

A Compendium of Research on ESG and Research Outlook - Visualisation and Analysis Based on CiteSpace Software

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Abstract: Against the backdrop of global climate change and the increasing challenges of social governance, ESG, as a key framework for promoting sustainable development and corporate responsibility, has become increasingly important. In this paper, we use CiteSpace software to visualise and analyse ESG-related core literature from CNKI and Web of Science databases in English and Chinese, and compare and contrast the development process, research hotspots, and evolutionary trends of ESG in China and other countries. The study finds that: Chinese ESG research started late, the number of published articles is relatively small, institutional cooperation is scattered, and research hotspots focus on financial aspects such as "financing constraints" and "corporate governance"; whereas foreign research is more mature, and the hotspots are more inclined to "social responsibility" and "corporate governance". On the other hand, foreign studies are more mature, and the hotspots are more in favour of "social responsibility", "sustainable development performance", and "environmental performance". Future research on corporate ESG performance can be carried out by enriching basic theories, expanding research dimensions, and improving the evaluation index system to provide further theoretical support for the sustainable development of enterprises and society.

Keywords: ESG; CiteSpace; Stage Research; Frontier Trend.

1. Introduction

In recent years, with the global climate change, social development imbalance, and corporate governance issues highlighted, the international community's call for sustainable development has been increasing. ESG as a comprehensive assessment framework began to appear in the public eye. ESG is an acronym for Environment, Social and Governance, which is a comprehensive environmental, social and governance. The concept of ESG can be traced back to Milton Moskowitz's defence of SRI's superior financial performance in the early 1970s, when the SRI (Social Responsible Investment) trend was emerging in various European countries, with several companies advocating the integration of environmental and social factors into their business decisions. Some companies were supporting the inclusion of environmental and social considerations in their business decisions. However, the term "ESG" was born out of a 2004 United Nations report called "Who Cares Win", which aimed to integrate Economy, Society, and Governance into the capital markets to better serve the interests of business and society (Kapil and Rawal, 2023) [1]. Since the concept of ESG was introduced by the United Nations Global Compact in 2004, ESG principles have gradually gained popularity among governments, organisations, and businesses.

Driven by practice, academic research on ESG has gradually increased, and the relationship between ESG and corporate value has been focused on, and related studies have gradually increased and become a major hotspot. In this paper, we will use CiteSpace visualisation software to screen the core journals of China and other countries in the related fields, and conduct a comparative analysis of the development process and research status of ESG in China and other countries, and analyse the research hotspots in this field from horizontal and vertical dimensions, to find out the shortcomings of China's ESG research and improve it, and

provide theoretical guidance for the construction of the information disclosure system in China. Theoretical guidance is also provided for the construction of China's disclosure system.

2. Data Sources and Research Methods

2.1. Data Sources

The research samples in this paper mainly include Chinese and foreign language literature, Chinese literature all comes from the CSSCI core journals in the CNKI database as the scope of the search for advanced search, "ESG performance" as the theme and keywords for screening, manually eliminating the literature with low relevance, a total of 245 articles of related literature were obtained. A total of 245 relevant documents were obtained, and then all the documents were exported to CiteSpace database in Refwork format and used as valid data; the English documents were screened from the SCI core journals collection in Web of Science core database, and the search condition was "TS=(ESG), TI=(ESG)", and the less relevant documents were manually excluded. After eliminating the literature with low relevance, a total of 890 pieces of literature were obtained, and then exported to the database in plain text format as the final valid data (Zhao et al, 2023) [2].

2.2. Research Methods

With the proliferation of bibliometric software, CiteSpace Scientific Knowledge Graph has been widely used in many professional fields for its convenient operation, prominent centre, and beautiful graph. As it can provide three different visualisations, Cluster view (Cluster), Timeline view (Timeline), and Timezone view (Timezone), to map the development and evolution of an entire knowledge domain (Chen, 2006) [3]. Therefore, this paper adopts CiteSpace visualisation software to analyse ESG-related literature in

terms of the number of publications, authors, research institutions, and keywords.

3. Research Status

3.1. Comparison of Literature Issuing Institutions

CiteSpace software is used to generate a visual mapping of ESG research and to study the network relationship between research institutions and their partner institutions in China and other countries, which helps to grasp the current status of

research in this field and the future direction of cooperation between institutions. Among them, each node represents each institution that sends out articles; the larger the font of nodes, the more related articles are sent out, and the connecting lines between nodes represent the cooperation relationship between each institution that sends out articles. The higher the node threshold, the lower the number of thresholds shown in the mapping, and the more prominent the key issuing institutions. Figures 1 and 2 show the mapping of research issuing institutions in China and other countries when the threshold is 2.

