


## Article

# Mapping and Clustering Analysis on Environmental, Social and Governance Field a Bibliometric Analysis Using Scopus

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**Abstract:** Academic interest in ESG has grown significantly in recent years. Nevertheless, bibliometric and visualization research on this topic is still insufficient. This study aims to conduct publication metrics on the literature connected with ESG and attempt to give a research agenda for future research. In this study, we used data from the Scopus database. Various bibliometric techniques, such as bibliographic coupling and co-occurrence analysis, were combined with assorted themes to present an overview. To the best of our knowledge, there is no study that analyses the bibliographic data on ESG fields; this study is a unique contribution to the literature. This study also provides an overview of the trends and trajectories with a visual and schematic frame for the research of this topic. This may help researchers understand the current trends and future research directions, and enable future authors to conduct their studies more effectively.

**Keywords:** ESG; CSR; bibliometric analysis; publication metrics



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## 1. Introduction

With the continuous development of the economy, enterprises need to fulfill the standards of social responsibility is also increasing. Enterprises should not only pursue high market value and high profitability but also undertake various responsibilities. The comprehensive strength of enterprises is more closely combined with the Environmental, Social and Governance (ESG) concept, sustainable development, and other issues.

At present, the novel coronavirus (COVID-19) has severely affected the health and daily lives of people around the world. In addition to the need of governments of all countries to actively respond to this, companies should also play their role in alleviating the current crisis and accelerating economic recovery [1]. For the company itself, formulating an ESG plan has a positive impact on the company's long-term value and business flexibility [2]. Increased investment in the environment, society and human capital can enable companies to better mobilize the internal resources of the company [3]; enhance employee loyalty [4], thereby increasing employee productivity and work efficiency [5]; and ultimately form the company's sustainable development capabilities. In addition, many studies have shown that companies with high ESG performance have better financial performance [6–8], the risk of a company experiencing crisis is lower [9,10] and it is more attractive to institutional investors [11].

ESG was born out of Socially Responsible Investment (SRI). The concept of social investment can be traced back to the 1960s and 1970s. Due to the rapid growth of industrial experience in European and American countries after World War II, a series of environmental and social problems have arisen, and a large number of public environmental protection campaigns have come into being. As a result, the capital market has begun to pay attention to and value environmentally responsible investment. The term “Environmental, Social and Governance” first appeared in the UN report “Who Cares Wins” in 2004. Subsequently, the

United Nations Principles for Responsible Investment (UN-PRI) was formally established in 2006, which put forward the ESG framework and listed some factors for consideration. The same year, Goldman Sachs Environmental Policy: 2006 Year-End Report was released, formally juxtaposing the seemingly unrelated terms E/S/G.

The European Union and many developed countries have made ESG reports mandatory for companies to disclose. Although ESG disclosure is still in its infancy in China, Hong Kong Exchanges and the Growth Enterprise Board of Shanghai Stock Exchange have taken the lead in stipulating that the listed companies under these exchanges are required to disclose ESG reports. It can be inferred that, in the future, China's A-share listed companies will follow the example of European and American countries and gradually promote the ESG mandatory disclosure principle of listed companies.

For researchers in the field of ESG, bibliometric research methods can make it more convenient to use big data to discover trends in ESG literature publications. By exploring the network relationship of authors [12], countries [13] and journals [14], as well as the analysis of keywords [15], the development trends of this research topic can be found out intuitively and visually.

The contribution of the study is threefold. First, the findings reveal the research's patterns. Second, the thesis offers an overview of ESG research's conceptual framework through the use of a bibliographic coupling. Thirdly, and above all, the study outlines some suggestions for future research, allowing researchers to understand and identify future issues for research.

## 2. Literature Review

### 2.1. *Environmental, Social and Governance (ESG)*

Although the concept of ESG has existed for decades (dating back to the 1950s), it was not until the early 2010s that ESG issues were gradually taken seriously by enterprises. The ESG evaluation system consists of three dimensions, namely Environment, Society and Governance, which respectively represent the environmental responsibility, social responsibility and corporate governance responsibility of corporations. Environmental responsibility mainly refers to the idea that the company should improve its environmental performance in production and operation and reduce the environmental cost per unit of output [16]. Social responsibility means that a company should adhere to higher business ethics, social ethics, legal standards and attach importance to the internal relationship with the external society, including human rights, interests of relevant parties and ecological improvement of the industry [17]. Corporate governance responsibility refers to the scientific management system through which the company should improve the modern corporate system, rationally distribute the power of shareholders and the management of the board of directors around those who can be entrusted with that responsibility and the scientific management system from development strategies to specific actions [18].

Since the early 2010s, corporate managers have begun to carry out a series of reforms in corporate governance in order to rebuild investors' trust in the capital market after the 2008 financial crisis. Although the global economy has been gradually recovering in the past ten years, the environmental and social problems caused by companies have also increased rapidly. Many corporate crises that affect consumers, the environment and the entire society have occurred (child labor issues in a manufacturing company; gender equality in the enterprise; Wirecard financial fraud incidents, etc.).

ESG is a core indicator of non-financial performance. Investors who agree with the concept of socially responsible investment believe that ESG factors help to gain insight into the company's long-term performance. At present, there are several mature ESG evaluation systems in the world. MSCI, Thomson Reuters, FTSE Russell, Goldman Sachs, etc., have established a complete ESG rating framework. Among them, the evaluation systems of MSCI and Thomson Reuters have relatively complete and representative manuals. At the same time, ESG has also aroused the interest of a wide range of scholars. Researchers have

found that ESG has an impact on the performance and reputation of corporations [19] and plays a certain role in the process of internationalization of corporations.

At present, the number of ESG papers is increasing rapidly. Therefore, we believe that it is necessary to sort out and summarize the related literature and then analyze the status of ESG research. This is because, for scholars who are new to ESG research, it is generally difficult to quickly understand the past achievements and future development trends in the field. Therefore, this article will summarize the main trends of the ESG literature so that scholars interested in this field can quickly get started.

