

Analysis of the Current Status and Trend of Environmental, Social and Governance (ESG) Research Based on CiteSpace

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Abstract: This article mainly reviews the relevant literature in the field of the environmental, social and governance (ESG) in China, summarizes the current status and development trends of ESG research in China, and uses 647 articles related to corporate ESG published in Chinese core journals and CSSCI journals from 2015 to August 2024 in the China National Knowledge Infrastructure (CNKI) database as samples. CiteSpace software is used to visualize the keywords and authors of the articles. The research results indicate that the number of ESG literature in China has grown rapidly in the past three years and is currently in the stage of deepening exploration; The degree of collaboration among authors in the ESG field is not high, and most of them are independently created by individuals; The research hotspots in the field focus on four aspects: financing constraints, corporate risks, corporate value, and green innovation; In the future, it is necessary to strengthen research on the motivation for ESG information disclosure, the impact and mechanism of digital transformation on corporate ESG performance, and the impact of corporate ESG on technological innovation.

Keywords: Environmental; Social and Governance (ESG); CiteSpace; Visual Analysis

1. Introduction

As China's economy shifts from high-speed development to high-quality development, the concept of sustainable development is gradually permeating into various fields. We must adhere to green development and promote harmonious coexistence between humans and nature. How to achieve the unity of economic and social benefits has become an urgent problem to be solved in the process of sustainable development of enterprises, and the importance of ESG concept is increasingly evident. ESG is a

comprehensive evaluation of a company from the perspectives of the environmental, social, and governance, integrating green development, social value, and corporate value, which is highly consistent with the connotation of high-quality economic development. At present, there is a lack of research literature in the field of ESG in China, and a systematic theoretical framework has not yet been formed. Therefore, this article uses CiteSpace software to create a visual map of the literature data in CNKI, in order to systematically sort out the existing ESG research, understand the current research status, analyze the research hotspots and trends in the ESG field, and provide reference for comprehensive research in the ESG field in China.

2. Data Sources and Research Methods

2.1 Data Sources

In order to more accurately grasp the research progress and trends of ESG, this article takes the literature from Peking University Core and CSSCI of China National Knowledge Infrastructure as the analysis object. When searching, "ESG" is used as the keyword, and the literature source types are selected as "Peking University Core" and "CSSCI". Literature and conference records that are not related to corporate ESG are checked and removed one by one. Finally, 647 valid literature are obtained and imported into CiteSpace for data processing.

2.2 Research Methods

This article uses CiteSpace 6.3.1 software to conduct a bibliometric visualization analysis on the relevant research results in China's ESG field since 2015. The keywords of the relevant literature were analyzed for co-occurrence, and the period was selected from 2015 to 2024 to generate a co-occurrence map. Finally, combined with the generated map, the research progress and trends in China's ESG field were

analyzed.

3. Quantitative Analysis of ESG Research Literature in China

According to the CNKI search results, the trend chart of the number of relevant research literature in the ESG field in China from 2015 to August 2024 is shown in Figure 1. ESG research in China is divided into three stages based on the number of publications and literature content.

The first stage (2015-2018): budding stage. From 2015 to 2018, research in the ESG field in China entered its infancy stage, during which there were relatively few publications. The concept of ESG was only officially proposed in 2006, and the relevant policy documents are not yet complete. The understanding of ESG by enterprises is not yet profound. Prior to this, the academic community had conducted more research on corporate social responsibility (CSR), which is the improvement and redefinition of corporate social responsibility. Therefore, after the concept of ESG was proposed, the academic community began to change its thinking and gradually shifted its perspective from CSR to ESG, ushering in a new era in China's ESG field.

The second stage (2019-2021): initial development stage. From 2018 to 2021, research in the ESG field in China has entered the right track, with a total of 18 core journal articles published. The academic community has begun to build an ESG evaluation system that is suitable for China's national conditions, exploring the path and possibility of ESG development in China. A few scholars have begun to pay attention to the economic consequences of corporate ESG performance^[1,2], laying a solid foundation for subsequent ESG research.