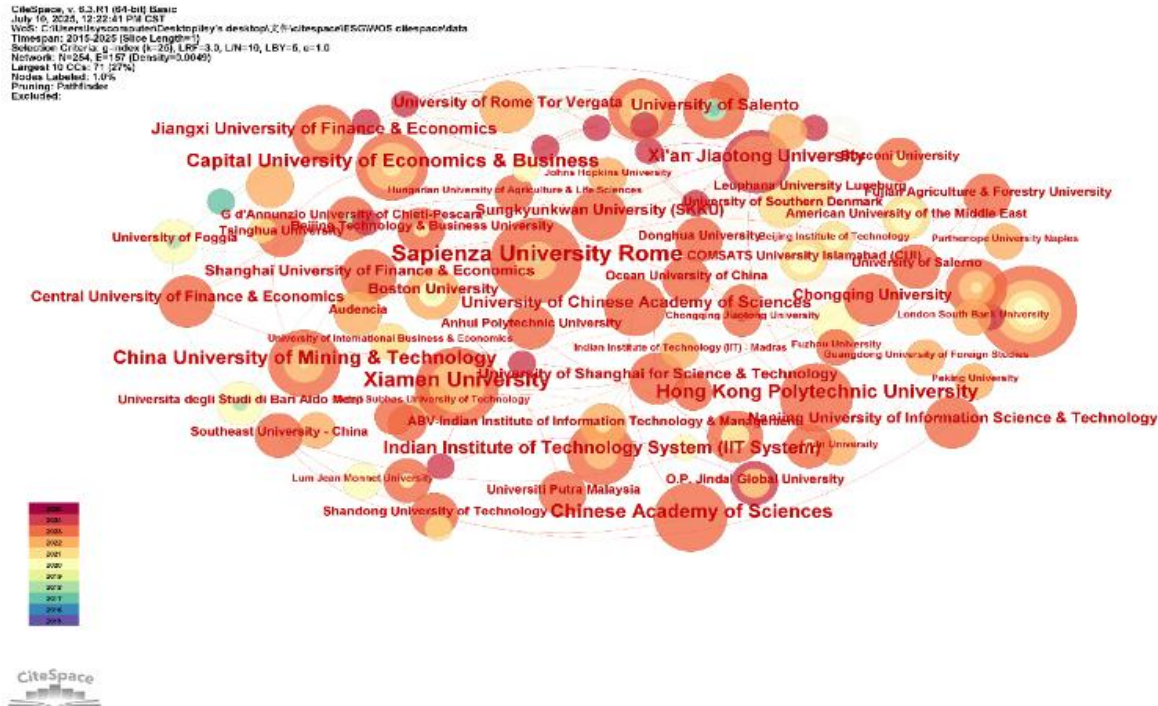


Figure 1. Mapping of ESG research issuing institutions in other countries (threshold of 2)

Figure 1 shows that the number of ESG research in other countries is much higher than that in China, and the cooperation between institutions is extensive and far-reaching, with effective integration of theoretical research and enterprise practice, and the main research institutions are Sapienza University Rome, Indian Institute of Technology System and Sungkyunkwan University, and the main research institutions are Sapienza University Rome, Indian Institute of

Technology System and Sungkyunkwan University. The main research institutions are from Sapienza University Rome, Indian Institute of Technology System, and Sungkyunkwan University, most of which are universities in Europe and the United States. Due to the late start of ESG research in China, the number of published articles is obviously smaller, and the cooperation between institutions is more scattered and independent.

