(46), 16569–16572. <https://doi.org/10.1073/pnas.0507655102>
- [24] Ireland, T., MacDonald, K., & Stirling, P. (2012). *The H-Index: What Is It, How Do We Determine It, and How Can We Keep Up With It?*
- [25] Egghe, L. (2006). Theory and practise of the g-index. *Scientometrics*, 69(1), 131–152. <https://doi.org/10.1007/s11192-006-0144-7>
- [26] Yu, E. P., Luu, B. V., & Chen, C. H. (2020). Greenwashing in environmental, social and governance disclosures. *Research in International Business and Finance*, 52, 101192. <https://doi.org/10.1016/j.ribaf.2020.101192>
- [27] Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, 35(1), 1–23. <https://doi.org/10.1002/smj.2131>
- [28] Ndwandwe, M., Bishop, D. G., Wise, R., & Rodseth, R. (2021). Bibliometrics to assess the productivity and impact of medical research. *South African Journal of Higher Education*, 35(4). <https://doi.org/10.20853/35-4-4341>
- [29] Krueger, P., Sautner, Z., & Starks, L. T. (2020). The Importance of Climate Risks for Institutional Investors. *The Review of Financial Studies*, 33(3), 1067–1111. <https://doi.org/10.1093/rfs/hhz137>
- [30] Broadstock, D. C., Chan, K., Cheng, L. T. W., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. *Finance Research Letters*, 38, 101716. <https://doi.org/10.1016/j.frl.2020.101716>
- [31] Amel-Zadeh, A., & Serafeim, G. (2018). Why and How Investors Use ESG Information: Evidence from a Global Survey. *Financial Analysts Journal*, 74(3), 87–103. <https://doi.org/10.2469/faj.v74.n3.2>
- [32] Pástor, L., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, 142(2), 550–571. <https://doi.org/10.1016/j.jfineco.2020.12.011>
- [33] Pedersen, L. H., Fitzgibbons, S., & Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics*, 142(2), 572–597. <https://doi.org/10.1016/j.jfineco.2020.11.001>
- [34] Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate Confusion: The Divergence of ESG Ratings. *Review of Finance*, 26(6), 1315–1344. <https://doi.org/10.1093/rof/rfac033>
- [35] Xie, J., Nozawa, W., Yagi, M., Fujii, H., & Managi, S. (2019). Do environmental, social, and governance activities improve corporate financial performance? *Business Strategy and the Environment*, 28(2), 286–300. <https://doi.org/10.1002/bse.2224>
- [36] Duque-Grisales, E., & Aguilera-Caracuel, J. (2021). Environmental, Social and Governance (ESG) Scores and Financial Performance of Multilatinas: Moderating Effects of Geographic International Diversification and Financial Slack. *Journal of Business Ethics*, 168(2), 315–334. <https://doi.org/10.1007/s10551-019-04177-w>