## 2.2. Why Bibliometric Analysis?

Bibliometrics refers to the cross-science of using mathematical and statistical methods to quantitatively analyze all knowledge carriers [20]. It is a comprehensive knowledge system integrated with quantification, mathematics, statistics and philology. The number of documents (various publications, particularly journal articles and citations), the number of authors (individual collectives or groups), the size of vocabulary (various document identifications, the majority of which are thesauruses) and so on are the main measurement objects.

Bibliometrics is widely used. Identifying core records, reviewing publications, examining document use and understanding scientific management of library and information departments are examples of micro-level applications. Designing more cost-effective intelligence systems and networks, improving the efficiency of intelligence processing, searching for flaws and defects in document services, predicting the direction of the publication and developing and improving basic intelligence theories are all examples of macro-level applications.

Recently, bibliometric methods have been used to conduct the bibliometric analysis of Journals [21,22], disciplines [23], Institutes and Countries [24].

This article mainly uses the bibliometric method to analyze the performance and structure of the ESG literature. The performance of the literature can be reflected by the number of times the literature has been cited, and scientific mapping can visualize the structure and dynamics of the field. In order to achieve these research goals, we mainly analyze the literature as follows:

- Citation and Co-citation analysis.
- Bibliographical coupling.
- Keyword co-occurrence analysis

Citation, co-citation and bibliographic coupling mainly reflect the importance of the literature and the similarity between the themes of the literature. Citation analysis enables scholars to quickly understand the influence of journals, papers or authors in the field, while co-citation analysis simplifies the complex relationship between many papers into the relationship between several ethnic groups through the computer and directly expresses the relationship between documents. Keyword co-occurrence analysis mainly explores the similarity between words and infers the research hotspots of the subject by analyzing the relationship between keywords.

## 3. Methods

### 3.1. Database Choice and Search Terms

Numerous research articles have suggested that the Scopus database is suitable for bibliometric analysis [25–27]. For example, compared to the WOS database, the Scopus database is more convenient to export data with [25]. Manual operations are required when using WOS to export more than 500 papers, and the Scopus database covers a wider range of papers in the field of business and management [26,27]. Therefore, compared with the Web of Science database (WoS), Scopus turned out to be more suitable for bibliometric analyses [28].

This study searched SCOPUS for “ESG” or “Environment social governance” in the title, abstract, keywords and text of the article. The original results showed that

5677 documents were published, with a time span from 1934 to 2021. This paper aims to analyze the overall trend of ESG research; therefore, we did not limit the time range. The discipline category is limited to “business, management and accounting” and “Economics, Econometrics and Finance” since this is the area of interest for the analysis, and the number of remaining papers was 740.

### 3.2. Data Cleaning

In order to reduce the influence of the chronological factor on the statistical results, we deleted the year 2021. Ultimately, the number of documents selected was 690. The “AND” and “OR” Boolean operators were used. The retrieval procedure is as follows: title-abs-key (“environment social governance”) or title-abs-key (“ESG”) and (limit-to (subjarea, “busi”) or (limit-to (subjarea, “econ”)) and (exclude (pubyear, 2021))).

### 3.3. Indicators

After cleaning the data of the literature, the next step was to analyze the indicators in the data. In literature, mainly two types of indicators (Durieux and Gevenois, 2010) are used for bibliometric analysis, performance and science mapping. Performance analysis mainly evaluates productivity and influence through the number of publications and citations [29]. Scientific mapping is to visualize the information of the literature and clearly show the research dynamics and structure of the field.

### 3.4. Software and Technique

This article mainly uses two analysis software: VOSviewer and Rstudio. VOSviewer is a free software based on JAVA and developed by Van Eck and Waltman of The Centre for Science and Technology Studies (CWTS) of Leiden University in the Netherlands in 2009, mainly for literature data [30]. RStudio is R’s integrated development environment (IDE), which includes a console, a syntax highlighting editor that supports direct code execution and tools for drawing, history, debugging and workspace management [31]. These tools can generate visual images of the literature, and graphs can show hotspots, emerging trends and intelligent networks in the research field.

## 4. Result

### 4.1. Publication Trend

The figure shows the publication trend in the field of ESG research during the period of the 1990s to 2020. The results presented here show a general upward trend in the publication of topics related to ESG. The terms “Environmental, Social and Governance” first appeared in the UN report “Who Cares Wins” in 2004. As we can see from Figure 1 and Table 1, since 2004, the number of articles on ESG topics has continued to increase. The annual publication numbers in ESG fields have been in a steady state before 2010. After 2010, the number of publications has increased significantly and maintained a rising trend. It is worth noting that the ESG articles published in 2014 and 2015 were highly cited papers, which means that those papers are considered highly impactful. In addition, the number of ESG papers has soared from 42 in 2016 to 243 in 2020. In just five years, the number of papers in related fields has increased by nearly six times. Although the number of citations of papers has declined after 2016, the continuous increase in the number of papers also reflects the importance of ESG in academia to a certain extent [32,33].