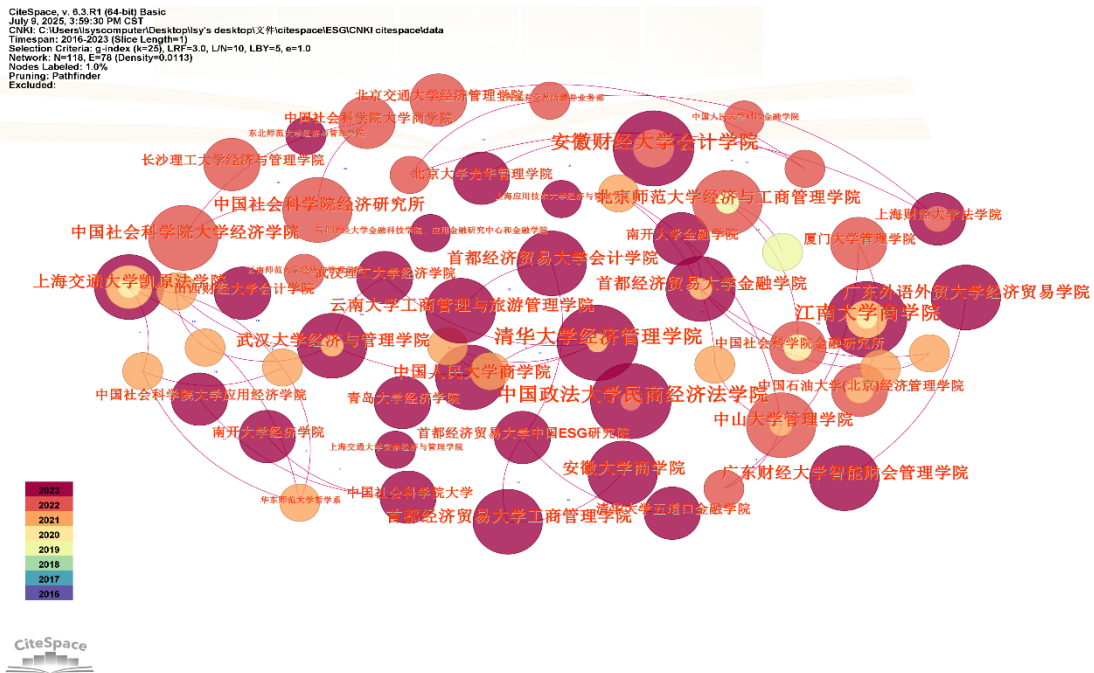


Figure 2. Overall mapping of ESG research issuing institutions in China (threshold of 2)

Figure 2 shows that the main output institutions of China's ESG performance are Tsinghua University School of Economics and Management, Anhui University of Finance and Accounting, Capital University of Economics and Trade, and Jiangnan University Business School. Compared with other countries, China tends to conduct independent research, and the cooperation map of institutions is fragmented and decentralised, with research directions including the construction of ESG evaluation systems and the "greening" of ESG reports. On the whole, ESG performance research in other countries mainly focuses on universities in developed countries, and the main researchers of ESG research in each country are professors in universities, which ensures the reliability and professionalism of literature sources. There are fewer studies on enterprises in various countries, indicating that there is no better combination of production and learning in ESG, and theories are not efficiently applied to practice.

3.2. Comparative Analysis of Research Priorities

3.2.1. Keyword word frequency and centrality mapping analysis

Keywords are closely related to the article, is the essence of the whole article research content and research theme refining, keyword frequency and centrality to a large extent shows the topic in the field of research hotspot direction, the higher the frequency of a keyword, in which the importance of a keyword will be higher, but at the same time to take into account the keyword appeared in the year, if the centrality of the keyword > 1, on behalf of the keyword importance of higher degree.

Table 1 shows the word frequency and centrality statistics of ESG research in China, from high to low, the key words are financing constraints (0.28), corporate governance (0.27), enterprise value (0.25), information disclosure (0.20), and green finance (0.19), which indicates that China's research on ESG mainly stays at the level of corporate finance, and pays more attention to the financial performance of enterprises. Table 2 shows the keyword frequency and centrality statistics of ESG disclosure in other countries, from high to low, the keywords are Performance (0.25), Financial performance (0.24), Corporate social responsibility (0.10), Impact (0.10), and Governance (0.05).

(0.24), Corporate social responsibility (0.10), Impact (0.10), and Green finance (0.19). Impact (0.10) and Governance (0.05). It is worth noting that although the keywords "corporate social responsibility" and "impact" have a high word frequency of 236 and 184, their centrality is not high, and the year of their appearance is relatively old, which indicates that in recent years the research hotspots of ESG in other countries have begun to gradually deviate from these two directions, and that the research on ESG in other countries has gradually turned away from these two directions. This indicates that in recent years, the research hotspots on ESG in other countries have begun to gradually deviate from these two directions and shift to the study of corporate performance.

Table 1. Statistics on word frequency and centrality of ESG research in China

No.	Word Frequency	Centrality	Keywords	Year
0	22	0.28	Financing constraints	2021
1	16	0.27	Corporate Governance	2020
2	12	0.25	Corporate value	2022
3	12	0.20	Disclosure	2019
4	12	0.19	Green Finance	2017

Table 2. Word frequency and centrality statistics of ESG research in other countries

No.	Word frequency	Centrality	Keywords	Year
0	144	0.25	Performance	2018
1	158	0.24	Financial performance	2018
2	236	0.10	Corporate social responsibility	2013
3	184	0.10	Impact	2014
4	137	0.05	Governance	2013

3.2.2. Keyword clustering mapping analysis

In the research of keyword mapping, a lot of similar keywords, the integration of these similar keywords, using the

algorithm of number likelihood ratio (LLR), and keyword clustering is generated, which can more intuitively reflect the direction of the research and the main framework.

