Corporate governance and green innovation performance: a TCCM-based systematic literature review

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Abstract

This study reviews and synthesizes literature linking corporate governance mechanisms to green innovation performance. It examines how board structure, ownership patterns, executive incentives, and ESG practices shape firms' pursuit of sustainability-driven innovation across institutional contexts. Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) protocol and TCCM (Theory-Context-Characteristics-Methodology) framework, the review analyses 213 articles published between 2015 and 2025. Bibliometric mapping and content analysis identify foundations, methodological trends, and differences in the governance-innovation nexus. Findings show that board diversity, independence, and environmental competence improve green innovation performance by supporting perspectives and stakeholder responsiveness. Ownership structure, CEO duality, and ESG disclosure influence innovation outcomes, with effects varying by institutional quality and industry context. Quantitative and single-theory approaches dominate, highlighting the need for integrated frameworks and methods. The study positions governance as both a compliance mechanism and a driver of competitiveness and value creation, providing a synthesis and a research agenda for sustainability-focused corporate governance.

Keywords: *Corporate governance, Green innovation, ESG disclosure, Board diversity, Sustainable performance.*
JEL Classification*: G34, Q55, Q56*

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1. Introduction

As the world moves towards low-carbon economies, rapid action is needed on climate change issues because green innovation has become an important aspect of business strategy and policy-making. Green innovation, which involves producing products, services, processes, and technologies that benefit the environment, is particularly crucial for reducing ecological footprints and keeping firms competitive in markets that prioritize sustainability (Qin et al. 2025). In simple terms, green innovation can be any technology aimed at limiting the negative environmental impact caused by human activity. The economic benefits of green innovation mostly flow through increased investment in the first few years. Over time, further progress in returns comes from cheaper energy and more energy-efficient production processes. In addition to its ecological benefits, green innovation has been linked to long-term financial development, better authenticity, and a better ability to withstand regulatory shocks. This is why it is an essential tool for both enterprises and the government.

In this context, corporate governance (CG) has become a vital factor influencing organizations' capacity to invest in, manage, and effectively execute green innovation. Governance structure, including board structure, independence, diversity, ownership focus, executive incentives, and ESG oversight, influences managerial decision-making and risk-taking behavior (Lu et al., 2024). Good governance ensures that managers' interests align

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with other stakeholders' needs for sustainability. It also reduces agency costs and enables companies to pursue long-term ecological policies. This can affect the firm's ranking of sustainability-oriented innovation over short-term financial returns (Amore & Bennedsen, 2016; Shui et al., 2022).

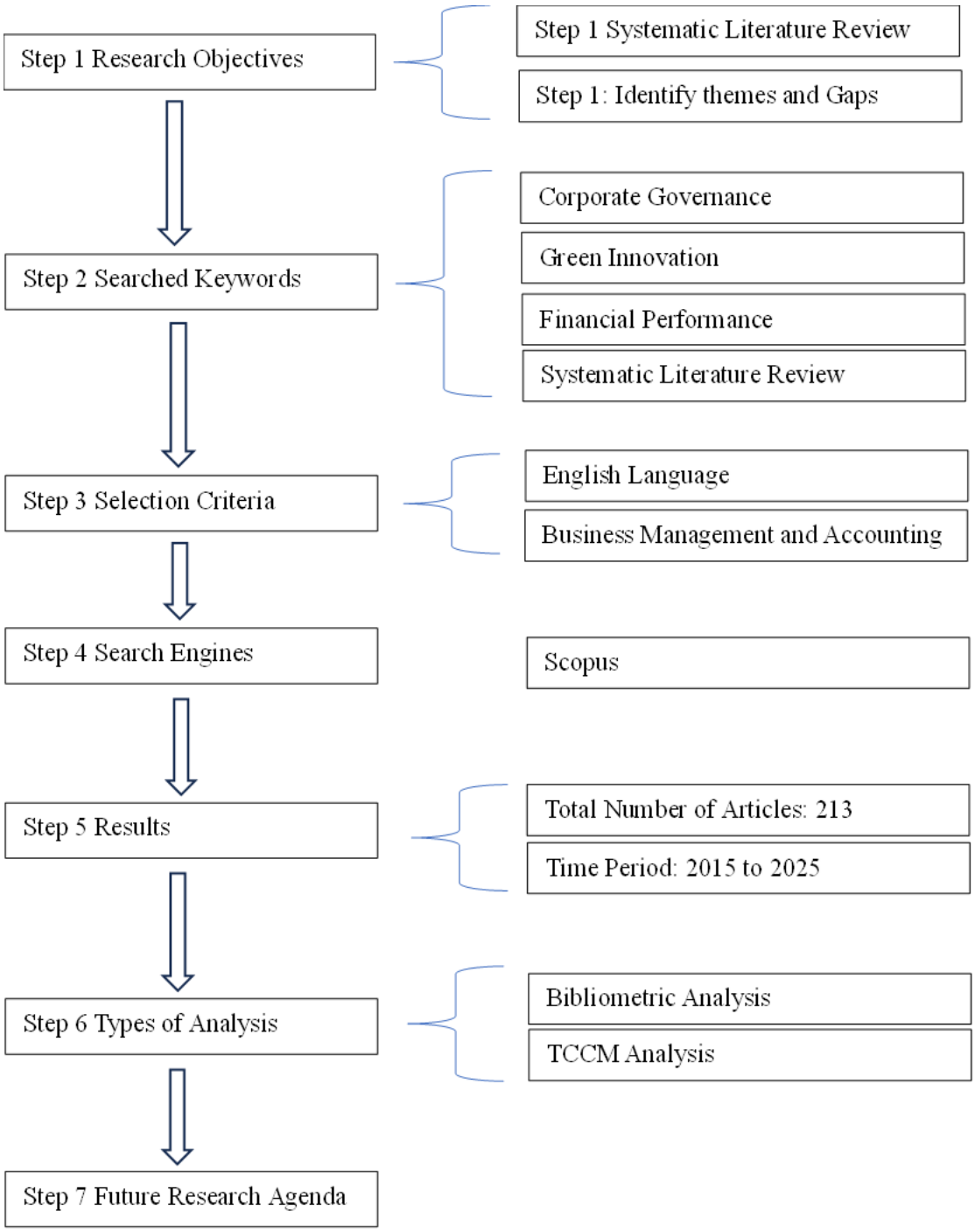


Figure 1. Seven-step methodology (SSM) for the literature review

At the board level, several governance mechanisms have shown strong connections to green innovation outcomes. Board diversity, especially gender diversity, enriches a firm's innovative capability by bringing distinct perspectives and sustainability concerns. Chu (2024) found that gender-diverse boards of Chinese firms positively affected green technology innovation. In addition, Javeed et al. (2023) demonstrate that the green total factor productivity of firms was significantly improved by board capital, which consists of the

knowledge, experience, and social networks of directors. This is in line with the resource-based view of governance. Governance is increasingly relevant for digital transformation projects, which are becoming more interconnected with green innovation. Fang (2024) found that corporate digitalization, particularly under effective governance, motivated firms in China to pursue green patenting.