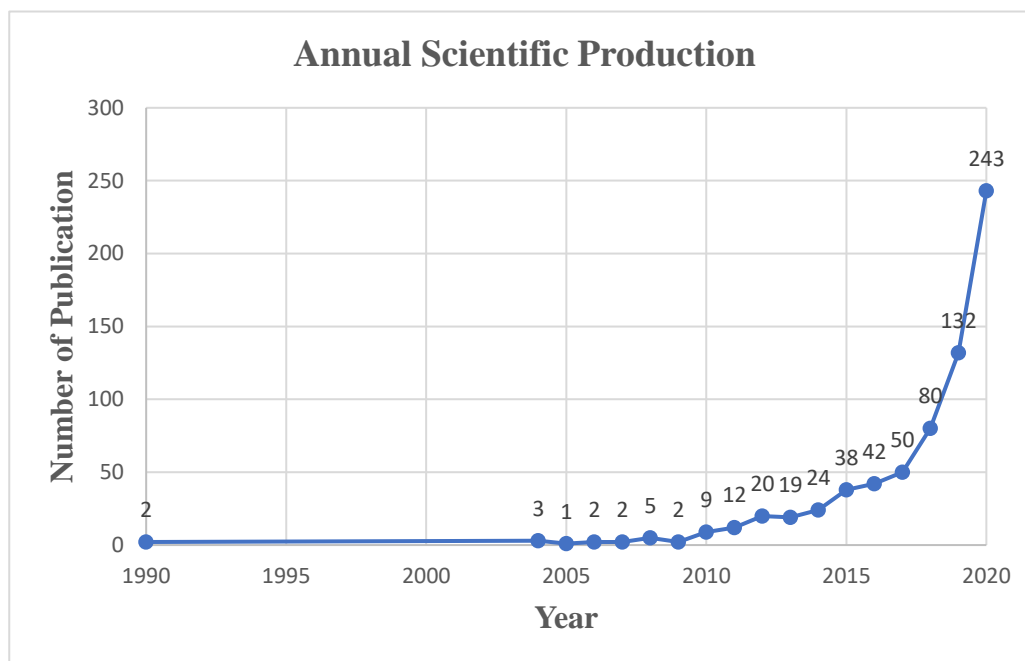


Figure 1. Publication trends.

Table 1. Trends of Publication and citations.

Year	No. of Publications	Citations
2020	243	497
2019	132	701
2018	80	982
2017	50	981
2016	42	980
2015	38	1076
2014	24	1268
2013	19	283
2012	20	87
2011	12	109
2010	9	93
2009	2	6
2008	5	75
2007	2	25
2006	2	0
2005	1	0
2004	3	0
2003	0	0
2002	0	0
2001	0	0
2000	0	0
1999	0	0
1998	0	0
1997	0	0
1996	0	0
1995	0	0
1994	0	0
1993	0	0
1992	0	0
1991	0	0
1990	2	59

This phenomenon is closely related to the attention of the international community to the issues of corporate social responsibility and environmental protection. It also shows that the topic of ESG has been paid more and more attention by scholars, and also proves the topic of this article is worth being studied.

The figure shows the publication trend in the field of ESG research during the period of the 1990s to 2020. As of 2020, 690 articles in the ESG field have been collected in the Scopus database. It can be seen that the number of documents in the ESG field has increased dramatically since 2005, and the number of publications in the past five years has accounted for 72% of the total number of publications. At the same time, it can be seen in Table 1 that the number of citations of ESG articles is also increasing overall.

#### 4.2. Leading Countries in ESG Research

In this section, we examine the most productive and influential countries in the field of environmental, social, and governance (ESG). At present, in the past few decades, more than 62 countries and regions have made significant contributions to ESG research. Among them, both developed and developing countries have published ESG themed papers. Table 2 shows that the top five countries for publishing papers are the United States, the United Kingdom, France, Australia and Germany. These countries are all traditionally developed countries. The United States is the most productive country in this field and has published 228 articles. However, at the same time, it can be found that developing countries such as India, China, Brazil, Ukraine and Romania have gradually begun to study the ESG field.

**Table 2.** The most productive countries.

Rank	Country	Documents	Citations	AC/D
1	USA	228	1657	7.267
2	UK	124	596	4.806
3	France	80	348	4.350
4	Australia	74	542	7.324
5	Germany	73	855	11.712
6	Italy	68	211	3.103
7	Canada	59	275	4.661
8	Spain	50	296	5.920
9	Malaysia	39	36	0.923
10	India	36	74	2.056
11	Netherlands	26	109	4.192
12	China	21	15	0.714
13	Brazil	20	126	6.300
14	Japan	20	60	3.000
15	South Korea	20	29	1.450
16	Switzerland	19	109	5.7372
17	Ukraine	19	0	0
18	South Africa	18	153	8.500
19	Sweden	18	71	3.944
20	Romania	16	12	0.750

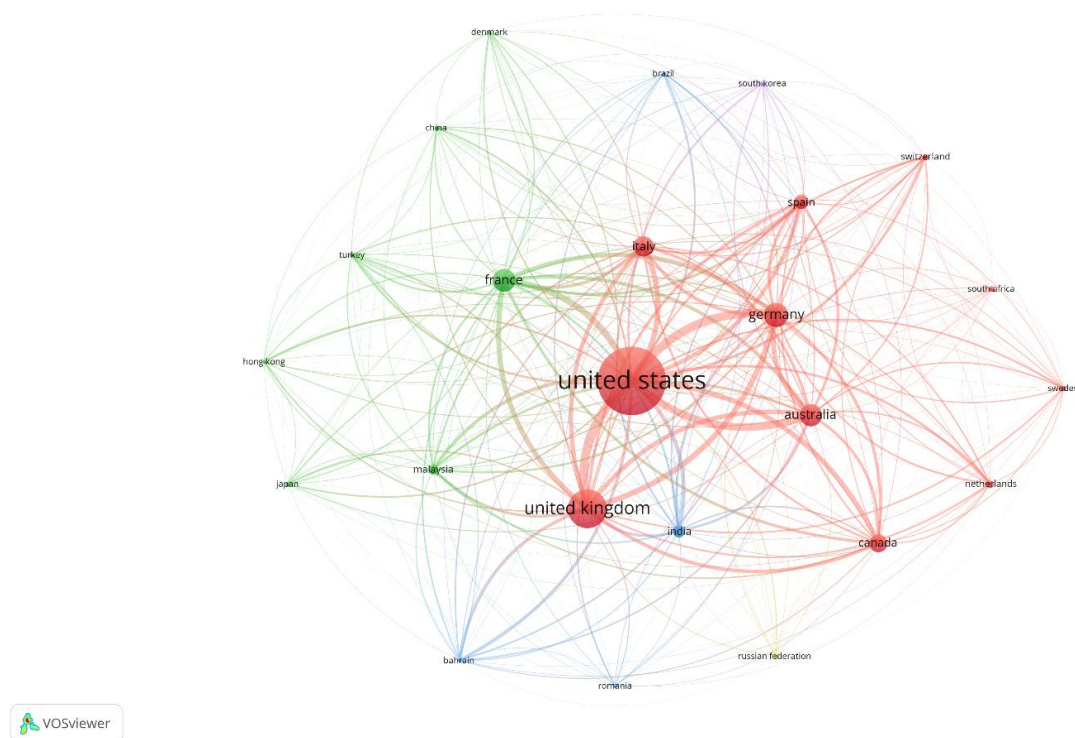
In general, developed countries account for the majority of the top 20 countries that publish papers. This should be attributed to the positive correlation between the country's attention to the environment and corporate ethics and local economic development. In addition, papers published in Germany, South Africa, Australia, the United States and Brazil are cited more frequently, which indicates that the quality of papers in these countries is better.