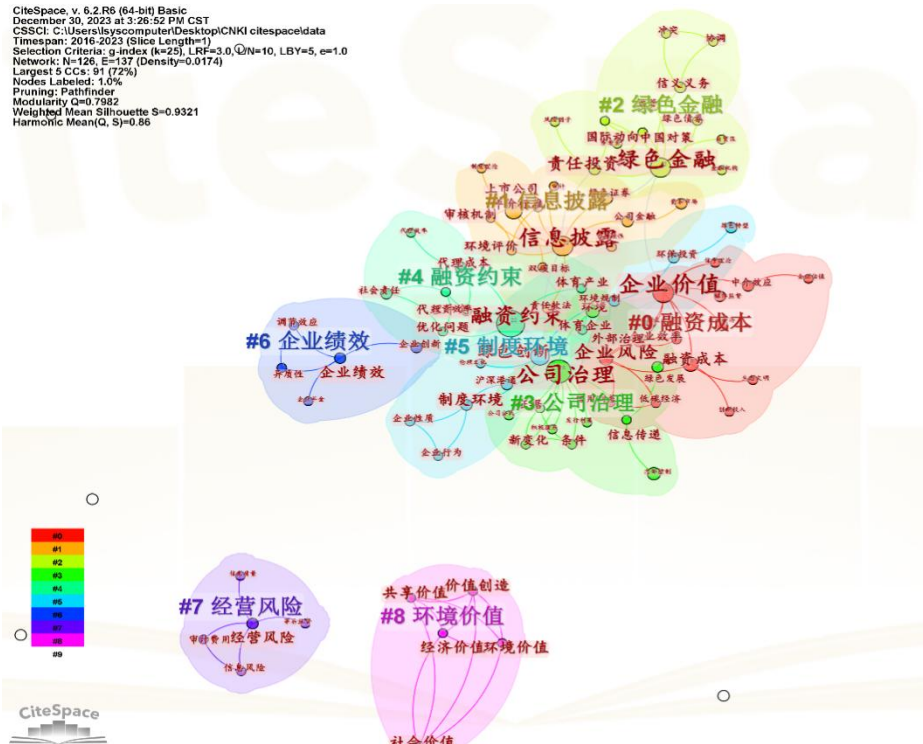


Figure 3. Keyword clustering of ESG research in China

Figure 3 shows that there are nine cluster labels, each cluster is composed of keywords that are closely related to each other, the order is from 0 to 8, the smaller the number, the more keywords are included in the cluster. The Q value of the keyword clustering module for ESG research in China is 0.7982, and it is generally considered that $Q > 0.3$ is a significant clustering result, and the S value of the average profile of the clusters is 0.9321, and it is generally considered that $S > 0.7$ is a convincing clustering result. Based on the different clusters in the mapping, it is easy to find that Chinese ESG research mainly focuses on #0 financing cost, #1 information disclosure, and #2 green finance.

In terms of the largest clustered #0 financing cost, the main keywords it contains are enterprise value, enterprise risk, and mediation effect. Because enterprises will more consciously and actively undertake the task of fulfilling social responsibility and realising green transformation only when their own benefits are greater than their costs, the enterprises' demand for cost reduction and alleviation of financing constraints will be stronger, and ESG performance can control the financing costs through three ways of equity financing, commercial credit and financial credit, so as to reduce the enterprise risk and increase the enterprise's social value (Cheng et al, 2014) [4]. Therefore, more and more enterprises are beginning to pay attention to the issue of ESG good information disclosure.

Cluster #1 Information Disclosure, which contains the keywords listed companies, environmental evaluation, and audit mechanism. As an important way to effectively solve the information asymmetry, "information transfer" can provide positive signals to both internal and external enterprises and

help investors and society to understand enterprises more comprehensively. Different from the traditional CSR investment, ESG not only focuses on the financial performance of enterprises, but also examines the non-financial aspects of enterprises, such as environmental benefits and other indicators (Uyar and Kuzey, 2022) [5]. In recent years, China's demand for secondary and tertiary industries to improve their own environmental governance has been increasing, and although the transparency of corporate ESG information is voluntary, more and more companies are disclosing information, and the rate of ESG disclosure is increasing year by year. Since China's ESG research started late, it has not yet formed a perfect theoretical system and institutional advantages, so the disclosure audit mechanism is not yet standardised, and the ESG information disclosure principles of each enterprise are still individually differentiated.

Cluster #2 Green finance, green finance was first included in the G20 summit topics in 2016 to provide policy support for the global sustainable development of the green economy, and the dual-carbon target was first proposed at the seventy-fifth session of the United Nations General Assembly in 2020, and since then China has begun to pay more attention to the green development of microeconomic subjects. The essence of green finance lies in guiding micro subjects to focus on environmental governance and ecological protection through green finance, so as to promote the sustainable development of the society, which coincides with the concept of ESG, and the concept of ESG will continue to be a hot topic of social concern for a long time to come (Ye and Tian, 2025) [6].

CiteSpace, v. 6.2.R6 (64-bit) Basic
 December 31, 2023 at 5:21:25 PM CST
 WoS: C:\Users\yscomputer\Desktop\WOS citespace\data
 Timespan: 2010-2023 (Slice Length=1)
 Selection Criteria: g-index (k=15), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=297, E=882 (Density=0.0201)
 Largest 5 CCs: 297 (100%)
 Nodes Labeled: 1.0%
 Pruning: Pathfinder
 Modularity Q=0.5404
 Weighted Mean Silhouette S=0.7463
 Harmonic Mean(Q, S)=0.6269