Despite the mentioned improvements, the literature remains fragmented and context-specific, yielding different results across countries, sectors, and regimes. In emerging and developing markets, ownership concentration and state ownership are more relevant, whereas in developed markets, board independence, ESG (Environmental, Social, and Governance) integration, and stakeholder-oriented governance emerge as critical variables. Moreover, significant gaps remain that future research must address. Many studies simply neglect the endogeneity problem or employ inadequate instrumental variables. The studies on green innovation measurement (e.g., green patents, eco-R&D, emissions reductions) are highly heterogeneous, while corporate governance variables are conceptualized and operationalized in very different ways. This makes it difficult to obtain a clear, unified picture of the effects of governance policy on green innovation performance across countries.

A systematic literature review aims to collate and summarize empirical evidence and key contributions from leading researchers in the field, following the PRISMA guidelines. This study has identified the relevant governance mechanisms driving green innovation and analyzed how contextual factors such as regulations, industry, and institutional settings affect the effectiveness of these mechanisms and their financial performance. The study also assesses the presence of sampling bias and discusses major methodological limitations, suggesting avenues for future research. (Amore & Bennedsen, 2016; Qin et al. 2025).

Recent reviews have examined green innovation implementation (Qin et al., 2025), the relationship between executive incentives and green innovation (Wu et al., 2022), and broader corporate sustainability (Shabbir, 2025). In contrast, this study specifically examines the corporate governance- green innovation nexus using the TCCM framework (Theory, Context, Characteristics, Methodology), integrating theoretical, contextual, governance-related, and methodological perspectives to identify key gaps and future research directions. This study has the following research objectives (ROs).

RO1. *To synthesize the literature on corporate governance and green innovation performance from theoretical, contextual, and methodological perspectives.*

RO2. *To examine how corporate governance mechanisms influence green innovation across different institutional and industrial contexts.*

RO3. *To identify key research gaps and propose future directions in the corporate governance green innovation literature.*

The rest of the paper is as follows. Section 2 presents the methodology. Section 3 discusses the theoretical framework. Section 4 presents the TCCM analysis. Section 5 presents the bibliometric analysis. Section 6 discusses the findings. Section 7 concludes, and Section 8 proposes future research agendas.

2. Methodology

Researchers have proposed numerous approaches for doing a systematic literature review (Tranfield et al., 2003; Snyder, 2019). These principles were utilized in this study and adapted to correspond with the specific objectives of examining the relationship between corporate governance and green innovation performance. This system was based on seven steps (SSM) as depicted in Figure 1. It provided us with a clear methodology in the SSM that

was both reproducible and up to date and complied with best practices for systematic reviews (Volquez et al., 2025; Dubey et al., 2017).

The systematic review involves gathering and analyzing existing empirical studies. Thus, it enables the accumulation of knowledge and minimizes distortion, while also indicating where research gaps remain (Singh et al., 2020; Gur & Greckhamer, 2025). The first part of the review aimed to present the review's objectives and outline possible directions for future research on the influence of corporate governance on the outcomes of green innovations.

The study selection process is presented in Figure 2. The Scopus search identified 545 records. After applying the 2015-2025 publication period, 365 records remained for screening. Following title, abstract, and keyword screening, 95 records were excluded, while 57 records were excluded during eligibility assessment. Finally, 213 studies were retained for in-depth analysis. The screening process was conducted by both authors.