The third stage (2022-2024): deepening exploration phase. In 2022-2024, research in the ESG field in China will enter a stage of rapid development, with a rapid increase in the number of publications. In recent years, in order to promote sustainable development and achieve the dual carbon goals, multiple departments and institutions such as the China Securities Regulatory Commission, State-owned Assets Supervision and Administration Commission, and environmental regulatory departments have successively introduced ESG related policies, which have also attracted attention from the academic community in the field of ESG. With

the gradual improvement of the ESG evaluation system, scholars have begun to pay attention to research topics such as ESG ratings, ESG performance, and ESG information disclosure, and have studied the influencing factors and economic consequences of different ESG behaviors of enterprises, continuously promoting the research heat in the ESG field.

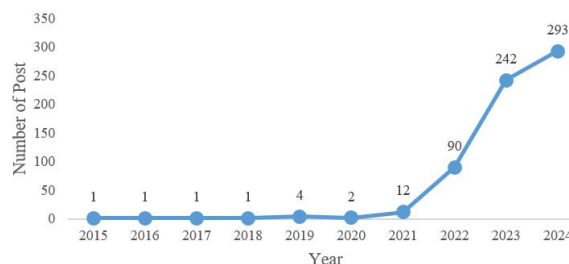


Figure 1. Number of ESG Related Research Literature in China

4. Analysis of Collaborative Network Diagram of Research Authors

Using CiteSpace, a visual analysis was conducted on authors studying ESG (e.g., Figure 2). The graph shows the collaboration and citation relationships between authors, with different colors of connecting lines indicating the year of collaboration and citation. Node size reflects the number of articles published by authors in the ESG field. There are a total of 87 nodes and 37 connections in the graph, with a network density of 0.0099. From the overall visual display effect, the collaborative relationship between authors is not very close, with only a small number of authors having collaborative relationships. The relationship network between authors generally presents the characteristics of "small aggregation, large dispersion".

Based on the distribution of the graph, Zhou Ze will be the author with the highest number of publications in this field, having published 6 core articles in the past two years. This scholar mainly focuses on ESG performance and the economic consequences of ESG ratings, with Umbrella Yao as the main co-author and 2 collaborative articles. Next are scholars such as Zhang Hui, who has published 5 articles, and Zhang Zenglian, Xu Yan, and Dong Zhanfeng, who have published 4 articles. Overall, scholars who have published numerous articles mostly maintain good cooperative relationships with other scholars. Therefore, scholars in various fields need to strengthen academic exchanges and jointly explore the framework of ESG in

China, in order to better leverage the positive driving role of ESG.