#### 4.3. Country Bibliographic Coupling

Bibliographic coupling is a measure of similarity between the research sources, which can be used to explore the similarities in different research [34]. Bibliographic coupling



occurs when two documents cite a third study commonly. As far as countries are concerned, bibliometric coupling occurs when, in their publications, a document from two countries cites the third document. This shows how other countries use similar literature in their publications and focus on a similar point. The result in Figure 2 is based on the minimum of each country/region.

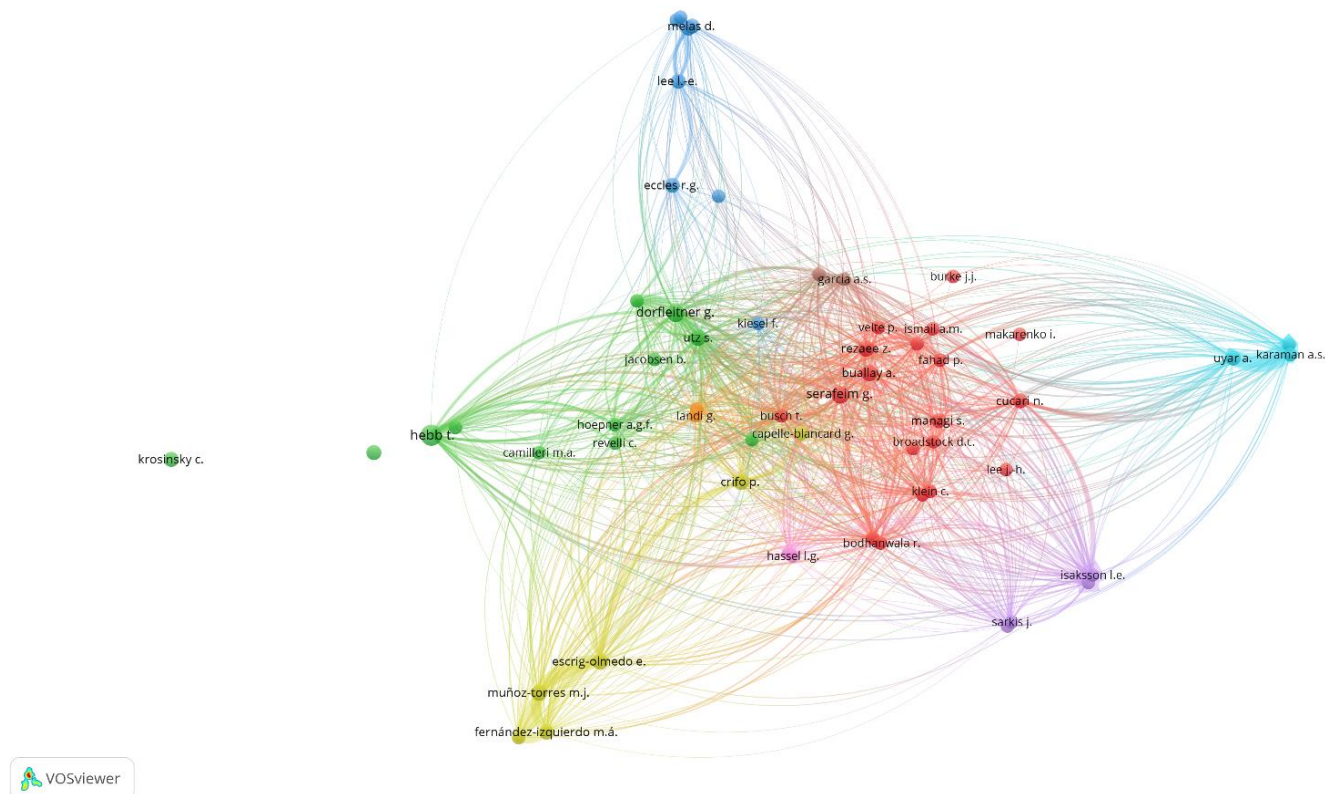


**Figure 2.** Bibliographic coupling of countries/regions.

In the results of bibliographic coupling of countries, each circle represents a country/region, and each color represents a cluster. There are nine clusters in total in the result. It can be seen that countries in the same color may mainly focus on or face the same problems. Further, according to the number of clusters, it can be inferred that the ESG problems faced by different countries are not consistent in their differences.

#### 4.4. Authors Bibliographic Coupling

According to the concept of bibliographic coupling, the cluster with the same color presents a common research area. There are a total of 1494 authors in the database. After the minimum publications limitation has been set to three, there are 58 left which meet the threshold. The result in Figure 3 shows the collaboration and connection in the field of ESG among authors. The red and green cluster occupy nearly half the area of the graph, which illustrates that they are core researches of energy saving.



**Figure 3.** Bibliographic coupling of authors.

Among the authors with the same interests, the one whose circle in the graph is bigger demonstrates a larger contribution to their research area. For instance, Dorfleitner G. has the biggest circle in the red cluster, which means that Dorfleitner is the author with the most contributions of bibliographic coupling in the green clusters.

#### 4.5. Most Productive Journal

The 690 articles in the database were published in 314 journals. The journals with a higher number of documents are presented. Table 3 shows the top 20 journals with the largest number of ESG papers. Of the papers found, 41% are published in these journals. Among them, the journal with the most publications is the Journal of Sustainable Finance and Investment, which has published 50 papers; the journal with the most cited articles is Business Strategy and the Environment, with 716 citations. These indicate the leading position of these two journals in the ESG field.