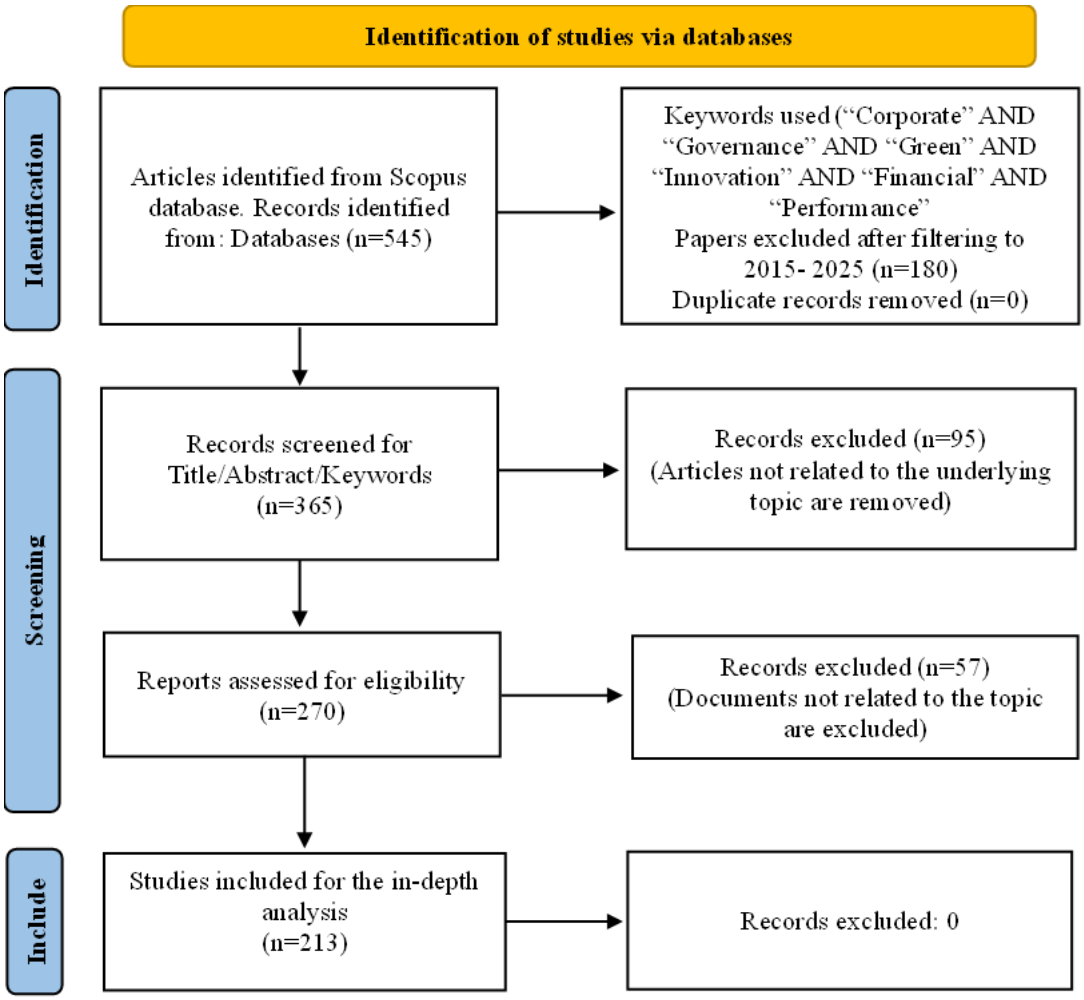


Figure 2. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram
Source: Page et al., 2021

Relevant search strings and keywords were developed for the data extraction. The terms used for the search included "Corporate Governance", "Green Innovation," and "Financial Performance". Different combinations of these keywords have identified relevant publications on the topic (Natalicchio et al., 2017). These terms were combined using Boolean operators (AND and OR) to identify relevant publications on the topic. The complete Boolean search string used in Scopus was TITLE-ABS-KEY ("Corporate

Governance" AND "Green Innovation" AND "Financial Performance"). The search was conducted on 8th August 2025. The retrieved publications were subsequently analyzed using VOSviewer and RStudio for bibliometric analysis.

Search String 1: TITLE-ABS-KEY ("Corporate Governance" AND "Green Innovation")

Search String 2: TITLE-ABS-KEY ("Corporate Governance" AND "Financial Performance")

Search String 3: TITLE-ABS-KEY ("Green Innovation" AND "Financial Performance")

After analyzing the issue collectively, the authors established final rules regarding who would be eligible to participate in the review. The authors did not consider any evidence outside of the business, management, and accounting fields. This ensured that the evidence reviewed was good and relevant (Tranfield et al., 2003).

The literature search was conducted using the Scopus database, which is widely recognized as one of the most comprehensive and reliable sources of peer-reviewed academic literature for bibliometric and systematic review studies (Herrera-Franco et al., 2020; Abbate et al., 2022). The initial search yielded 545 documents from the Scopus database. Following the application of predefined inclusion and exclusion criteria, removal of duplicates, and relevance screening based on titles, subject area, document type, language, and keywords, the dataset was refined to a final sample of 213 peer-reviewed articles. These articles constituted the final corpus for subsequent bibliometric and thematic analyses. However, using Scopus as the sole database may have excluded relevant studies indexed in other databases, such as Web of Science, which represents a limitation of the review.

This research employed standard bibliometric methods to identify the core journals, publication patterns, and key research themes within the corporate governance and green innovation literature. Secondly, employing the TCCM framework (Theory, Context, Characteristics, Methodology), this research mapped the literature and identified key themes and gaps for future research. (Paul & Rosado-Serrano, 2019). By employing these approaches, this research mapped the literature and identified key themes and gaps for future research (Donthu et al., 2021).

The findings of the review were subsequently utilized to make a plan for future research. The agenda, developed to highlight theoretical, situational, and governance 'gaps' as well as methodological gaps and potential future research avenues, has the potential to aid future research on corporate governance and the effectiveness of green innovation.

3. Theoretical framework

This paper utilizes five complementary theoretical perspectives in corporate governance and green innovation: Signaling Theory, Agency Theory, Stakeholder Theory, Resource-Based View (RBV), and Institutional Theory to gain a comprehensive understanding of the relationship between corporate governance and green innovation.

3.1. Signaling theory

Signaling Theory refers to the communication of information in situations where information differs among entities. Therefore, firms use visible actions, publications, and practices as signals of their underlying quality and intentions to the outside world (Spence, 1973; Connelly et al., 2011). In terms of corporate governance and green innovation, governance tools and eco-friendly initiatives can be viewed as signals built to show the company's standing regarding sustainability, transparency, and innovation. Board characteristics, sustainability disclosures, and green innovation activities may therefore

reduce information asymmetry and shape the perceptions of investors, regulators, customers, and other stakeholders. Connelly et al. (2011) further emphasize that signaling involves an interaction between a signal sender and a signal receiver, particularly where information asymmetry exists.

3.2. Agency theory

Managerial risk aversion to bet the company on uncertain, long-term GI-related projects (amalgamating basic, applied, and translational research) in order to generate higher-than-normal shareholder returns in the short run is a manifestation of agency costs (Jensen & Meckling, 1976). Agency costs arise from imperfections in corporate governance systems that are designed to lower agency costs by aligning management's interests with those of shareholders through efficient monitoring, incentive devices, longer-term compensation contracts, independent directors, and institutional investor monitoring of CEO activity (Amore & Bennedsen, 2016). In the context of Green and Inclusive business models, efficient monitoring and long-term incentives can motivate managers to invest in green R&D and ECO technologies that increase a company's long-run sustainable value.

3.3. Stakeholder theory

Stakeholder theory represents a significant shift from the long-held shareholder maximization view of the corporation. According to this theory, boards of directors must consider multiple stakeholders (consumers, employees, community residents, suppliers, the environment, regulatory bodies) when making business decisions. Boards composed of more diverse members with relevant stakeholder experience and environmental consciousness will be better equipped to address the challenges posed by sustainable business practices. This viewpoint elucidates the rationale behind governance frameworks that prioritize inclusivity and accountability, frequently propelling green innovation, as companies use eco-innovations to uphold legitimacy, enhance reputation, and fulfill stakeholder expectations (Singh et al., 2020).

