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Knowledge Mapping of Board Governance Research: A Visual Analysis Using CiteSpace

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Abstract

Based on the bibliometric and visualization analysis of relevant board governance research literature from 2003 to 2022, this study summarizes and outlines the knowledge structure, hot topics, and future research directions in the field of board governance. The research findings indicate that the publication volume in the field of board governance has shown an exponential growth trend, which highlights the increasing importance and research demand in this area. Company performance has become a critical topic in the field of board governance research. Furthermore, collaboration and communication among research institutions promote knowledge sharing and enhance the quality of board governance research. Through keyword clustering and burst analysis, corporate governance, ownership, and firm performance are identified as crucial keywords in the field of board governance, highlighting researchers' emphasis on improving corporate governance systems, optimizing ownership structures, and enhancing firm performance. Moreover, gender diversity, boards of directors, and corporate governance are identified as research hotspots, indicating scholars' attention to board structures and institutional designs, as well as the value of female directors' participation in board governance. Finally, sustainable development and green governance are recognized as frontier trends in board governance research, underscoring the importance placed on corporate social responsibility and environmental impact, as well as the role of boards in driving sustainable development. These research findings provide important insights for academia, practitioners, and policymakers, driving the development of board governance theories and continuous improvements in practice to achieve sustainable development goals for companies.

Keywords: Board Governance; Knowledge Mapping; CiteSpace; Research Hotspots

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1. Introduction

With the development of the global economy and the evolution of corporate governance principles, the board of directors progressively emerged as the core organizational structure in modern corporate governance, playing a pivotal role in the long-term development of companies. Since the 21st century, corporate scandals and economic crises have triggered extensive scholarly attention, while emphasizing the importance of corporate governance mechanisms and regulatory mechanisms. These events have sparked scholarly interest in the study of board governance. According to the principal-agent theory, the board of directors, as an important role connecting shareholders and managers, can supervise the behavior of the company's management on behalf of shareholders and ensure that the company provides shareholders with timely and accurate information disclosure, thus reducing information asymmetry (Hermalin and Weisbach, 1998; Jensen, 1993). An effective board plays a crucial role in supervising and advising management, exercising control over executives, and guiding corporate strategy and decision-making (Fama & Jensen, 1983; Sun & Guo, 2015; Lu & Hu, 2015). The complexity and diverse governance effects demonstrated by boards in corporate governance have become the focus of scholarly attention. Research on board governance contributes to improving corporate governance practices and promoting sustainable economic development.

The concept and principles of board governance have continued to develop and evolve. The academic community has become more specific and refined in its research on board corporations, and there is an increasing number of research achievements concerning this topic. However, existing studies mostly focus on micro-level empirical analyses of specific issues, such as board size and structure, functions and behaviors, characteristics of its members, and its impact on corporate performance (Xie, Zhang, Zhang, & Zheng, 2015; Astuti, Fachrurrozie, Amal, & Zahra, 2020; Hülsbeck, Meoli, & Vismara, 2019; Farooque, Buachoom, & Sun, 2020). Currently, no scholars have conducted a visual analysis and assessment of the research status and hot topics in the field of corporate governance from a macro perspective. Therefore, to address this research gap, this study utilizes the scientific bibliometric analysis tool, CiteSpace, for visualization analysis. A total of 5,014 articles related to board governance published from 2003 to 2022 has been retrieved through a topic search in the Web of Science

database. Next, we constructed knowledge graphs depicting the co-occurrence, clustering, and burst perspectives of research institutions, authors, and keywords in the field of board governance. These visualizations aimed to identify the research status, hot topics, and future research directions in the field of board governance. It is hoped that this study is going to provide references and insights for further research in the area of board governance.

2. Data Collection and Research Methods

2.1 Data collection

The Web of Science database is long recognized as the most authoritative academic literature retrieval and citation database, providing key research in various fields of science and technology (Boyack et al., 2005). It is commonly regarded as an ideal data source for bibliometric research (Leeuwen, 2006). Therefore, the data for both metric analysis and visualization in this study has been sourced from the Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI) within the Web of Science database. The retrieval strategy is as follows:

Topic= "board" AND "directors," which means that articles containing these terms in the title, abstract, or keywords would be retrieved.

The time range has been set from 2003 to 2022. This time frame has been chosen because, since the Enron scandal of 2001 and the WorldCom scandal of 2002, research on board governance has exhibited exponential growth. Analyzing the literature from the past 20 years enables a comprehensive evaluation of the current hot topics and future research directions in the field of board governance.

Following the data processing approach by Liu, Zhao, & Sun (2018), the subject is limited to ten disciplinary areas: Business, Management, Business Finance, Economics, Law, Ethics, Public Administration, Sociology, Information Science Library Science, Operations Research Management Science.

Based on the above search strategy, we obtained a total of 5014 valid documents from SSCI and A&HCI databases after excluding non-research documents such as conference notices, and saved them in other file formats, where "record content" is the complete record and cited references, and "file format" is plain text.