**Table 3.** The most productive journals.

Journals	Documents	Citations
Journal of sustainable finance and investment	50	398
Business strategy and the environment	34	716
Journal of business ethics	24	633
Corporate social responsibility and environmental management	21	333
Journal of portfolio management	21	38
Journal of cleaner production	15	380
Journal of asset management	14	109
Critical studies on corporate responsibility, governance and sustainability	12	29
Journal of investing	12	17
Finance research letters	11	27
Social responsibility journal	9	61
Sustainability accounting, management and policy journal	9	173
Journal of corporate finance	8	166
Sustainable investing: a path to a new horizon	8	0
Journal of business research	7	98
Journal of index investing	7	8
Accounting and finance	6	23
Corporate governance (bingley)	6	23
Corporate governance: an international review	6	92
Global finance journal	6	102

#### 4.6. Most Influential Publications Ranked by Number of Citations

List of top cited publications is provided in Table 4. The research content of the theses presented in these papers is very extensive, from the relationship between ESG and corporate performance (company performance, financial performance, investment) to how to realize the sustainable development of the company through ESG. In these papers, corporate disclosure is a key research topic, including ESG disclosure and company-wide reports. In addition, many papers focus on a single country or region, such as Italy, Australia and South Africa.

**Table 4.** The most Influential Publications.

Title	Journal	Year	Total Citation
Corporate social responsibility and access to finance	Strategic Management Journal	2014	721
ESG and financial performance: aggregated evidence from more than 2000 empirical studies	Journal of Sustainable Finance and Investment	2015	234
Socially responsible funds and market crises	Journal of Banking and Finance	2014	122
Investigating the relationship of sustainable supply chain management with corporate financial performance	International Journal of Productivity and Performance Management	2013	109
Integrated reporting in South Africa in 2012: Perspectives from South African institutional investors	Meditari Accountancy Research	2015	103
Corporate social responsibility governance, outcomes, and financial performance	Journal of Cleaner Production	2017	95
Environmental responsibility and firm performance: The application of an Environmental, Social and Governance Model	Business Strategy and the Environment	2016	95
Corporate social responsibility and financial performance: A non-linear and disaggregated approach	Economic Modelling	2016	92
The effects of environmental, social and governance disclosures and performance on firm value: A review of the literature in accounting and finance	British Accounting Review	2018	87
Diversity of Board of Directors and Environmental Social Governance: Evidence from Italian Listed Companies	Corporate Social Responsibility and Environmental Management	2018	82

Table 4. Cont.

Title	Journal	Year	Total Citation
Sustainable Development and Financial Markets: Old Paths and New Avenues	Business and Society	2016	82
Corporate Sustainable Development: Is 'Integrated Reporting' a Legitimation Strategy?	Business Strategy and the Environment	2016	81
Commitment Strategies for Sustainability: How Business Firms Can Transform Trade-Offs Into Win-Win Outcomes	Business Strategy and the Environment	2014	81
The impact of strategic relevance and assurance of sustainability indicators on investors' decisions	Auditing	2015	80
The impact of environmental, social, and governance disclosure on firm value: The role of CEO power	British Accounting Review	2018	79
ESG performance and firm value: The moderating role of disclosure	Global Finance Journal	2018	71
The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms	British Accounting Review	2017	64
Integrating Environmental, Social and Governance (ESG) Disclosure for a Sustainable Development: An Australian Study	Business Strategy and the Environment	2017	63
ESG Integration and the Investment Management Process: Fundamental Investing Reinvented	Journal of Business Ethics	2016	63
Corporate social responsibility and Eurozone corporate bonds: The moderating role of country sustainability	Journal of Banking and Finance	2015	63

It is worth noting that there are many highly cited papers published in the journal Business Strategy and the Environment. In addition, all highly cited papers were published after 2010, and many of them were published after 2015, which shows that ESG topics are still in the embryonic stage, and the number of ESG-related papers will rapidly increase in the future.

#### 4.7. Most Productive Authors

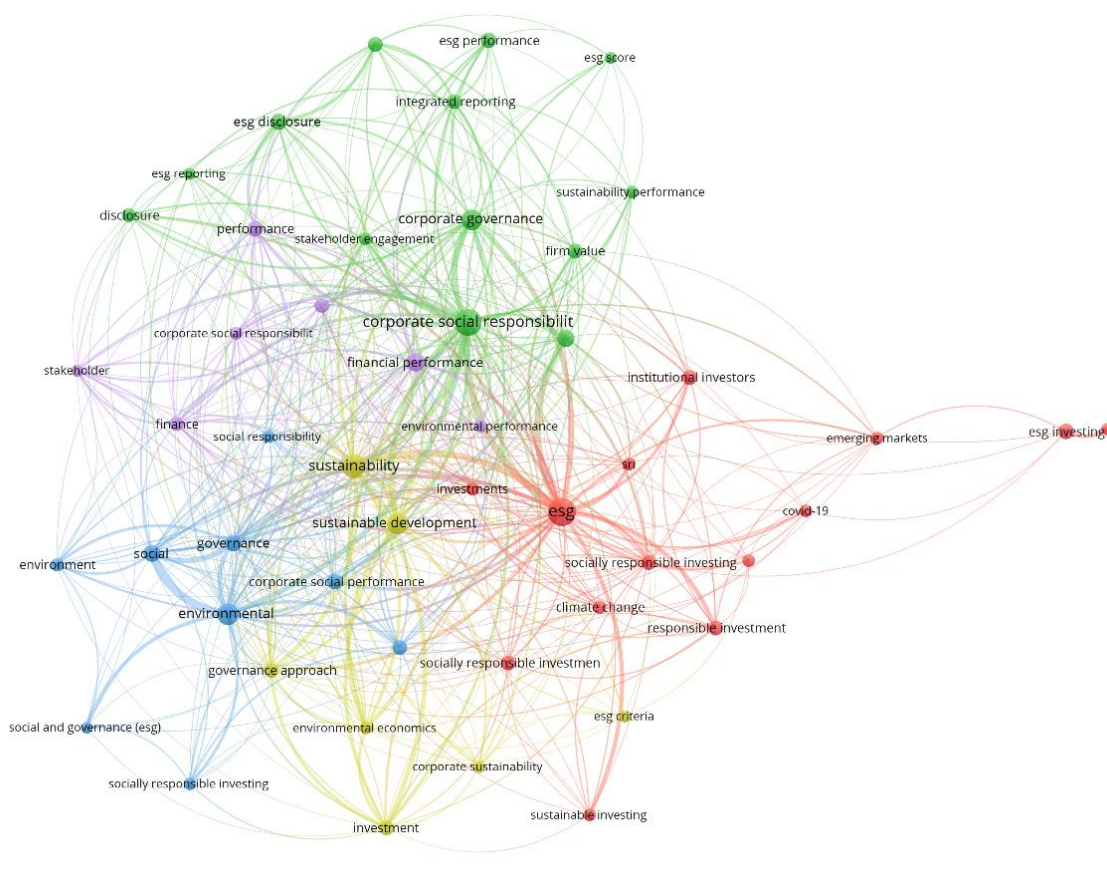
Table 5 ranks the most productive authors of ESG in the business and economic area. Table 3 shows that Hebb T. is the author with the most published papers in this field, with 10 papers published. Serafeim G. is the author with the most cited papers in this field. He has published six papers and the average number of citations is 131.33 times. It can be seen that Serafeim G. and Hebb T. are the two most important authors in the ESG field; however, at the same time, we should also pay attention to the three authors Cucarin, Rezaee Z. and Arayssim. The quality of the papers they publish is also very high, with each paper having been cited more than 20 times on average.