3.4. Resource-based view

From an RBV perspective, the key to competitive advantage lies in the organization's resources and capabilities, including technological and human capital, such as the competence of senior managers and the skills of the board of directors, as well as the organizational ties that facilitate access to external knowledge sources. Corporate governance can play an important role in helping the firm build a stock of relevant resources by shaping its strategic direction, allocating R&D funds, and bringing expertise to bear on green business opportunities, including experience from international markets and from traditional businesses transforming sustainability. From this perspective, the board and corporate governance systems can be seen as 'hidden assets' that enhance a firm's 'dynamic capability' for green innovation (Lin et al., 2022).

3.5. Institutional theory

Institutional theory is often used to explain the adoption of GI. From this perspective, external pressures such as regulatory, normative, and cultural forces influence organizational practices. These environmental factors include government regulations, ESG disclosure requirements, and sustainability norms. The effect of corporate governance on GI is particularly relevant in this context. Stronger governance structures facilitate firms' compliance with coercive, normative, and mimetic pressures and, consequently, can explain why GI is adopted by some firms but not others in various countries and industries (Mohy-ud-Din et al., 2024).

3.6. Integrated theoretical framework

Together, these perspectives create a holistic understanding of the governance GI nexus. The signaling theory explains how governance practices and ESG disclosures communicate firms' commitment to sustainability and reduce information asymmetry. Agency theory explains the alignment of managerial incentives with GI. The stakeholder theory captures the role of diverse stakeholder demands in pressuring firms toward GI. The RBV positions governance as a capability that enhances the resources for green innovation. The institutional theory situates GI outcomes within broader regulatory and cultural environments. By integrating these logics, this study posits that corporate governance mechanisms influence GI both directly and indirectly.

4. TCCM analysis

Using the TCCM framework (Theory, Context, Characteristics, Methodology) to synthesize the existing body of knowledge on the relationship between corporate governance and green innovation performance, this paper identifies the knowledge gaps and inconsistencies. A total of 213 documents from Scopus databases were reviewed and analyzed. Table 1. Shows the sources and documents published in this area. The number of citations in this table shows that these articles are having an impact on researchers and that their visibility is increasing in the academic world.

Table 1. Top 10 Journals with Number of Publications

Rank	Source	Documents	h-index	Citations
1	International Review of Economics and Finance	17	7	283
2	Business Strategy and the Environment	14	9	839
3	Journal of Cleaner Production	13	10	714
4	Energy Economics	12	11	695
5	International Review of Financial Analysis	12	7	548
6	Corporate Social Responsibility and Environmental Management	10	8	509
7	Finance Research Letters	10	5	86
8	Environment, Development and Sustainability	9	4	50
9	Emerging Markets Finance and Trade	7	4	246
10	Research in International Business and Finance	7	3	22

4.1. Theories

4.1.1. Dominant theoretical foundations

Theory and evidence regarding the impact of corporate governance on sustainability innovation are increasingly important for business and society. Most existing research applies Signaling Theory (30), Resource-Based View (RBV) (21), Stakeholder Theory (20), and Agency Theory (18) to explain how governance structures, such as boards of directors and shareholding structures, influence managers' incentives to engage in green R&D by aligning interests, responding to stakeholder expectations, or increasing monitoring (C. Zhang & Chen, 2023). Information asymmetry and conflict of interest between managers and shareholders hinder long-term investment. In contrast, for firms that seek to be socially responsible, managers and boards of directors must respond to the expectations of environmentally focused stakeholders, including governments, local communities, NGOs, and environmentally conscious consumers (Shabbir, 2025; Shan et al., 2024).

4.1.2. Expanding theoretical perspectives

However, beyond the basic factors of ownership, board composition, and CEO characteristics, the focus is shifting to analyzing how the company's governance creates value by shaping the development of unique resources and capabilities. In this regard, the firm's RBV (Mohy-ud-Din et al., 2024) identifies environmentally knowledgeable directors and other board characteristics conducive to the development of unique internal governance-

related resources that, in turn, facilitate innovative outcomes. Furthermore, as the global marketplace transitions toward sustainability, institutional theory is becoming increasingly relevant, particularly in emerging markets where firms are compelled to respond to rigid regulatory, social, and industry norms (M. Chen et al., 2024). An institutional theory perspective helps to understand cross-country differences in green innovation (Ji et al., 2025).

4.1.3. Integrating multi-theoretical models

A notable gap in the research is the lack of an integrated framework that incorporates the aforementioned theories into a holistic model that explains the impact of governance on innovation. The majority of existing research is based on single theories and fails to capture the complexity of the issue. To address this limitation, future research can adopt an institutional logics perspective to examine how external governance structures influence firms' strategic decisions and innovation, while simultaneously incorporating behavioral agency theory to account for how managerial risk preferences and personal incentives affect the implementation of strategic decisions. In terms of market-based governance, future research can draw on signaling theory and the RBV to investigate how ESG disclosure serves as a signal to stakeholders and as a capability-building tool to achieve better innovation performance (Chen et al., 2024).

While there is some diversity in the current literature on governance and green innovation, there remains a lack of empirical studies that adopt a dynamic capability perspective to examine how governance affects a firm's capability to innovate under climate uncertainty. In addition, there is a dearth of research on the upper echelons that examines the psychological characteristics of executives, such as risk tolerance, environmental values, and cognitive frames, that affect innovation beyond the structural dimension of governance. There is a need for future studies to move towards a multi-level and interdisciplinary approach to theorizing the governance of the green innovation nexus, drawing on insights from economics, sociology, and the behavioral sciences.

4.2. Contexts

4.2.1. Geographic distribution

The analysis revealed that the empirical evidence is highly geographically biased in favor of China, which accounts for more than half of the studies in the sample. The prevalence of China in the literature can be attributed in part to its adoption of green finance policies and regulatory actions, as well as the availability of firm-level data (Ding et al., 2022; J. Zhang & Liu, 2023). Nevertheless, the limited generalizability of findings to other emerging markets is a concern. Other countries, most notably the UK, the US, and Taiwan, are represented, but mostly in small-scale studies that take a reflective, case-level approach, or in cross-listed firm analyses.