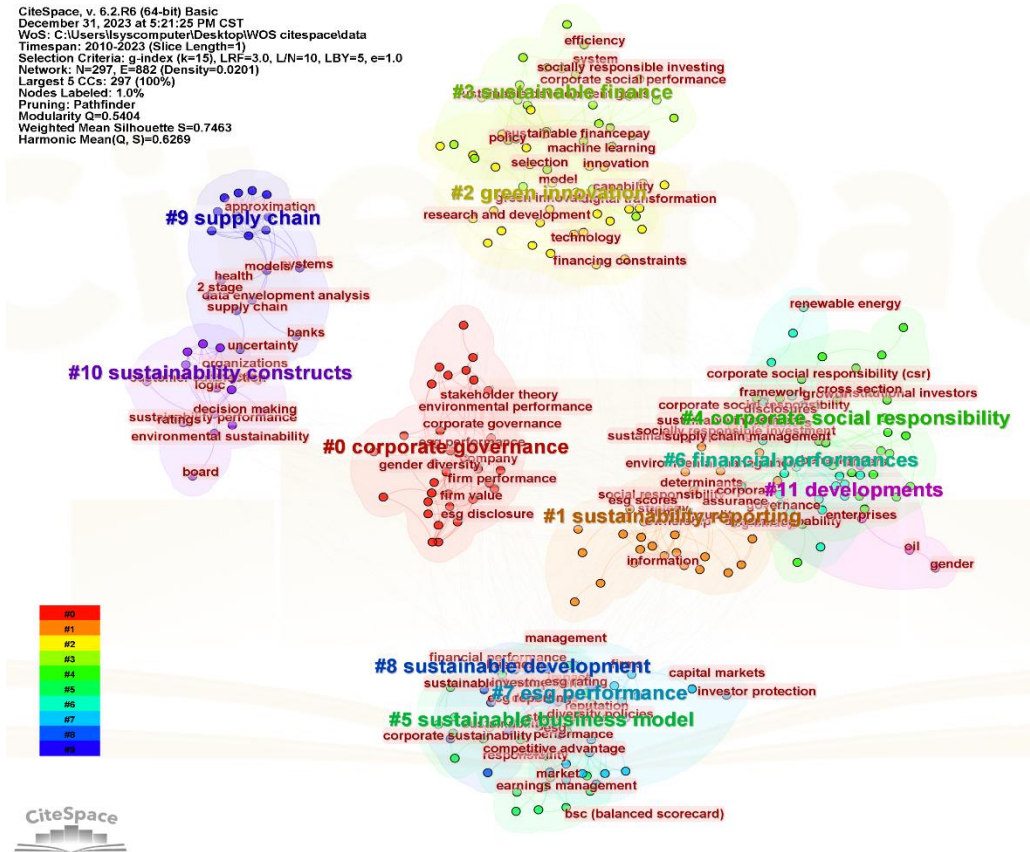


Figure 4. Clustering of keywords for ESG research in other countries

Figure 4 shows the clustering of ESG research keywords in other countries, with a Q value of 0.5404 and an S value of 0.7463, which indicates that the clustering results are significant. Clustering into 11 modules, it is obvious that compared with China, the research field of other countries is a bit broader, and the research results are mainly concentrated in the field of #0 corporate governance, #1 sustainability reporting, #2 green innovation, and #3 sustainable finance. The results of the mapping show that the research in other countries as a whole is centred around the two frameworks of corporate governance and sustainable development.

Cluster #0 focuses on "corporate governance", with the keywords centered around "corporate value" and "ESG disclosure", exploring the impact of ESG information disclosure on corporate value and corporate governance, as well as the influencing paths (Drempetic et al, 2019) [7]. How ESG performance affects corporate long-term value and through what intermediary mechanisms will continue to be a hot topic in ESG research.

The keyword research for the cluster #1 "sustainability reporting" focuses on "CSR (Corporate Social Responsibility)" and "ESG rating", and has some overlapping results with #3 cluster "sustainable finance", emphasizing sustainable development. ESG was developed based on CSR and evolved from external factors in the modern economic era. The core connotation of both is similar, which indicates the requirement to take responsibility for stakeholders, but the difference is that CSR favours ethics and charity, while ESG emphasises environmental performance and social responsibility.

The research of #2 cluster "green innovation" mainly focuses on financial constraints and green innovation transformation, as the call for global economic community is getting higher and higher, green innovation has the double advantages of environmental protection and green economic

development, so in recent years, more and more scholars have started to study the relationship between green innovation and ESG. Relationship between green innovation and ESG, Zheng et al (2023) [8] used panel cointegration test and dynamic least squares to determine the existence of a long-term bi-directional co-movement positive relationship between green innovation and ESG performance, and Zhao et al (2023) [9] based on large-scale manufacturing enterprises used hierarchical regression analysis to test the impact of digital transformation on corporate ESG performance, and pointed out that the green innovation capability in which the mediated transmission effect.

#3 clustering "sustainable finance", ESG performance of companies' financial soundness and long-term sustainable development is crucial, in addition to the wide range of social values, this positive impact can help to promote the construction of a sustainable business ecosystem.