Table 5. The most productive authors.

Rank	Author	Documents	Citations	C/D
1	Hebb T.	10	100	10.00
2	Dorflleitner G.	6	101	16.83
3	Serafeim G.	6	788	131.33
4	Buallay A.	5	14	2.80
5	Crifo P.	5	95	19.00
6	Escrig-Olmedo E.	5	90	18.00
7	Muñoz-Torres M.J.	5	72	14.40
8	Rezaee Z.	5	136	27.20
9	Utz S.	5	46	9.20
10	Cucari N.	4	109	27.25
11	Eccles R.G.	4	20	5.00
12	Fernández-Izquierdo M.Á.	4	41	10.25
13	Giamporcaro S.	4	9	2.25
14	Krosinsky C.	4	1	0.25
15	Lee L.-E.	4	15	3.75
16	Managi S.	4	58	14.50
17	Melas D.	4	16	4.00
18	Nagy Z.	4	16	4.00
19	Uyar A.	4	24	6.00
20	Arayssi M.	3	74	24.67

#### 4.8. Keyword Co-Occurrence

To identify the future research directions for ESG research in the management and economic research field, we analysed the co-occurrence of keywords and topic trends of themes. Keywords are the most refined introduction to an academic article. By observing the co-occurrence of keywords in a field, scholars can quickly understand the research hotspots and future research directions of the academic field. In this study, a keyword co-occurrence graph was created in VOSviewer, as shown in Figure 4. We set a minimum of 10 occurrences of a keyword to analysis among all 2333 keywords, and only 50 keywords meet the threshold. In a scientific field, keyword co-occurrence analysis creates a network of topics and their relationships.



**Figure 4.** Occurrence of all keywords.

The size of the node in this map indicates the number of times the keyword appears. The strength of co-occurrence between pairs of keywords is determined by the distance between two nodes and the thickness of the line connecting them. The nodes' color represents keyword clusters, which frequently contain co-occurring words and can be interpreted as broad research topics in the field [34]. From 1990 to 2020, five general clusters appear to summarize the topical foci of interest in the field of ESG.

**Cluster 1:** ESG investment originated from socially responsible investment, which is the abbreviation of environmental, social and corporate governance investment philosophy. Principles for Responsible Investment (PRI) signatories currently control up to 60 trillion US dollars in assets under administration of half of all global institutional assets. Sustainable investment strategies include negative screening, positive screening, standardized screening, ESG integration, sustainable development-themed investment and shareholder participation. At present, it mainly focuses on negative screening and ESG integration strategies. This is evident from the first (red cluster) keyword, which demonstrates a

general interest in investment in global business contexts, as evidenced by frequently co-occurring words such as sustainable investing, sustainable finance, socially responsible investment, portfolio theory, ESG investing, climate change and emerging market.

**Cluster 2:** The topics presented in this cluster (green cluster) were mainly focused on ESG disclosure, including ESG reporting, ESG performance, ESG score, integrated reporting, stakeholder engagement, sustainability performance, firm value and corporate governance. ESG disclosure refers to the disclosure of environmental, social responsibility and corporate governance (Environment, Social and Governance, referred to as ESG) information. With the continuous development of the capital market, listed companies should have a conscious awareness of ESG information disclosure, actively fulfill their social and environmental responsibilities and promote long-term sustainable development. The second topical area focuses on ESG disclosure in a certain context.

**Cluster 3:** The topics presented in this cluster (blue cluster) were mainly focused on corporate social responsibility, including corporate social performance, governance, environment, governance and social responsibility. Corporate Social Responsibility (Corporate Social Responsibility, CSR) is a concept proposed by the European Union in 2001. Corporate Social Responsibility (CSR) refers to a responsibility that companies take social and environmental factors into consideration when making decisions and operations. There are some differences between CSR and ESG. CSR focuses on the interests of multiple stakeholders and a wide range of groups. Environment, society and governance have become important pillars of corporate social responsibility. ESG mainly starts from the perspective of investors in the capital market, focusing on the relationship between corporate social performance and shareholder returns. CSR application scenarios are relatively broad and may appear in areas such as enterprise supply chain management, brand marketing, community communication and employee management. These departments are all related to CSR work. ESG application scenarios focus on the capital market, especially between investors and listed companies. In the company, the investor relations management department is generally responsible for ESG work.