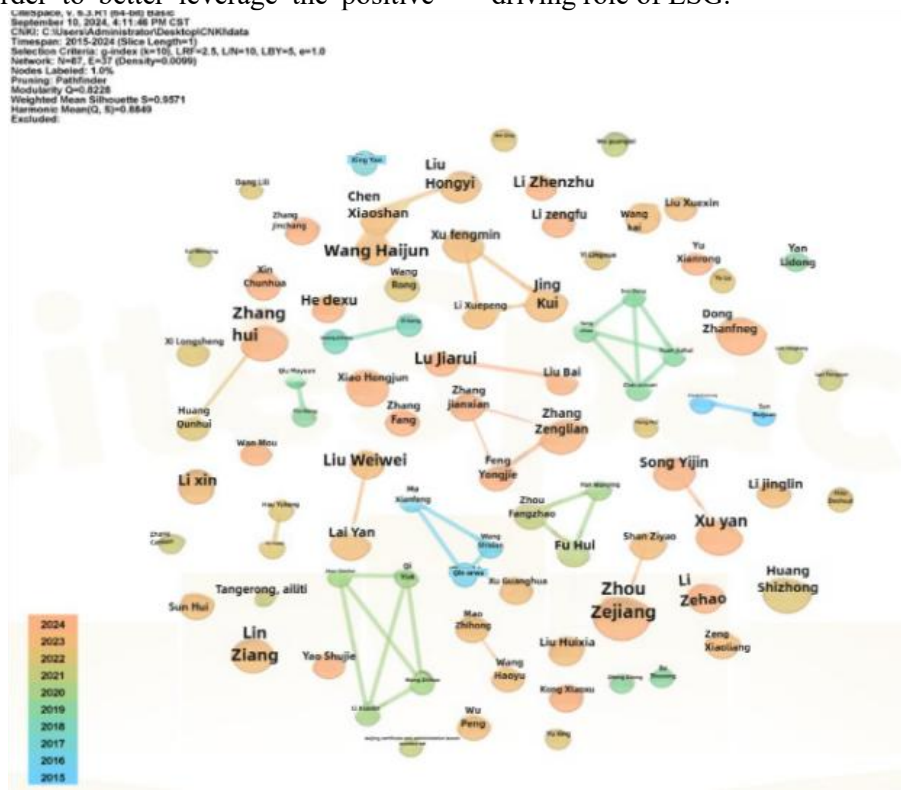


Figure 2. Collaborative Network of Authors in the ESG Field in China

5. Keyword Visualization Analysis

5.1 Analysis of Keyword Co-occurrence Knowledge Graph

Keywords can reflect the main research topic of an article, so co-occurrence frequency detection based on the keyword function in CiteSpace software can be used to conduct a visual analysis of keywords (e.g., Figure 3). From the perspective of word frequency, there is a high degree of linkage between research topics in the ESG field, with multiple nodes serving as bridges to connect different research hotspots. The nodes of financing constraints, enterprise value, green innovation, and green finance are prominent and connected to multiple nodes, extending to research branches such as enterprise risk, information disclosure, internal control, green development, peer effects, and financing costs. Financing constraints appear the most frequently, with a total of 71 occurrences, mainly because many literature studies use financing constraints as intermediary variables to analyze the impact of corporate ESG performance on factors such as corporate risk [3], corporate value [4], and corporate cash holdings [5]. In addition, keyword centrality is also an

important indicator of a keyword's ability to mediate throughout the entire graph. The higher the centrality, the more times the keyword is connected to other keywords. Among numerous research topics, the top five in terms of centrality are enterprise risk (0.83), enterprise value (0.78), enterprise efficiency (0.67), green finance (0.65), and financing cost (0.63). Based on the ranking of word frequency and centrality, it is found that the three themes of enterprise value, enterprise risk, and financing constraints are the key topics of concern for scholars in the ESG field.

5.2 Analysis of Keyword Emergence Knowledge Graph

Based on the knowledge graph of keyword emergence, it is possible to understand the explosive frequency of keyword co-occurrence in a short period, and analyze it according to the timeline to reflect the active time of different topics. The emergence map of ESG research keywords in China is shown in Figure 4, with a total of 14 emerging keywords extracted. The figure shows the start and end times of different keywords' emergence. From the beginning to the end of the emergence, it reflects the period when a certain keyword becomes a research hotspot. In the field of ESG, the highest emergence

intensity is "responsible investment", with an emergence intensity of 2.49 and an emergence period of 2017-2022, indicating that the research hotspot with significant changes during this period is a responsible investment. The emergence intensities of "enterprise value", "agency problem", "carbon neutrality", and "carbon peak" are 2.39, 1.78, 1.67, and 1.67, respectively, and these keywords are also hot topics before 2022. Starting from 2022, "social responsibility," "agency problems," and "technological innovation" will become new research frontiers. From the changes in research frontiers reflected in the emergence chart, these changes match the changes in new technologies and the new era. For example, the core idea of "technology is the primary productive force"

emphasizes the importance of technological innovation in promoting high-quality development. Therefore, the ESG field has also begun to study the technological innovation activities of enterprises in the process of fulfilling ESG responsibilities. The agency problem has always been a common issue in companies with separation of ownership and control, but now it has once again entered the research field of scholars, mainly because many managers use ESG practices as a "fig leaf" to cover up their self-interest behavior, thus triggering deeper agency problems [3]. Therefore, policy guidance and changes can lead to changes in corporate behavior and also cause rapid changes in ESG research hotspots in the short term.