3.3. Analysis of Keyword Timeline Evolution

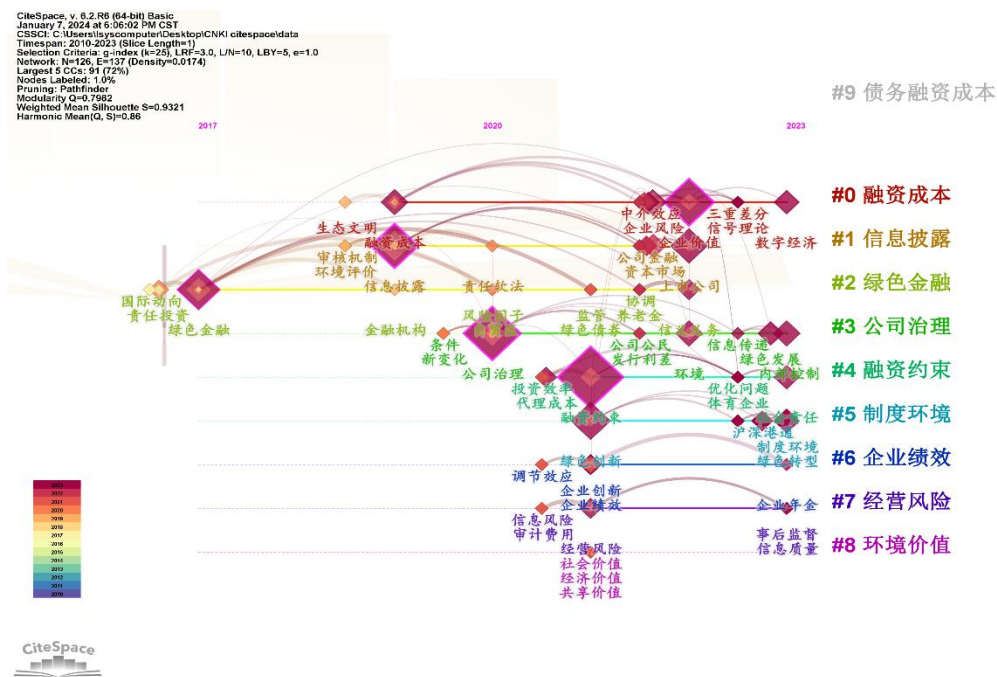


Figure 5. Keyword Clustering Timeline of Chinese ESG Research

Keywords	Year	Strength	Begin	End	2010 - 2023
责任投资	2017	1.71	2017	2020	
信息披露	2019	0.87	2019	2020	
公司治理	2020	1.29	2020	2020	
企业绩效	2021	1.11	2021	2021	
资本市场	2022	1.22	2022	2023	
企业风险	2022	0.93	2022	2023	

Figure 6. Keywords with the strongest citation bursts in China

Keyword timeline and keyword emergence are generated on the basis of keyword clustering, which aims to use horizontal dynamic evolution and vertical static comparison to decompose the map, and keyword emergence refers to keywords with significant changes in word frequency contribution in different time periods, which can reflect to a certain extent the research hotspot changes in different periods. In this paper, Timeline View of CiteSpace software is used to generate the timeline mapping, and Figure 5 shows the clustering timeline of Chinese ESG research keywords, which horizontally indicates the time of keyword emergence and its evolution process, and vertically indicates the labels of each cluster. Figure 6 is the timeline of keyword emergence for ESG research in China, and combining the two, it is easy to see that the development and evolution trends in China are as follows:

(1) Starting stage: 2017 and before

Prior to 2017, China's ESG research was primarily focused on "international trends" and "corporate responsibility investment." It started late and just started to develop in 2017. The study is still incomplete. The anchoring effect of ESG disclosure in investor decision-making was examined using experimental research methods by Zhang Qiaorui and Sun Ruijuan, who initially presented ESG as a significant research area in Chinese academia in 2015. The use of ESG ratings and the evolution of the disclosure system in Chinese listed firms were first examined in the literature in 2017.

(2) Exploration stage: 2018~2020

With the clarification of concepts and definitions as well as the disclosure of information in China, 2018 serves as an

important watershed, and the breadth and depth of ESG research in the academic community have been expanded and extended to varying degrees. In 2018, the National Conference on Ecological Environmental Protection formally put forward the principle of promoting the construction of ecological civilization in the new era and accelerating the construction of an ecological civilization system, and ecological civilization was applied as a hot topic in the ESG research system. In the same year, the Securities and Futures Commission (SFC) released the revised Code of Governance for Listed Companies, which actively draws on international experience, improves the basic framework for ESG disclosure in light of the structural characteristics of China's capital market, strengthens the leading role of listed companies in environmental protection, social responsibility and corporate governance, and urges listed companies to fulfil their social functions. The ESG grading system became the primary focus of research in 2019, and Chinese academics started investigating Chinese academics began investigating the development of ESG evaluation systems and analyzing the mechanism by which information disclosure affects corporate finance costs in 2019, as ESG evaluation systems will become the primary focus of research. Studies using the terms "risk factor," "soft law of responsibility," and "corporate governance" will begin to appear in 2020, offering a solid foundation for ESG practice. Research using the terms "risk factor," "responsible soft law," and "corporate governance" started to appear in 2020, offering guidance for corporate ESG practices.