4.2.2. Industry and sectoral focus

Despite the growing relevance of sustainability and green innovation, the bulk of studies on governance mechanisms remains confined to certain industries such as manufacturing, energy, and other polluting sectors, where stakeholder pressure is more intense, and firms are quicker to respond to such pressures (Chouaibi & Fadhli, 2026). However, there is a growing body of studies focusing on the digital economy, in which sustainable practices are increasingly embedded in the pursuit of eco-efficiency and even carbon neutrality by fintech, SaaS, and e-commerce companies (Ma & Chang, 2023). There is, however, a dearth of studies focusing on agriculture, healthcare, consumer services, and other industries that can yield substantial insights.

4.2.3. Institutional diversity

Innovative firms have to grapple with institutional, enforcement, and socio-political challenges when seeking new opportunities in many emerging markets (Wang, 2019). Emerging research in countries like Indonesia, India, and Vietnam has observed that the existing governance system does not inherently promote innovation. In particular, corporate governance appears to be less effective in resource-scarce emerging markets like these. Future studies on entrepreneurial governance could also focus on regions such as Africa and Latin America, where distinct bundles of governance challenges await detailed study.

4.2.4. Contextual gaps and future directions

There is a need for comparative cross-country studies that are currently underrepresented in the literature. Such studies could test the generalizability of current theories by examining why governance innovations are effective in some contexts but not others. What works for state-owned enterprises in China may not work for family-owned firms in Latin America. A comparative institutional approach would allow scholars to incorporate variation in relevant regulatory, cultural, and political factors into their analysis of the relationship between governance innovation and governance.

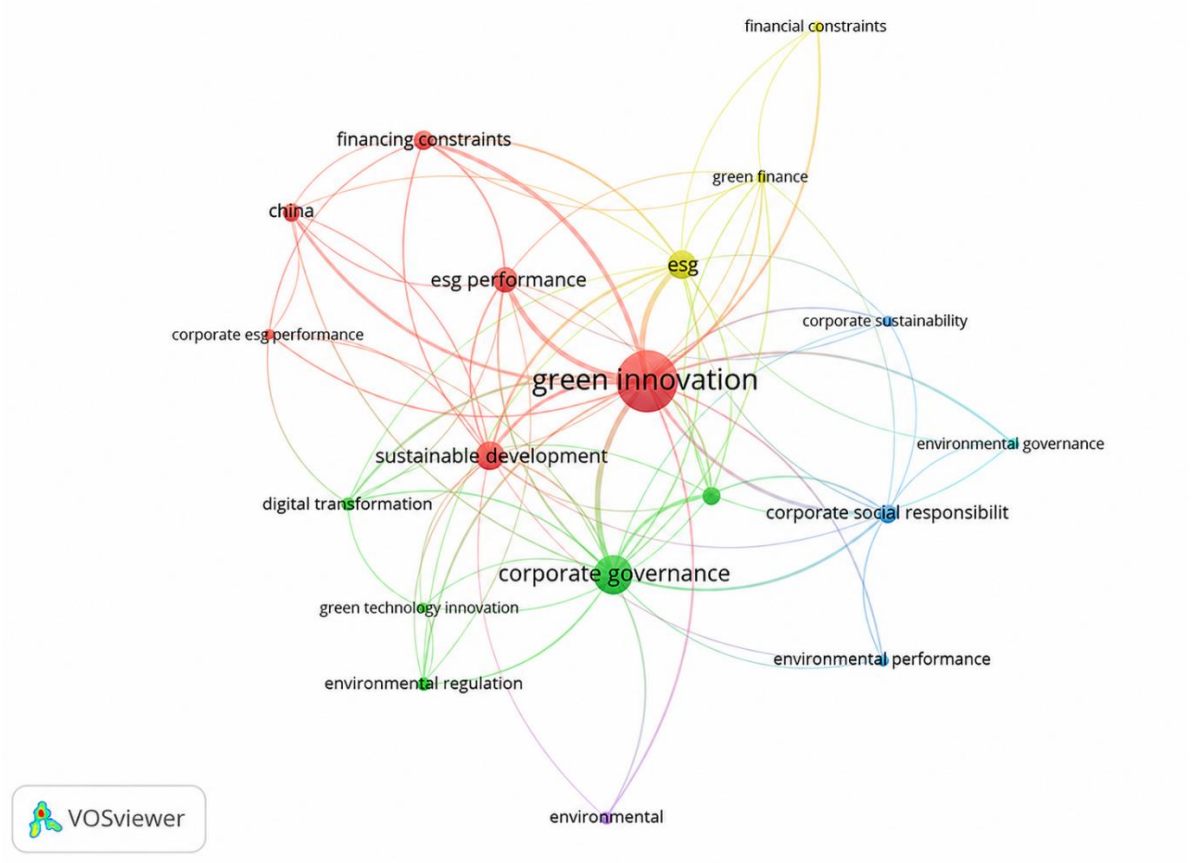


Figure 3. Keyword co-occurrence network

4.3. Characteristics

4.3.1. Governance variables

Besides board characteristics, corporate governance has also drawn attention to other mechanisms, and the typical classification system is not so clear nowadays (Mohy-ud-Din et al., 2024; Chouaibi & Fadhli, 2026). Figure 3 shows that researchers also focused on aspects such as green innovation, sustainable development, CSR, corporate governance, and environmental issues. Within typical governance measures, the current studies mainly focus on the association between governance factors, including board characteristics and ESG

disclosure practices. Recent studies also investigate environmental expertise on boards and its impact on corporate innovation outputs (Chen et al., 2024).

4.3.2. Innovation performance measures

Performance measures of Green Innovation can take various forms, such as green patent counts, R&D expenditure on environmental issues, or eco-innovation indices (Shan et al., 2024; Yang et al., 2025). While these metrics provide valuable insights, they are primarily quantitative and lack a more in-depth assessment of the actual quality of Green Innovation. Therefore, there is a growing need for multidimensional indicators of Green Innovation Performance that capture not only the novelty of an innovation but also its potential to reduce carbon emissions or increase resource efficiency (Liu et al., 2025).