2.2 Research method

Scientometrics is a discipline that characterizes, evaluates, and predicts scientific activities. With the advancement and development of information technology, coupled with the accumulation of research outcomes in various academic fields, there has been a rapid growth in research results based on scientometric analysis. It provides an effective and feasible research approach and channel for uncovering research trends and future directions in various research fields, leveraging keywords, authors, and affiliated institutions from published research data. This study employs the CiteSpace scientometric analysis tool to construct a knowledge structure map of the corporate governance research field, conducting visual analysis from various dimensions such as temporal distribution, institutional distribution, authors, and keywords. The aim is to explore the knowledge structure and research hotspots in the corporate governance domain. Subsequently, using burst detection techniques, the development trends in the field of board governance are identified, and a future research framework for this domain is established.

3. The Current State of Research in The Field of Board Governance

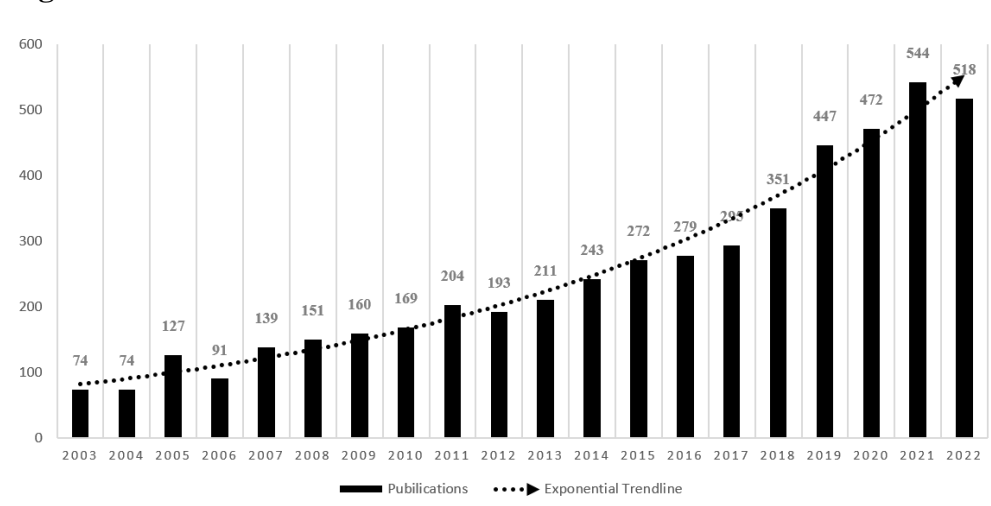
3.1 Analysis of the Evolution Trend of Publication Volume

The number of papers published in a particular field can visually reflect the level of development and attention in that research area (Qu & Wu, 2015). Figure 1 shows the annual distribution of literature publications in the field of board governance research from 2003 to 2022. It can be observed that as corporate governance issues have received widespread attention around the world, the research results in the field of board governance have shown an "exponential" rapid growth trend. The number of research literature increased from 74 articles in 2003 to 518 articles in 2022, which is seven times the initial count, reaching a peak of 544 articles in 2021.

This phenomenon may be attributed to several factors. Firstly, the external shocks of the Enron scandal in 2001, WorldCom scandal in 2002, and the 2008 financial crisis catalyzed the exposure of internal governance issues in emerging market contexts, leading to extensive attention from practitioners and academia on corporate governance, particularly board governance. Secondly, countries worldwide strengthened regulatory and supervisory requirements on corporate governance during this period, which further

stimulated scholarly research on board governance. For instance, the United States passed the "Sarbanes-Oxley Act" (SOX) in 2002, which requires publicly traded companies to establish internal controls and independent audit committees. The purpose of this act is to enhance the accuracy and reliability of corporate disclosures, thus safeguarding investors. In 2008, China issued the "Basic Norms for Enterprise Internal Control," which emphasizes the significance of internal control construction in corporate governance. The aim of this standard is to enhance the level of business operation and management as well as the capacity for risk prevention within enterprises. These developments have facilitated the rapid growth of research on board governance, leading to the typical exponential growth trend in the number of research papers, which is expected to continue increasing in the future.

Figure 1: Annual Distribution of Board Governance Research Literature



3.2 Analysis of Article Citations

Table 1 presents the top 10 most cited references in the field of board governance. These papers cover a range of topics within the field of board governance and shed light on important aspects such as board diversity, CEO connections, sustainability, earnings management, and resource dependence. By examining the top three highly cited articles, we find that the research primarily focuses on company performance. Adams and Ferreira (2009) argued that gender-diverse boards invested more effort in monitoring and have a significant effect on firm performance. Hillman and Dalziel (2003) suggested that the board of directors was able to monitor management and provide resources on behalf of

the shareholders, and through the effective performance of its functions it can improve corporate performance. Corporate performance is a key indicator of how well a business is functioning and achieving its objectives. These widely cited articles demonstrate their significance and influence in the field of board governance research.