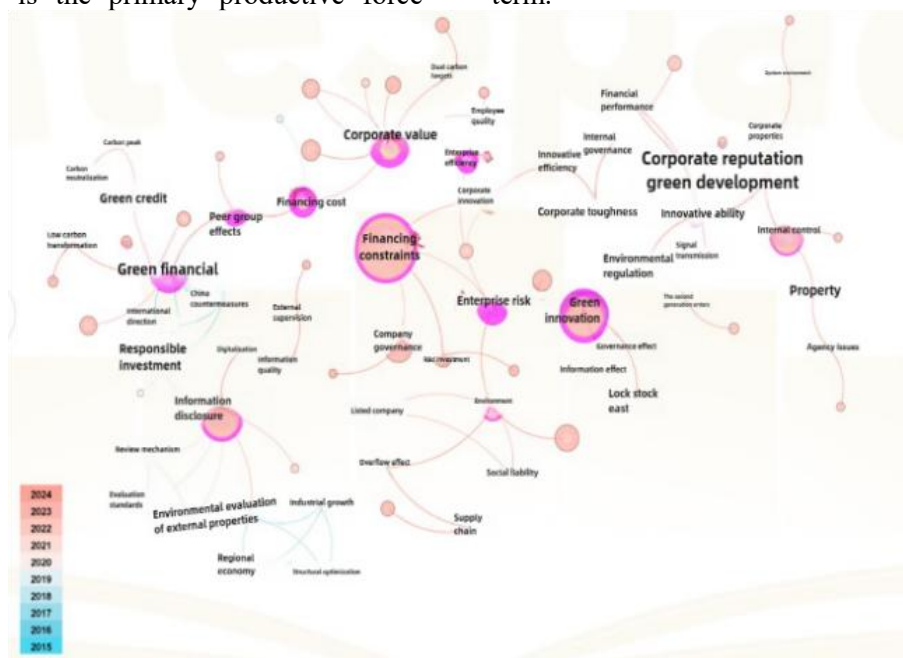


Figure 3. Co-occurrence Map of ESG Keywords in China

Keywords	Year	Strength	Begin	End	2015-2024
Responsible investment	2017	2.49	2017	2022	
Externalities	2018	1.51	2018	2022	
information disclosure	2019	1.37	2019	2022	
enterprise value	2021	2.39	2021	2022	
Enterprise performance	2021	1.3	2021	2021	
Carbon Neutrality	2022	1.67	2022	2022	
Carbon peak	2022	1.67	2022	2022	
social responsibility	2022	1.51	2022	2024	
Green finance	2017	1.43	2022	2022	
Enterprise risk	2022	1.4	2022	2022	
corporate governance	2022	1.29	2022	2022	
Green bonds	2022	1.26	2022	2022	
Agency problem	2023	1.78	2023	2024	
technological innovation	2023	1.42	2023	2024	