4.3.3. Mediators and moderators

Research has increasingly explored the mediating and moderating mechanisms underlying the relationship between governance and innovation. For instance, the role of financial flexibility (M. Chen et al., 2024), the effect of digital media attention (Chen et al., 2024), and competitive pressure (Ji et al., 2025) have been examined. Governance, therefore, may not have a direct effect on innovation but instead operates through organizational-level mechanisms or is contingent on other environmental factors.

4.3.4. Future directions

There is a lack of behavioral and qualitative constructs in green innovation research. Additionally, there is a need for more research into how managerial cognition, organizational culture, and ethical orientation relate to green innovation and performance. Most of the current research treats governance as a single construct. Breaking down governance into formal (legalistic) and informal (normative, cultural) components could explain more of the variance in the data.

4.4. Methodology

4.4.1. Quantitative dominance

Econometric analyses of governance and innovation, especially quantitative approaches such as panel regressions, the generalized method of moments (GMM), or difference-in-differences designs, have recently gained significant traction in the field and are currently dominating the methodological landscape (Ding et al., 2022; C. Zhang & Chen, 2023). However, these methods have blind spots in understanding the underlying processes and meanings embedded in these phenomena.

4.4.2. Emerging approaches

Some recent studies employ quasi-natural experiments by leveraging regulatory changes such as mandatory ESG disclosure policies (Liu et al., 2025). Others integrate machine learning and text mining to analyze ESG reports and sustainability disclosures. These innovations improve measurement precision and open the door to big-data-driven governance research.

4.4.3. Methodological gaps

Of the total studies (213) assessed, 22 used techniques involving instrumental variables, 23 involved experiments or quasi-experimental designs, and 12 used first-stage tests. It is clear from the results of this review that, although several studies have employed causal identification methods, rigorous identification methods are used. Consequently, future studies should employ more rigorous identification methods and report the associated diagnostics.

Each article was systematically coded across the four TCCM dimensions: Theory, Context, Characteristics, and Methodology. Theory coding identified the theoretical perspectives used; context coding captured the country, industry, institutional, and environmental settings; characteristics coding recorded the key variables, relationships, and governance mechanisms examined; and methodology coding captured the research design, data sources, sample characteristics, and analytical techniques. Where an article reported multiple theories or methodological approaches, each relevant category was coded to reflect the study's full research design.

5. Bibliometric analysis

Figure 4 presents the distribution of relevant publication sources. The size of the bubbles or circles represents the relative contribution, i.e., the number of documents published by a specific source.

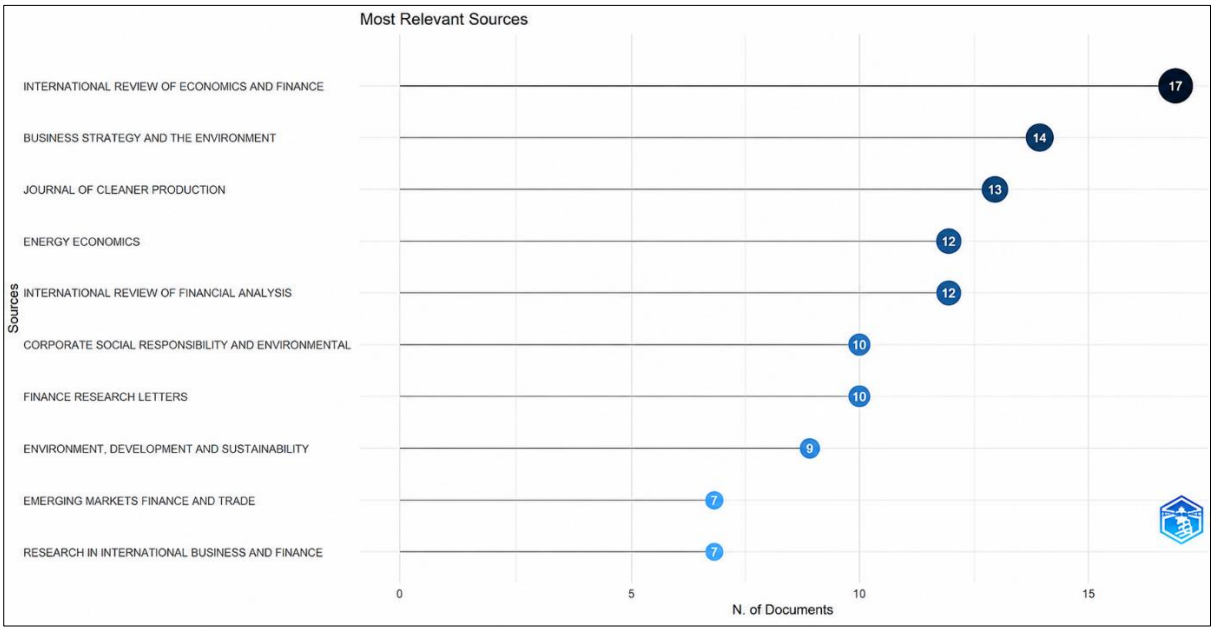


Figure 4. Most relevant sources and their number of documents

The most published papers come from the International Review of Economics and Finance (17 documents), followed by Business Strategy and the Environment and Journal of Cleaner Production, with 14 and 13 articles, respectively. Articles from *Energy Economics* and *International Review of Financial Analysis* (12 documents each), as well as articles from Corporate Social Responsibility, Environmental Management, and Finance Research Letters (10 documents each), constituted the middle range of publications. *Environment, Development and Sustainability* published 9 articles, while *Emerging Markets Finance and Trade* and *Research in International Business and Finance* published the lowest number of papers on the list, with 7 each.

The distribution of this research is mainly concentrated in finance, economics, sustainability, and environmental management journals. In financial journals such as *International Review of Financial Analysis* and *Finance Research Letters*, papers focused on sustainability and corporate governance from a monetary perspective were published. In the environmental journals, viz. Journal of Cleaner Production and Business Strategy and the Environment, papers focusing on the sustainability and environmental aspects of corporate

governance from environmental and business management perspectives were published. Furthermore, the papers were published in multidisciplinary journals in the fields of finance, strategic management, and sustainability.