Table 1: Top 10 Most Highly Cited Papers on Board Governance

| No. | Title | Author | Journal | Citation Count | Year |
|-----|--|--|--------------------------------|----------------|------|
| 1 | Women in the boardroom and their impact on governance and performance | Adams, RB X | journal of financial economics | 2194 | 2009 |
| 2 | Boards of directors and firm performance: Integrating agency and resource dependence perspectives | Hillman, AJ and Dalziel, T | academy of management review | 1796 | 2003 |
| 3 | Politically connected CEOs, corporate governance, and Post-IPO performance of China's newly partially privatized firms | Fan, JPH; Wong, TJ and Zhang, TY | journal of financial economics | 1377 | 2007 |
| 4 | Resource Dependence Theory: A Review | Hillman, AJ; Withers, MC and Collins, BJ | journal of management | 1291 | 2009 |
| 5 | Boards: Does one size fit all? | Coles, JL; Daniel, ND and Naveen, L | journal of financial economics | 1278 | 2008 |
| 6 | Earnings management and corporate governance: the role of the board and the audit committee | Xie, B; Davidson, WN and DaDalt, PJ | journal of corporate finance | 1114 | 2003 |
| 7 | The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey | Adams, RB; Hermalin, BE and Weisbach, MS | journal of economic literature | 956 | 2010 |
| 8 | Gender Diversity in the Boardroom and Firm Financial Performance | Campbell, K and Minguez-Vera, A | journal of business ethics | 949 | 2008 |
| 9 | Are busy boards effective monitors? | Fich, EM and Shivdasani, A | journal of finance | 871 | 2006 |
| 10 | The Impact of Corporate Sustainability on Organizational Processes and Performance | Eccles, RG; Ioannou, I and Serafeim, G | management science | 841 | 2014 |

3.3 Analysis of Institutional Collaboration Network

"By setting Top N=50 and Top N%=10% in CiteSpace, with "Institution" as the node, spanning from 2003 to 2022 with a time slice of 1 year, we obtained a co-occurrence network graph of research institutions in the field of board governance (Figure 2), consisting of 519 nodes and 944 edges. We also compiled a list of the top 10 research

institutions based on publication count (Table 2). It is evident that the primary institutions conducting board governance research from 2003 to 2022 include Penn State University, Arizona State University, and Texas A&M University. This highlights the significant contributions of these three institutions to the field of board governance research through their substantial publication output. Furthermore, Arizona State University boasts a centrality score of 0.11, indicating the presence of a first-class research team and abundant research resources, with their research outputs garnering widespread attention and citations within the academic community.

Figure 2 illustrates that the number of edges among the nodes is 944, representing the connections between them. A higher number of edges signifies closer connections between the nodes. Therefore, we can infer that these institutions have established close collaborative relationships, demonstrating effective synergy. The average centrality score for the top ten research institutions is 0.77, signifying a strong level of collaboration and communication among these institutions in the study of board governance.