**Cluster 4:** The topics presented in this cluster (yellow cluster) were mainly focused on corporate sustainability, including environmental, economic, ESG criteria, governance approach, sustainability and sustainability development. The ESG evaluation system helps companies formulate sustainable development strategies, thereby affecting the financial performance of multinational companies [35]. Bhattacharya (2006), Skarmeas and Leonidou (2013), and others, believe that customers may be skeptical of the company's investment in social responsibility, thus invalidating the company's ESG strategy [36,37]. Companies with high ESG ratings in a certain area usually have a higher competitive advantage than local companies, and they continue to maintain their own competitive advantages by formulating business plans and incentive plans. At the same time, a competitive advantage will help companies make profits and maintain the momentum for development.

**Cluster 5:** The topics presented in this cluster (purple cluster) were mainly focused on finance, including finance, finance performance and stakeholder theory. From a corporate perspective, companies that attach great importance to ESG and perform well are better than their peers in ESG risk management; in addition, companies that perform well in ESG have a long-term and stable positive correlation between ESG performance and financial performance. ESG investment strategies have the opportunity to bring significant excess returns in emerging markets. For example, since 2009, the total return of the MSCI Emerging Market ESG Net Return Index has continued to exceed the MSCI Emerging Market Net Return Index [38].

Gunnar Friede, Timo Busch and Alexander Bassen summarized more than 2200 related studies and found that more than 2100 empirical studies (especially company-centric empirical studies) showed that there is a positive relationship between ESG and corporate financial performance [6]. However, at the same time, the research results of McWilliams et al. (2006) show that there are still many studies which show that the relationship between ESG and financial performance is not completely positive but also has negative or mixed

effects [39]. Kim and Lyon (2015) believe that ESG practice only represents a cost of the company, and therefore does not bring real benefits to the company, thereby reducing the overall performance of the company [40].

#### 4.9. Dynamic Topic Model

This study further uses Biblioshiny to analyze the trend of keywords and set the minimum frequency of keywords for authors to 5 and the maximum number of keywords per year to 10. The results are shown in Figure 5. The abscissa represents the year, and the ordinate represents the frequency.

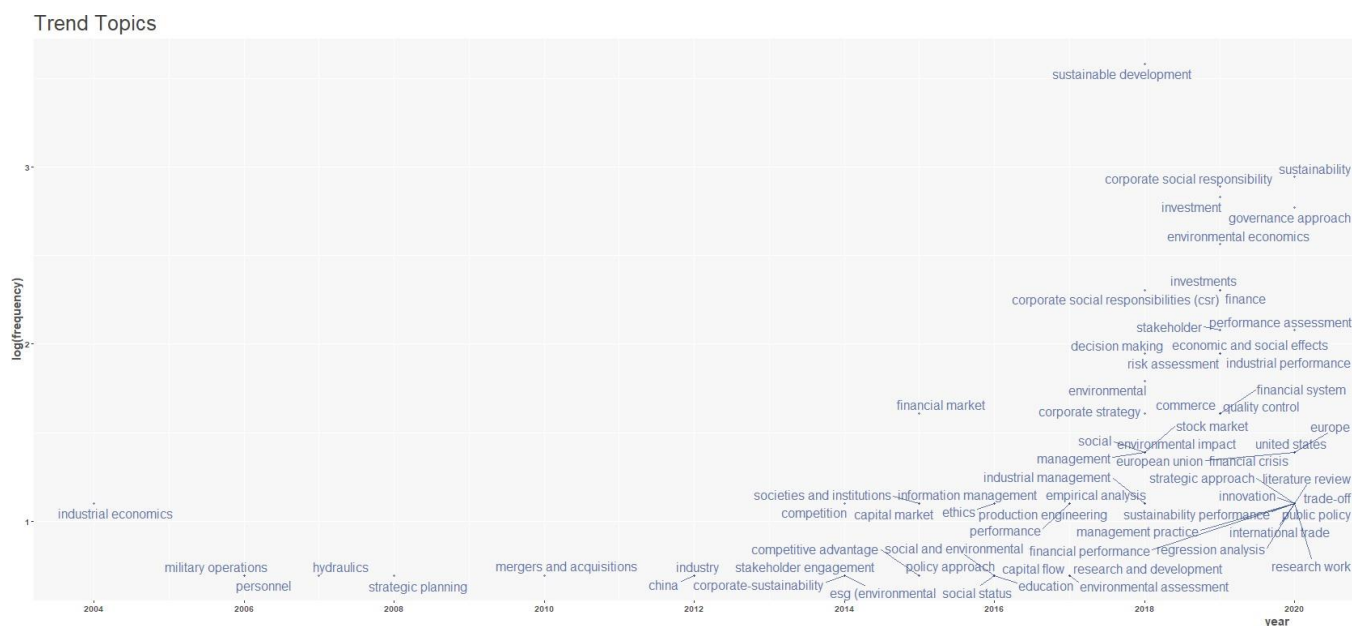


Figure 5. Trends of topic.

It can be seen from the figure that the most concentrated topic in the field of ESG research in the past 10 years was from 2004 to 2020. Sustainable development, sustainability, corporate social responsibility, investment, governance approach, environmental economics, etc., are the most studied topics. Some keywords, such as financial crisis, innovation, public policy, international trade, etc., are new keywords but with a low frequency, indicating that the topics represented by these keywords have received attention but have not been fully studied.

Based on the above analysis, we suggest following future research directions such as ESG disclosure, ESG investment, environmental protection and corporate governance.

First, forcing companies to disclose ESG information will become the new normal in this century. At present, regulatory agencies have gradually increased the requirements for corporate non-financial performance disclosure, and ESG disclosure will become the world's universal non-financial information disclosure standard in the future. In addition, ESG ratings will also have an impact on the judicial field. In the context of globalization in recent decades, different countries and regions have learned from each other's governance standards. For example, requirements such as executive compensation disclosure and gender diversity on the board of directors have spread rapidly around the world. Existing reporting standards can be used as a blueprint for any mandatory reporting, and a reporting framework for a wider audience of stakeholders can be designed from this.