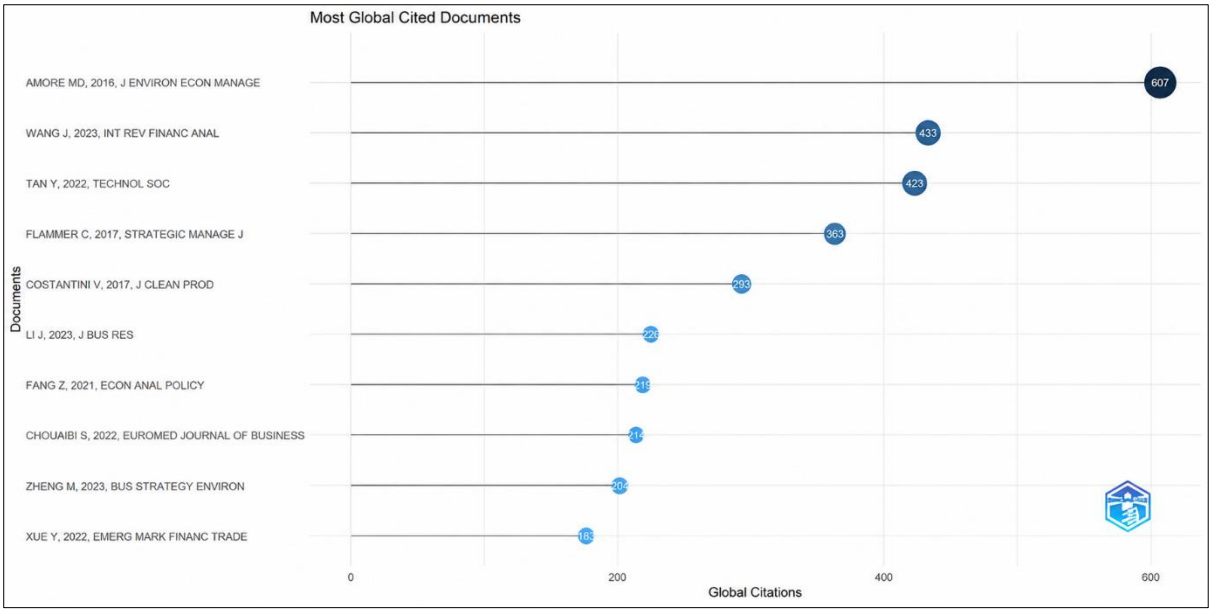


Figure 5. Most globally cited documents and their citation counts

Figure 5 shows the most highly cited documents worldwide within this research area. The horizontal axis displays the number of global citations, and the vertical axis displays the references along with the year of publication and names of the respective journals. The size of the bubbles corresponds to the citation counts (larger bubbles indicate higher citation counts).

Of these papers, the most cited is Amore and Bennedsen (2016), published in the *Journal of Environmental Economics and Management*, with 607 citations. This paper is followed by Wang (2023) published in the *International Review of Financial Analysis* with 433 citations; Tan (2022) published in *Technology in Society* with 423 citations; Flammer (2017) published in the *Strategic Management Journal* with 363 citations; and Costantini (2017) published in the *Journal of Cleaner Production*, with 293 citations. These papers document substantial interdisciplinary citations to environmental papers that include strategic variables predicting financial and economic outcomes.

Mid-range influential works include Li (2023) published in the *Journal of Business Research* with 226 citations, Fang (2021) from Economic Analysis and Policy with 219 citations, Chouaibi (2022) from *Euromed Journal of Business* with 214 citations, and recently published papers like Zheng (2023) in *Business Strategy and the Environment* with 204 citations, and Xue (2022) in *Emerging Markets Finance and Trade* with 183 citations.

The share of citations for publications indicates that, while foundational papers like Amore and Bennedsen (2016) and Costantini (2017) continue to garner the most citations (e.g., Wang, 2023; Li, 2023), newer research is quickly gaining traction and citations. The most highly cited journals for this topic are primarily peer-reviewed and reflect the topic's cross-disciplinary nature by covering finance, strategy, sustainability, and economics. The

most-cited journal is the *Strategic Management Journal*, followed by the *Journal of Cleaner Production* and *Business Strategy and the Environment*.

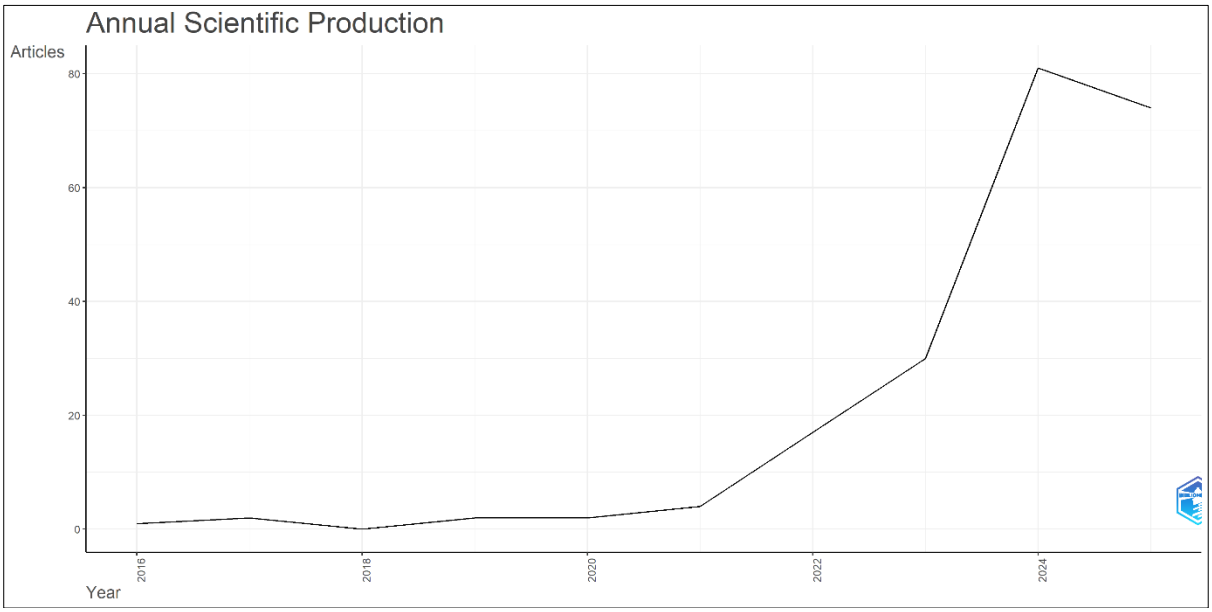


Figure 6. Annual scientific production of articles in the corporate governance and green innovation literature