Figure 2: The Network of Institutions

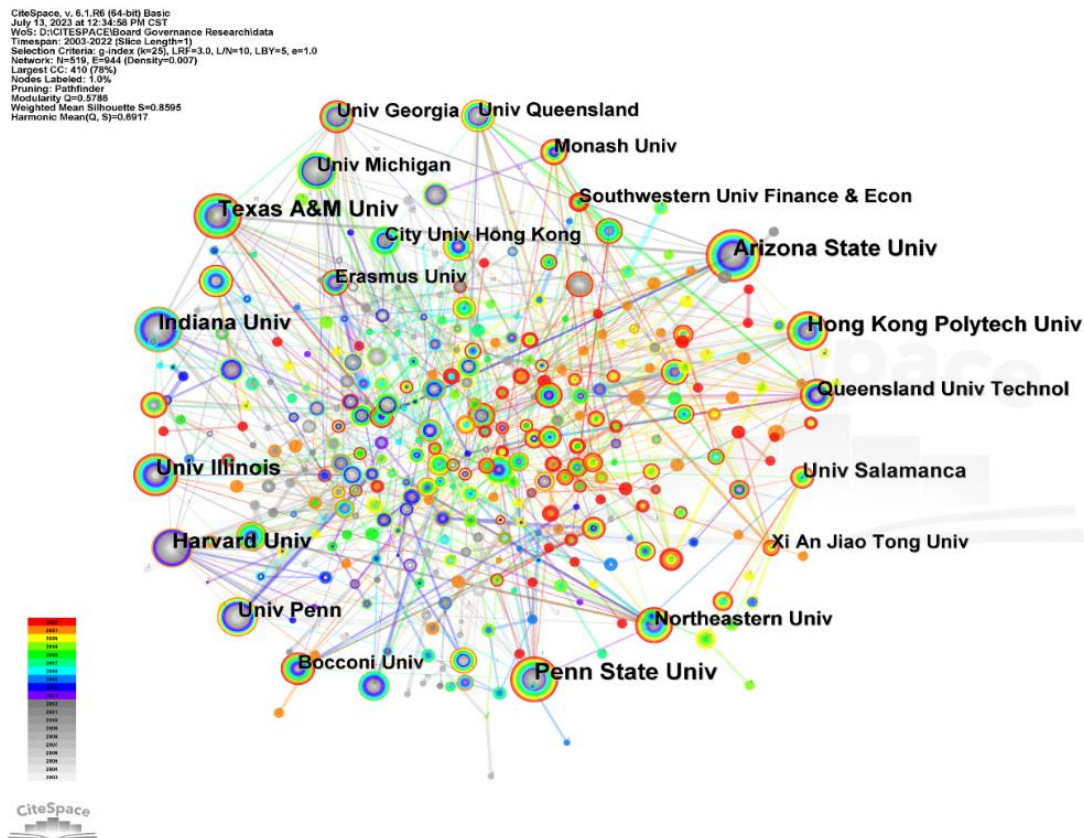


Table 2: Top 10 Institutions for Frequently Published Studies

| No. | Count | Centrality | Year | Institution |
|-----|-------|------------|------|-------------------------|
| 1 | 69 | 0.07 | 2006 | Penn State Univ |
| 2 | 61 | 0.11 | 2003 | Arizona State Univ |
| 3 | 56 | 0.09 | 2003 | Texas A&M Univ |
| 4 | 50 | 0.03 | 2004 | Univ Illinois |
| 5 | 49 | 0.12 | 2003 | Harvard Univ |
| 6 | 47 | 0.09 | 2005 | Hong Kong Polytech Univ |
| 7 | 47 | 0.07 | 2003 | Indiana Univ |
| 8 | 43 | 0.05 | 2015 | Univ Salamanca |
| 9 | 40 | 0.06 | 2004 | Univ Penn |
| 10 | 37 | 0.08 | 2006 | Queensland Univ Technol |

3.4 Analysis of Authors Collaboration Network

Node types are set as "Author," with a time span from 2003 to 2022 and a time slice of 1 year. After running CiteSpace, a co-authorship network graph is going to be obtained in the field of board governance (Figure 3), consisting of 736 nodes and 323 edges, resulting in a density of 0.0012. Additionally, the top 10 authors based on publication count are presented in Table 3. It is evident that the main authors contributing to board governance research during the period from 2003 to 2022 have been Jiraporn P, Garcia-Sanchez IM, and Garcia-Meca E. Each of them has published 25 or more articles, indicating their high academic contributions and research activity in the field of board governance. Although several sub-network structures among authors have formed in the graph, the overall pattern shows a tendency for small-group collaborations. There seems to be a lack of extensive communication among authors, potentially leading to limited diversity and innovation in research methods, theoretical frameworks, and research questions. This limitation may hinder a comprehensive understanding and the discovery of new insights in the field of board governance, potentially restricting the depth and breadth of research in this area.

Figure 3: The Network of Authors

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 WoS: D:\CITESPACE\ESBoard Governance Research\data
 Timespan: 2003-2022 (Slice Length=1)
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=739, E=323 (Density=0.0012)
 Largest CC: 36 (4%)
 Nodes Labeled: 1.0%
 Pruning: Pathfinder
 Modularity Q=0.5786
 Weighted Mean Silhouette S=0.8595
 Harmonic Mean(Q, S)=0.6917