(3) Rapid development phase: 2021 to present

China's financial industry and capital market have been hit hard by the epidemic, with huge fluctuations in stock returns and prices. How to restore the capital market to a stable state under the epidemic has become an urgent issue for all countries, and sustainable development has become more and more deeply rooted in people's hearts. As the dual-carbon target continues to be promoted, the State Council is actively mobilising micro-entities to save energy and reduce emissions and green innovation, and academic discussions on

ESG performance and disclosure have tended to diversify, with a proliferation of empirical studies. Keywords such as "financing constraints," "green innovation," and "mediation effect" have begun to emerge, based on cases of Chinese ESG

funds and China Shenhua, Suyeon (2024) [10] show the seriousness of the greenwashing problem and analyzes how ESG management is developing in the unique political and economic situation of China.

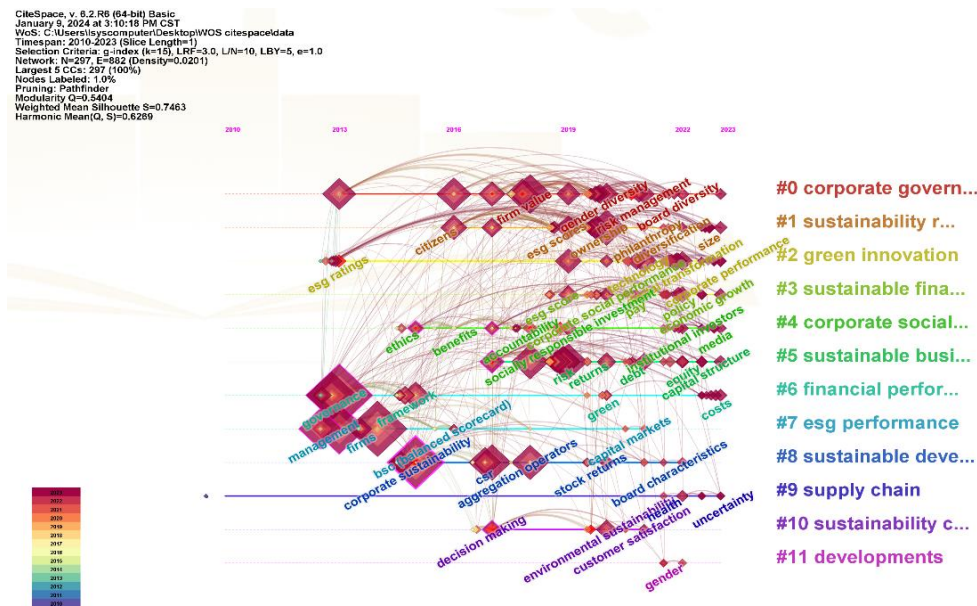


Figure 7. Clustering timeline of ESG research keywords in other countries

Keywords	Year	Strength	Begin	End	2010 - 2023
business	2015	2.16	2015	2018	
behavior	2015	1.97	2015	2019	
sustainability performance	2017	3.35	2017	2021	
company	2017	3.24	2017	2019	
cost	2017	2.36	2017	2020	
financial performance	2015	6.96	2018	2020	
firm value	2018	2.47	2018	2019	
corporate social responsibility	2013	2.24	2018	2019	
investors	2018	2.06	2018	2019	
socially responsible investment	2019	4.07	2019	2021	
risk	2019	3.56	2019	2021	
sustainable investment	2019	3.17	2019	2021	
return	2019	2.71	2019	2021	
environmental sustainability	2020	2.94	2020	2021	
social and governance (esg)	2020	2.1	2020	2021	
voluntary disclosure	2021	2.48	2021	2023	
economic performance	2013	2.04	2021	2023	

Figure 8. Keywords with the strongest citation bursts in other countries emerge

Figures 7 and 8 show the timeline of keyword clustering in other countries, and the trend of evolution of related research is as follows:

(1) Budding stage: 2010~2015

Compared to China, research on ESG performance in other countries started earlier. Early on, "socially responsible investment (SRI)", "stakeholder", and "ethical responsibility" were popular keywords, and Wagemens et al. (2013) [11] studied the direct impact of SRI on ESG performance under specific circumstances in 2013, although the focus is still on responsible investment. Wagemens et al. (2013) 2013 studied the direct impact of SRI on ESG performance in specific situations, although the focus is still on responsible investment, this also reflects the emergence of ESG as a new hot research area in the eyes of scholars in other countries. 2014 appeared in the "Corporate Social Responsibility". The emergence of "corporate social responsibility" and "behavioural performance" in 2014 indicates that enterprises have begun to pay attention to their own social behaviour and social responsibility.

(2) Rising Stage: 2016~2019

During this period, the number of ESG literature studies in other countries has increased significantly, and there are different degrees of innovation in research perspectives and research methods, and keywords such as "sustainability performance", "corporate social responsibility (CSR)", and "corporate risk" have begun to appear. Corporate risk" and other keywords began to emerge, which shows that scholars began to explore the economic consequences of ESG performance on enterprises, and began to gradually shift to corporate governance and sustainable development dimensions.