Second, ESG ratings are closely related to corporate environmental protection. At present, the world's climate and environment are changing drastically. Companies are constantly facing losses caused by natural phenomena such as earthquakes, wildfires, hurricanes and global warming. At the same time, they have gradually realized the importance



of protecting the environment. Due to the different levels of economic development, different countries have adopted different environmental policies. This has affected the multinational companies engaged in commercial activities in many countries, and the costs and profits of the companies have been affected. By observing the performance of the environmental part of a company's ESG rating, investors and corporate managers can effectively assess the environmental risks that companies are currently facing, which will also encourage companies to increase their investment in environmental protection.

Third, the future ESG rating will profoundly affect the investment field. Perfect ESG information disclosure will pave the way for investment professionals to better incorporate ESG risk assessment into their investment decisions. As more and more investors systematically evaluate companies based on ESG risks, asset management companies will push more ESG-related financial products into the market. Companies with high ESG ratings will attract more institutional investors and, therefore, in the future, ESG is likely to affect the capital structure of companies to a certain extent. In addition, ESG's rating standards and industry regulatory measures will play an important role in the development of sustainable finance standards.

Finally, ESG ratings will promote corporate governance reforms. Investors and stakeholders usually review corporate governance issues by observing corporate shareholder resolutions. In recent years, due to the increasing emphasis on ESG elements by asset managers, many measures related to corporate governance reform have been proposed. Asset managers are very concerned about issues such as the renewal of board members, gender diversity on the board and excessive directorship practices. In addition to the diversity of board members, the focus of the company and investors will also shift to diversity in the entire organization, from senior executives to ordinary employees. Companies pay more attention to equal opportunities and equal pay for equal work. The transparency of employee performance indicators will become the development trend of corporate governance. While the groundwork for many of the above-mentioned developments and issues has already been laid, we anticipate widespread adoption of ESG-related practices across industries and jurisdictions over the next 10 years. Companies, investors and governments that fail to act on ESG will likely face greater risks and miss out on significant opportunities compared to ESG leaders in many key areas, such as improved access to capital to pursue new business ventures.

Demonstrating ESG leadership will eventually become a differentiating factor for entities in both the public and private sectors, and market participants stand to benefit greatly from embracing ESG stewardship as part of their competitive advantage.

## 5. Conclusions and Discussion

Bibliometric analysis is used to determine the main trends and research trajectories of research fields or journals. Therefore, this study aims to determine the publication trend of ESG research from 1980 to 2020 and provide valuable information for ESG researchers and stakeholders. The data used in this article come from the SCOPUS database. As a result, the goal of this research was to uncover the condition of scientific output and map the intellectual structure of ESG in order to characterize trends and provide useful information to researchers working in related subjects. It can be found that the research in the ESG field is still in its infancy [41], and it has developed rapidly in the past 15 years and has produced many important research results.

Concerning the nationalities of the authors, it can be seen that the United States, the United Kingdom and France are the top three contributing countries; most of them are traditional developed countries in Europe or North America [42,43]. We believe that, as environmental and corporate social responsibility features grow around the world, more developing countries will acquire an interest in ESG issues. The ESG field deserves more attention. In addition to earning benefits for shareholders, companies should also contribute to the environment, human rights, gender equality, anti-corruption and other fields to improve the common interests of all stakeholders.

As far as the most productive authors are concerned, Hebb T., Dorfleitner G., and Serafeim G. are the scholars with the most essays. They each published 10, 6 and 6 articles, respectively. Another exciting aspect is that a total of 314 publications published ESG-related content. The top three journals that were most interested in ESG topics are: Journal of Sustainable Finance and Investment, Business Strategy and the Environment and Journal of Business Ethics.

Through the analysis of the literature, we can see that keywords such as sustainable development, investment, management methods and environmental economy are current ESG hot issues. ESG disclosure is one of the current study hotspots in ESG. There is evidence that the more positive ESG information a company discloses, the better the company's performance [19,44]. At the moment, ESG data is primarily collected and organized by rating organization or stock exchanges [45], such as Bloomberg ESG, MSCI ESG or Asset4 ESG database. For now, there is no unified, universal and comprehensive ESG database. It often happens that different ESG ratings of the same company appear due to different criteria for scoring [46]. How to establish an effective and standardized ESG information disclosure system and scoring system is worthy of research by experts from all over the world. Also, past researchers mainly focused on ESG and financial investment income, however, there is currently evidence that ESG can also have an impact on corporate mergers and cross-border mergers and acquisitions. ESG, as a comprehensive evaluation system for corporate non-financial performance, can also play an important role in the due diligence of corporate mergers and acquisitions, which requires further research. Through the study of keyword co-occurrence and keyword trends, combined with a systematic literature review, we propose that the possible future research directions of ESG should be related to factors such as ESG disclosure, ESG investment, environmental protection and corporate governance. We look forward to seeing more research on ESG and integrating the results of ESG research by academics and practitioners.

This article summarizes the existing research and the findings published so far, and analyzes the research results and research trends of ESG. On the one hand, this research can provide guidance for researchers who are new to the topic, can quickly get vital and necessary material and gain a basic comprehension of it; on the other hand, this article can sort out the existing literature for researchers who have already started ESG research and improve their scientific research efficiency. Although the current research has laid the foundation for the development trend of ESG, we still hope that ESG can be widely implemented in many fields soon in the future. Companies that value ESG development will seize opportunities for development, and companies that fail to implement ESG may face greater risks in the future. This study is expected to provide a wealth of information for researchers interested in performing future investigations on ESG in research.

## 6. Limitations and Future Work

As with other academic studies, this paper also has some limitations. First of all, the data for the study was only taken from the Scopus database. Other databases, such as the Web of Sciences, can be used to extract bibliographic data in the future. Secondly, in terms of the results, there are many similar duplicate data in bibliometric data, such as the singular and plural of the same keyword or the use of hyphens in the same compound word, which interferes with the validity of the results to a certain extent.

Furthermore, it is recommended that future researchers utilise different retrieval strategies, including more related search. Also, future work could generate networks of bibliography coupling and keyword co-occurrence with looser threshold settings to identify more potential links between identified sub-themes. Thus, more promising fields of study could be explored by the association of relevant subtopics or from different grouping solutions of the literature.

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