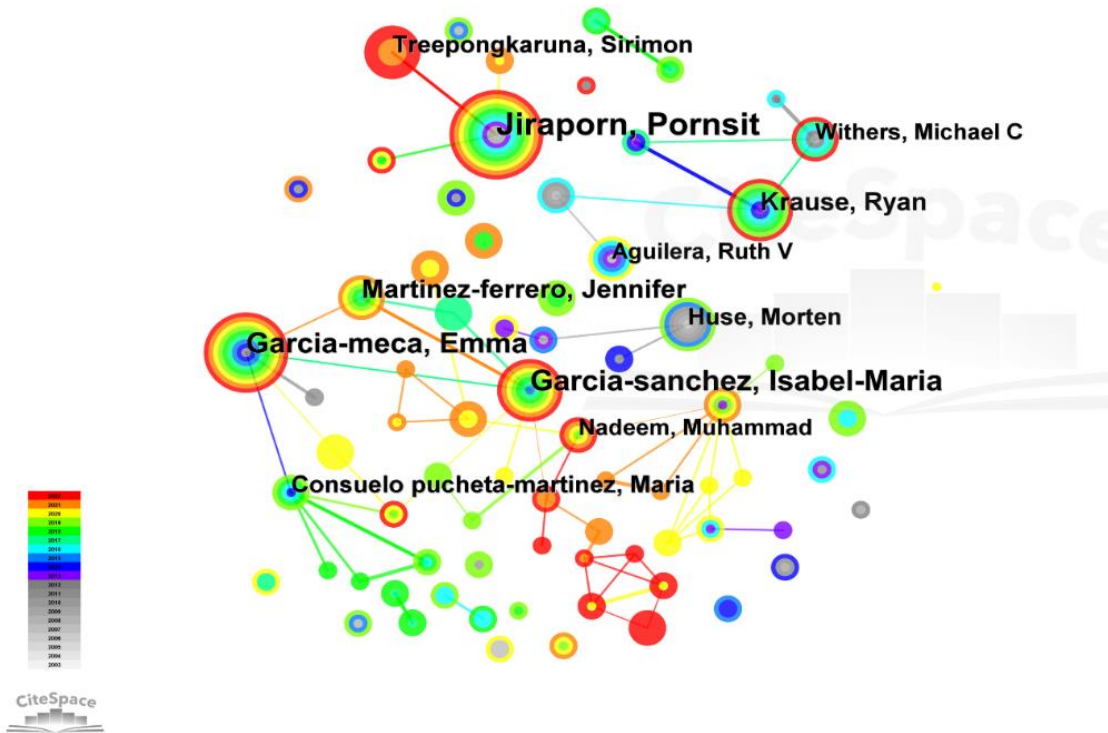


Table 3: Top 10 authors for frequently published studies

| No. | Count | Authors |
|-----|-------|---------------------|
| 1 | 37 | Jiraporn P |
| 2 | 26 | Garcia-Sanchez IM |
| 3 | 25 | Garcia-Meca E |
| 4 | 17 | Martinez-Ferrero J |
| 5 | 16 | Krause R |
| 6 | 14 | Pucheta-Martinez MC |
| 7 | 14 | Treepongkaruna S |
| 8 | 13 | Huse M |
| 9 | 12 | Aguilera RV |
| 10 | 12 | Withers MC |

4. Research hotspots in the field of board governance

4.1 Analysis of Keyword Frequency

Table 4 presents the top 20 keywords with the highest frequencies in board governance research from 2003 to 2022, along with their corresponding centrality indices. High-frequency keywords not only reflect the cutting-edge and focal points of corporate governance research but also provide insights into the dynamic developments in this area, allowing researchers to grasp the trends and directions of their studies.

Based on quantitative analysis of keyword frequency, the top five keywords are "corporate governance," "director," "ownership," "firm performance," and "performance." Moreover, the centrality indices of these keywords are all greater than 0.02, with "firm performance" reaching a centrality of 0.09. This suggests that nodes corresponding to these keywords hold significant positions in the network graph. The high frequency of these keywords indicates that researchers primarily focus on aspects such as corporate governance, characteristics of its members, ownership structure, and its impact on corporate performance. These are important concepts and elements in the study of board governance. Overall, there is a pattern of board governance research that is dominated by empirical research as the main research technique, with governance motives and economic consequences. Other important themes in the field include corporate governance mechanisms, board composition, company ownership structure, gender diversity, and board remuneration. Furthermore, the field of corporate governance is an evolving one, with new keywords and concepts emerging over time. Keywords such as ESG (Environmental, Social, and Governance), digital governance, diversity and inclusivity, risk management, and social media and reputation management are continually surfacing. These keywords reflect the latest trends and critical issues in this field, highlighting the challenges and opportunities in adapting governance practices to the rapidly changing business environment and societal expectations.

Table 4: Top 20 High-Frequency Keywords

| No. | Keywords | Counts | Centrality | Ranking | Keywords | Counts | Centrality |
|-----|-------------------------|--------|------------|---------|--------------|--------|------------|
| 1 | corporate governance | 2630 | 0.06 | 11 | firm | 643 | 0.01 |
| 2 | director | 1786 | 0.06 | 12 | management | 603 | 0.04 |
| 3 | ownership | 1276 | 0.04 | 13 | board | 512 | 0.03 |
| 4 | firm | 1218 | 0.09 | 14 | composition | 403 | 0.09 |
| 5 | performance | 1214 | 0.02 | 15 | ownership | 402 | 0.12 |
| 6 | board | 852 | 0.04 | 16 | structure | 393 | 0.03 |
| 7 | governance | 763 | 0.06 | 17 | financial | 388 | 0.02 |
| 8 | impact | 715 | 0.06 | 18 | performance | 365 | 0.05 |
| 9 | board of director | 677 | 0.05 | 19 | gender | 352 | 0.04 |
| 10 | determinant | 649 | 0.01 | 20 | diversity | 343 | 0.03 |
| | | | | | compensation | | |
| | | | | | women | | |
| | | | | | agency cost | | |
| | | | | | earnings | | |
| | | | | | management | | |

4.2 Analysis of Keyword Clustering

Keyword clustering analysis in the field of board governance is another approach to identifying research hotspots. By using clustering analysis, keywords can be grouped and ranked, revealing research topics and sub-domains within the field of board governance. Related keywords are grouped, allowing researchers to identify research themes and focal points, which helps in comprehensively understanding the knowledge system in corporate governance and discovering connections between different pieces of knowledge and important research topics. With "Keyword" as the central focus, the LLR (Log Likelihood Ratio) clustering algorithm has been applied to generate the keyword clustering graph in the field of board governance (Figure 4). From Figure 4, it can be observed that the top three clustering themes are: "Gender diversity," "Boards of directors," and "Corporate governance."