Figure 4. Keyword Emergence Map in China's ESG Field

5.3 Analysis of Keyword Time Clustering Graph

The keyword time clustering graph mainly displays the time when relevant keywords reappear after their first appearance, and the size of nodes indicates the frequency of occurrence. Therefore, it can be used to analyze the different development stages of ESG research hotspots in China. By conducting cluster analysis on keywords, eight clustering categories can be obtained, namely green development, green finance, enterprise value, information disclosure, financing constraints, environment, green innovation, and agency problems. In terms of word frequency, there have been many new research topics emerging in the ESG field from 2021 to 2023, such as corporate value, green innovation, corporate risk, and financing constraints. These topics have also laid the foundation for future research directions, and the research topics for 2024 are basically related to these research directions. For example, the low-carbon transformation in 2024 is a combination of the dual carbon goals and the green transformation in 2022. The media supervision in 2022 is closely related to the media attention in 2024, and the positioning of the media role has expanded from "supervisor" to "disseminator" [6]. In addition, it can be seen from the graph that there are relatively few research topics under the category of information disclosure. Research on ESG information disclosure mainly focuses on the impact of ESG information disclosure on corporate green innovation activities [7,8]. In addition, the current ESG information disclosure system is not yet perfect. Although China's ESG information disclosure is mainly a combination of voluntary and mandatory information disclosure, the legal environmental information disclosure standards are not unified [9], which directly leads to rating differences among ESG rating agencies [10]. Therefore, the imperfection of the ESG information disclosure system also affects the development of research in this field.

6. Research Conclusions and Prospects

6.1 Research Conclusion

This article mainly uses CiteSpace software to briefly summarize the research content in China's ESG field from three aspects: the trend of changes in the number of publications,

analysis of collaborative author network diagrams, and keyword visualization analysis. In terms of the number of articles published, there is an overall upward trend, with the ESG field experiencing rapid growth in the past three years and a high level of research enthusiasm. In terms of network relationships among co-authors, there is relatively little communication and collaboration between authors, with most collaborations occurring in 1-2 articles and a lack of stable research teams. In addition, the research hotspots and trends in China's ESG field were sorted out by combining keyword co-occurrence analysis, emergence analysis, and cluster analysis. The current research hotspots mainly focus on the changes in ESG investment behavior of enterprises under the background of carbon peak and carbon neutrality, as well as the impact of ESG behavior on enterprise value, enterprise risk, and financing constraints.

6.2 Research Prospects

In the era of pursuing green development, corporate social responsibility has been given a new definition, and ESG theory is being integrated into all aspects of corporate development. Based on this, this article uses Citespace software to conduct visual analysis of literature in the ESG field and makes the following prospects for future research directions.

(1) Motivation for ESG Information Disclosure Existing literature on ESG information disclosure has mainly focused on its economic consequences, with few studies exploring the motivation behind ESG information disclosure. Currently, there is relatively little voluntary disclosure of information in China's ESG information disclosure. How to stimulate companies' voluntary disclosure behavior should be a concern for scholars. Under the dual effects of external regulation and internal governance, what factors are more likely to stimulate and influence companies' ESG information disclosure? The conclusions of these studies will be helpful in finding the optimal solution between voluntary disclosure and mandatory disclosure in China, and constructing an ESG information disclosure system that is in line with China's national conditions.

(2) The Impact and Mechanism of Digital Transformation on Corporate ESG Performance Although scholars have researched on the relationship between digital transformation and

ESG performance, most of them focus on the impact of new technologies on companies themselves, and rarely analyze the impact of digital transformation on corporate ESG performance from the perspective of stakeholders; In addition, there are few studies on the path of how digital transformation affects corporate ESG performance. The research on the relationship between the digital transformation of enterprises and their ESG performance will be beneficial in promoting digital technology to better empower enterprises to fulfill their ESG responsibilities.

(3) Enrich the measurement indicators of green innovation

At present, research has studied the impact of ESG on corporate green innovation from the perspectives of ESG rating, ESG responsibility fulfillment, and ESG information disclosure. However, in these studies, the measurement of technological innovation is mostly from the perspective of output, using the number of patents to measure innovation performance. This measurement method is too single. It is hoped that in future research, research on corporate green innovation activities can be conducted from multiple dimensions, using a combination of long and short-term methods to measure innovation indicators. Measuring technological innovation from different perspectives is conducive to measuring the quality of corporate innovation and injecting vitality into the sustainable development of enterprises through innovation activities.

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