(3) Mature stage: 2020 to present

With the sudden outbreak of the new crown epidemic, the environment, social responsibility and corporate governance from which dimension are followed by the principle of sustainable development as an important issue, so other countries in this stage of the research on ESG began to show a spurt of development, "board diversity" "executive gender New terms such as "board diversity," "gender of executives," "media intermediaries," "carbon emissions," "environmental sustainability," "voluntary disclosure," "economic performance," and so on are emerging. "Environmental sustainability," "voluntary disclosure," and "economic performance" have become hot topics during this period. Cai et al (2024) [12] indicate that the relationship between ESG practices and corporate value is moderated by the academic background. Is moderated by the academic backgrounds of senior executives, who negatively influence it, and by male executives, who exert a positive moderating effect. effect. With the increasing prominence of global ecological issues, environmental disclosure has become an important research direction for ESG performance studies in other countries.

4. Conclusion and Prospect

4.1. Research Conclusion

This paper screens a total of 1135 articles of CSSCI and

SCI data in CNKI and WOS databases, and uses CiteSpace software to generate visual maps for comparison, as a way to analyse the current status of research on ESG responsible investment in the field of economics in China and other countries, so as to guide its relevant enterprises and institutions to advance the pace of ESG disclosure. The conclusions of the comparative analysis are as follows:

(1) Number of studies. Attention to ESG research is increasing in various countries, but ESG research in Chinese academia started late, the number of publications is relatively small, and the connection between publishing institutions is fragmented, so there are certain limitations and lags in related research. Other countries have started earlier, have rich research results, have published more articles, and have a theoretical system of CSR as a cushion, so the research on ESG is worth learning from China in terms of breadth, depth, and innovation.

(2) Research frontiers. Each country has its own different research hotspots in each period. There are both similarities and differences. Although there is a lag, China's research is by no means just copying the ideas of Western countries, China favours ESG disclosure in responsible investment, financing constraints, corporate governance and other financial aspects of the research, while the research frontiers of other countries are socially responsible investment, sustainable development, and environmental performance and other biased in the direction of "social responsibility (S)". The research on social responsibility (S). At the same time, there are also differences in the construction of ESG disclosure and rating systems, as other countries have already formed a more mature rating system, while China is still exploring the construction of the framework.

(3) Research theme. Along with the continuous promotion of the sustainable development agenda, relevant research in various countries is also expanding, although there are differences, but ultimately in the same way. The research on ESG responsible investment in various countries has formed an ESG responsible investment system with sustainable development as the background, market-oriented, environmental, social, and governance as the theoretical support, and corporate value as the core.

4.2. Research Outlook

Based on the above analysis, this paper believes that there is still a lot of room for the development of research on ESG, which can be explored in depth from the following perspectives:

(1) Enrich the basic theory of ESG research. In future research, it is necessary to strengthen the cooperation and exchange between countries, institutions, and disciplines to enrich the theory of ESG research. At present, the theoretical support of the ESG system covers many aspects, including sustainable development theory, CSR theory, stakeholder theory, shareholder interest maximisation theory, and risk management theory etc. Diversified theories can only continue to explore the boundaries of the disciplinary field, and many areas of ESG are still worthy of exploration by scholars from various countries, such as social contract theory, attribution theory, resource dependence theory, institutional theory, and so on.

(2) Innovate ESG research perspectives. Not only should we integrate multiple dimensions to explore the influence mechanism of ESG on a certain factor, but we should also analyse the impact of each of the three dimensions on

corporate development, such as the impact of ESG practices on long-term corporate performance and return on investment, in order to better understand the value of ESG factors in investment decision-making. At the same time, it can further explore how ESG factors affect corporate risk management and how financial institutions can integrate ESG and incorporate it into their risk assessment models to help corporations more comprehensively understand the impact of ESG on financial practices.

(3) Strengthen the combination of ESG theoretical research and practice. In future research, we can focus on deepening the research of state-owned enterprises in terms of empirical evidence, analysing the current situation of ESG disclosure by listed companies and existing problems, and searching for key paths to improve ESG performance. ESG development goals can be incorporated into senior management's performance evaluation and compensation decisions to ensure that ESG performance is aligned with the goals of corporate governance at the top. In addition, more financial institutions can be guided to develop innovative ESG investment products, such as ESG index funds and green financial bonds, to promote sustainable social development on the basis of meeting investors' investment needs.

(4) Improve the construction of indicators and standards for the ESG disclosure system. Considering the differences in culture, laws, and regulations in different countries and regions, the construction of the ESG rating system has a localised character; therefore, each country should formulate an assessment methodology that meets its own national conditions, so as to better reflect the ESG performance of enterprises in different environments. China should give full play to the advantages of socialism with Chinese characteristics and establish a sound and mature ESG disclosure system with Chinese characteristics.

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