Firstly, clustered high-frequency words on 'Gender diversity' include gender diversity, corporate social responsibility, board gender diversity, female directors, and women on boards. Gender diversity refers to the effect of the proportion of women on boards and their level of participation in the company. The main focus of the study is whether increasing the proportion of women on boards affects corporate governance effectiveness and performance, as well as exploring potential effects on decision-making, corporate risk management, and innovation. In representative studies on gender diversity, Campbell and Mínguez-Vera (2008) found that gender diversity positively affects firm

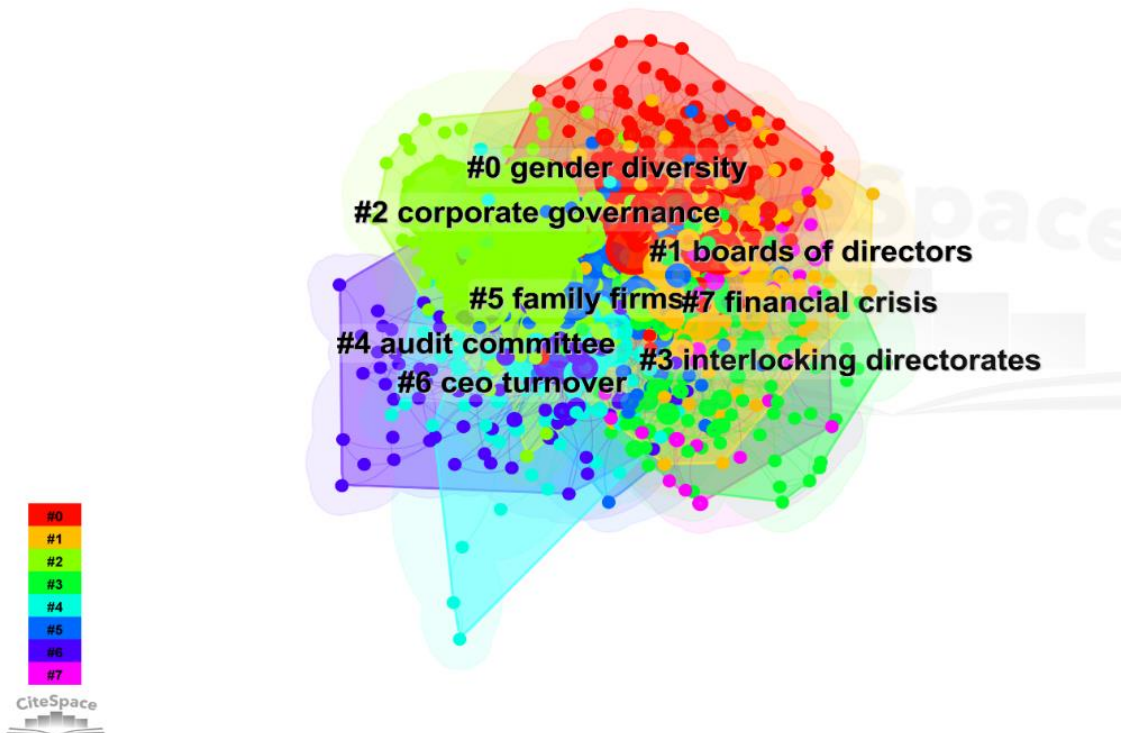
value and may bring economic benefits to the firm. Adams and Ferreira (2009) found that corporate stock performance significantly affects CEO turnover in firms with higher gender diversity and that gender-diverse boards are better able to fulfill their oversight function. Gender diversity on boards has become a focus of global research and policy attention, and several countries have introduced policies to increase the number of women directors in listed companies.

Secondly, clustered high-frequency words on "Boards of Directors" include boards of directors; strategic change; upper echelons; upper echelon, and organization. Corporate board research is an important academic field that primarily focuses on the roles, decision-making, and strategic changes within boards of directors. Hillman and Dalziel (2003) found two critical functions of boards of directors: representing shareholders to supervise management and providing resources. Coles, Daniel, and Naveen (2008) found that complex firms have larger boards and more independent directors. A larger proportion of board insiders in research and development-intensive firms can significantly increase the firm's Tobin's Q value. These keywords can provide researchers with clues and guidance for further exploring relevant issues and topics within the field of board governance.

Thirdly, clustered high-frequency words on "Corporate governance" include corporate governance; agency theory; board composition; ownership structure, and firm performance. Corporate governance is closely related to other aspects of corporate governance, such as equity governance, supervisor governance, and executive governance, all of which collectively influence the organization. Fan, Wong and Zhang (2007) found that politically connected CEOs are more likely to appoint other bureaucrats to the board. Adams, Hermalin, and Weisbach (2010) conducted a survey of the board of directors literature focusing on the composition of boards and board behaviors and the impact on firm performance. Boards of directors play a major oversight and advisory function in companies, and research on board governance has driven further research on corporate governance.

Figure 4: The Keyword Clustering Graph

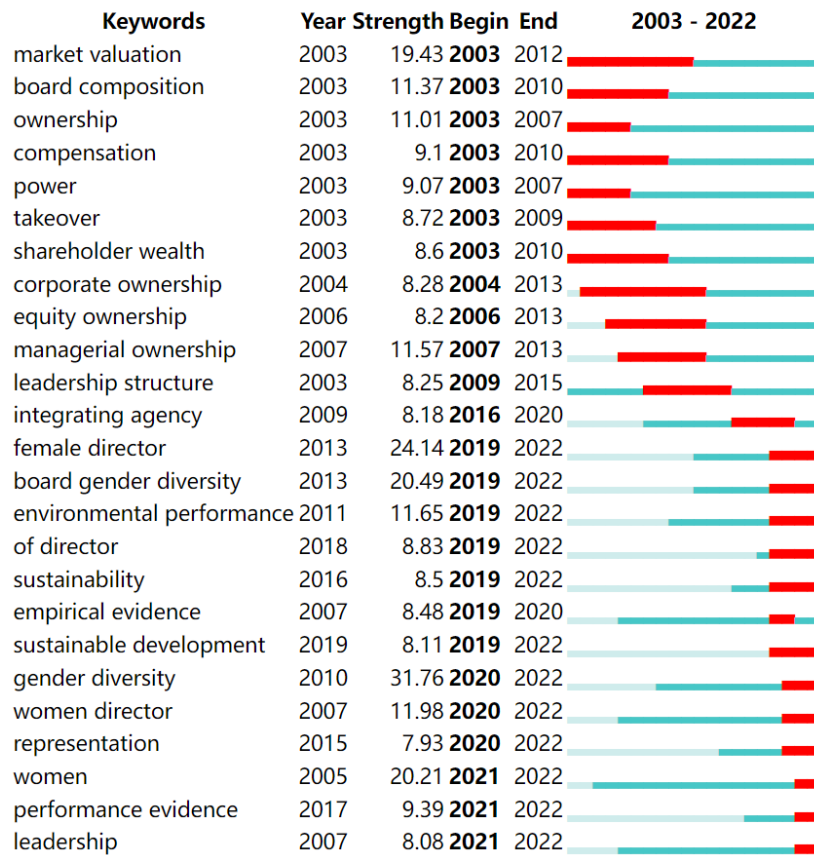
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 July 13, 2023 at 4:56:00 PM CST
 WoS: D:\CITESPACE\Board Governance Research\data
 Timespan: 2003-2022 (Slice Length=1)
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=842, E=5099 (Density=0.0144)
 Largest CC: 839 (99%)
 Nodes Labeled: 1.0%
 Pruning: Pathfinder
 Modularity Q=0.3681
 Weighted Mean Silhouette S=0.6836
 Harmonic Mean(Q, S)=0.4793



5. Research Trends in the Field of Board Governance

The analysis of keyword burst detection provides insights into the research frontiers and hot issues in board governance and provides valuable guidance for future research in this area. By utilizing CiteSpace software for cluster analysis of the "keyword" data in corporate governance literature, a knowledge graph of keyword bursts in corporate governance is generated. Figure 5 shows the top 25 high-frequency keywords with their corresponding burst intervals, and bold line segments indicate the years when a burst of publications occurred in this field. Through the analysis of burst intervals (start-end), the development trends and cutting-edge topics in board governance research since 2003 can be identified. Based on the start and end times of keyword bursts, the research frontier is categorized into three types: early-stage research frontier, mid-term research frontier, and the most recent research frontier, helping to clarify the research directions in different periods of corporate governance studies.

Figure 5: Top 25 high-frequency keywords for surge intensity



5.1 Early Research Frontiers

The early-stage research frontier mainly refers to the research topics reflected by keyword nodes with burst start times after 2003 and burst end times before 2010. In this phase, the research frontier keywords in the field of board governance, ranked by burst strength, include aspects such as "market valuation," "board composition," "ownership," "compensation," "power," "takeover," and "shareholder wealth." The early-stage research frontier primarily reflects the relationship between board composition, company ownership structure, and key indicators like market valuation and shareholder wealth. "Market Valuation" ranks first in burst strength during this stage, indicating that early researchers emphasized the impact of the board in terms of company value and market performance, as well as how the market evaluates and reflects corporate governance quality.

Research shows that corporate governance has an impact on market valuation. Bai, Liu, Lu, Song, and Zhang (2004) found that a firm's concentration of non-controlling shareholders' ownership and foreign investors' ownership can significantly enhance

market valuation. DeFond, Hann, and Hu (2005) found that the market reacts positively when firms include accounting experts on their audit committees. These keyword studies reveal the key role of the boards in decision-making, power distribution, remuneration arrangements, and corporate ownership structure. In-depth research on the relationships and influences between these keywords can further enhance our understanding and improve the effectiveness and benefits of board governance.

5.2 Medium-term research frontiers

The mid-term research frontier mainly refers to the research topics reflected by keyword nodes with burst start times after 2004 and burst end times before 2020. In this phase, the research frontier keywords in the field of board governance, ranked by burst strength, include aspects such as "corporate ownership," "equity ownership," "managerial ownership," "leadership structure," and "integrating agency."

The mid-term research frontier primarily reflects the interrelationships and impacts between corporate ownership structure and board governance. Scholars were particularly concerned about the board's coordination among the various stakeholders. Different types of corporate ownership structures, the concentration of equity ownership, and managerial ownership inevitably had varying effects on board governance. Holderness (2009) examined the relationship between equity concentration in U.S. firms and global investor legal protections. Lasfer (2006) found that the higher the level of managerial ownership, the lower the effectiveness of board oversight and the effectiveness of corporate governance mechanisms. Munisi, Hermes, and Randøy (2014) examined the relationship between firms' ownership structure and board structure and found that higher foreign and managerial ownership and ownership concentration were associated with lower firm board size. During the mid-term research frontier phase, scholars had a keen research interest in the board organization, power distribution, decision-making mechanisms, and their relationships with corporate governance and performance. These studies contributed to a deeper understanding of corporate governance and provided practical guidance.

5.3 Latest Research Frontiers

The latest research frontier mainly refers to the research topics reflected by keyword nodes with burst start times after 2019 and burst end times before 2022. In this phase, the research frontier keywords in the field of board governance, ranked by burst strength, include aspects such as "female director," "board gender diversity," "environmental performance," "sustainability," "empirical evidence," "sustainable development," "gender diversity," "women director," "representation," "women," "performance evidence," and "leadership." These keywords reflect scholars' research interests in areas such as gender diversity in boards, environmental performance, sustainable development, and leadership within corporate governance. It indicates that fundamental issues like the complexity of board structures are receiving broader attention.

Currently, Adams and Ferreira (2009); Carter, Simkins, and Simpson (2003); and Campbell and Mínguez-Vera (2008) examined the relationship between gender diversity and structural diversity on boards and firm performance. They supported the positive effects of gender diversity and structural diversity on boards and provided empirical evidence for improving board governance effectiveness. This research theme will continue to develop and evolve as time passes and new challenges emerge.

6. Research Findings and Implications

6.1 Research Findings

By visualising and analyzing the board governance research literature from 2003 to 2022 and using the latest visualization software CiteSpace, we constructed the knowledge map of institutions, authors, and keywords. Additionally, we generated keyword clustering and burst maps to visually analyze and summarize the knowledge structure, research hotspots, and development trends in board governance research.

The results of the study show that the amount of literature on board governance research is growing exponentially from 2003 to 2022. The high citation rate of board governance research and its direct impact on corporate performance have attracted significant academic attention. Analyzing the cooperation network of research institutions, we observed a dense distribution of research institutions, indicating close collaboration and effective communication among them. However, regarding author cooperation network analysis, although several author sub-networks have been formed

in the graph, authors in the corporate governance field tend to work independently or in small groups, potentially limiting a comprehensive understanding and discovery of new insights in this area.

The co-occurrence analysis of high-frequency keywords shows that "corporate governance", "ownership" and "corporate performance" occupy an important position in the research network in terms of frequency and centrality, reflecting the main research direction and consensus of the academic community. It underscores the significance of board governance in enhancing corporate governance systems, optimizing ownership structures, and improving firm performance. Keyword clustering analysis identified "Gender diversity," "boards of directors," and "corporate governance" as research hotspots, indicating scholars' focus on exploring board structure and institutional design. The increased attention on female directors' participation in board governance reflects the growing recognition of their value in economic and social activities.

Finally, by analyzing the frequency and time distribution of high-frequency keywords in board governance research, we determined their burst strength to identify the research frontier and development trends. Findings reveal that internal complexity structures, such as board gender diversity, sustainability, green governance, listed company ownership structures, shareholder governance, and mechanisms for enhancing listed company performance and pathways, have emerged as emerging trends in board governance research.

6.2 Research Implications

Firstly, board governance research has shown an exponential growth trend in the past two decades. This indicates that globalization and rapid changes in the business environment have made corporate governance and the role of boards increasingly important. Government regulations and financial crises have also sparked interest in corporate governance, leading to the need for continuous attention and emphasis on board governance in academia.

Secondly, current research on board governance focuses mainly on financial performance. Apart from financial performance indicators, researchers need to consider non-financial performance metrics such as innovation capabilities, green development, and environmental contribution. Additionally, a deeper understanding of the impact

mechanisms of board governance on company performance is necessary. This involves exploring the mediating variables between board characteristics, decision-making processes, power structures, and firm performance to reveal their mechanisms and pathways, adapting to the ever-changing business environment and governance challenges.

Thirdly, there is a need to continuously strengthen cooperation networks in the field of board governance research among research institutions and scholars, promoting knowledge sharing and exchange. Collaborative networks allow researchers to engage with scholars from different academic backgrounds, experiences, and viewpoints. This helps broaden research perspectives and encourages interdisciplinary and comprehensive studies. Furthermore, collaboration fosters resource sharing and complementarity, thereby improving research efficiency and effectiveness.

Fourthly, the academic community should pay attention to research on sustainable development and green governance in the field of board governance. The environmental impact of companies is garnering increasing attention, and green governance serves as an effective way to reduce a company's environmental footprint. Boards play a crucial role in formulating and promoting sustainable development strategies. Scholars need to focus on how boards integrate sustainable development principles and objectives and consider environmental, social, and governance factors at the strategic level to ensure companies achieve sustainable development goals in practice, fostering harmonious development in society, the environment, and the economy.

In conclusion, there is current academic interest and research on issues related to board governance, corporate performance, diversity, and sustainable development. These research findings provide important insights for the academic community, practitioners, and policymakers, helping them understand critical issues in corporate governance, improve decision-making and practices, and promote sustainable development in businesses.

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