Figure 6 presents the annual scientific production in the field under investigation from 2015 to 2025, as measured by the number of published articles per year. The horizontal axis represents the publication years, while the vertical axis shows the number of articles published annually. The trend demonstrates a slow and stagnant growth phase between 2015 and 2020, with annual publications rarely exceeding 2-3 articles. This reflects the early stage of scholarly attention to the topic, during which research contributions remained sporadic. From 2021 onward, the field experienced a gradual increase in publications, signaling growing academic interest. A significant turning point occurred after 2022, when the number of articles rose sharply, culminating in a substantial surge in 2024, with over 80 articles published, marking the peak of annual output. Although there was a slight decline in 2025 to 73 articles, overall production remains far higher than in earlier years, indicating sustained and robust research momentum. This growth trajectory highlights a clear acceleration in scholarly engagement, likely driven by increasing global emphasis on sustainability, corporate governance, environmental finance, and the intersection of ESG (Environmental, Social, and Governance) with financial and economic domains. The slight drop after 2024 may reflect natural saturation effects, data indexing lag, or the consolidation of research trends into more specialized outlets.

The graphical representation in Figure 7 explains the theoretical principles that are often used in the research that investigates the relationship between corporate governance and green innovation performance. Signaling theory and the RBV are the most widely used theories in this field, and they make important contributions to understanding how companies use management techniques to rearrange their resources to sustain green innovation. Signaling Theory seems to play a considerable role in examining government activities that are seen by investors and governments as signals of capacity. The emergence of those

theories so often underscores their importance, as these concepts clarify the processes by which governance structures can create benefits in sustainable development.

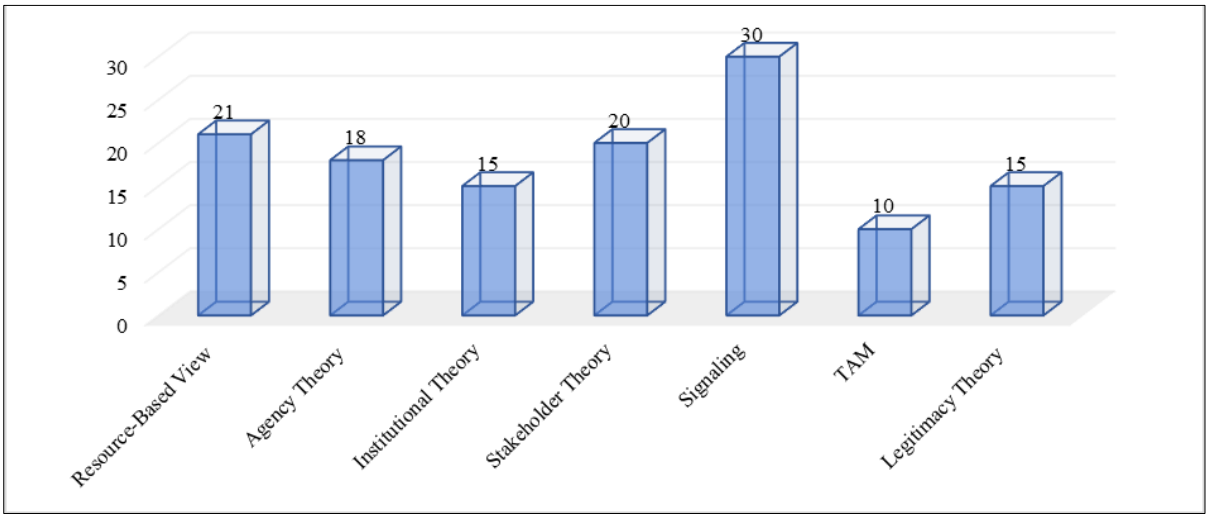


Figure 7. Prominent theoretical perspectives identified in the corporate governance and green innovation literature. Note: The figure presents 129 coded theory occurrences across the reviewed studies. A single study may contribute more than one theory code; therefore, the total represents the number of theory codes identified, not the number of distinct studies.

In addition, there are other theories, namely agency theory, institutional theory, and stakeholder theory, which exist in the literature and show the importance of governance mechanisms as a way to align managers' interests. The theories also help an organization adjust to institutional pressure and satisfy stakeholders' demands. On the other hand, there are theories such as the Technology Acceptance Model (TAM) and Legitimacy Theory that are not widely known but should be mentioned in the context of the adoption of green innovations and the pursuit of social legitimacy. Overall, the diagram shows that although RBV and signaling theory dominate the theoretical background, the importance of a multi-theoretical perspective should be emphasized.

Figure 8 shows the distribution of research methodologies examining the link between corporate governance and green innovation performance. The results indicate that most of the preceding studies are quantitative in nature and that the methods employed in the studies that use panel data (25 coded occurrences), experiments or quasi-experiments (23 coded occurrences), and regression analysis (21 coded occurrences) are the most commonly identified methodological approaches. The pervasive use of large datasets may reflect that researchers primarily use metrics and econometric methods to establish links or causal relationships between mechanisms of governance, such as board structure, ownership concentration, and CEO duality, and innovation outcomes, such as eco-patents and environmentally friendly product development (Baltagi, 2021; Wooldridge, 2010). The widespread application of panel-data methods is further evidence that the field is concerned with controlling for heterogeneity across firms and determining the influence of governance mechanisms on innovation processes over time.

On the other hand, a smaller number of methodologies are being used, such as surveys (7 coded occurrences), bibliometric mapping (5), quantitative analysis (5), structural equation modeling (4), case studies (2), and systematic literature reviews (1). This discrepancy

suggests a gap in the research, as while solid empirical data are available, there should be more emphasis on qualitative methods or integrative reviews that may clarify how governance encourages or obstructs environmental innovations (Donthu et al. 2021; Kline 2023). A lack of systematic literature reviews and case studies opens avenues for research and allows studies to move away from econometric analyses towards complex multi-method studies.

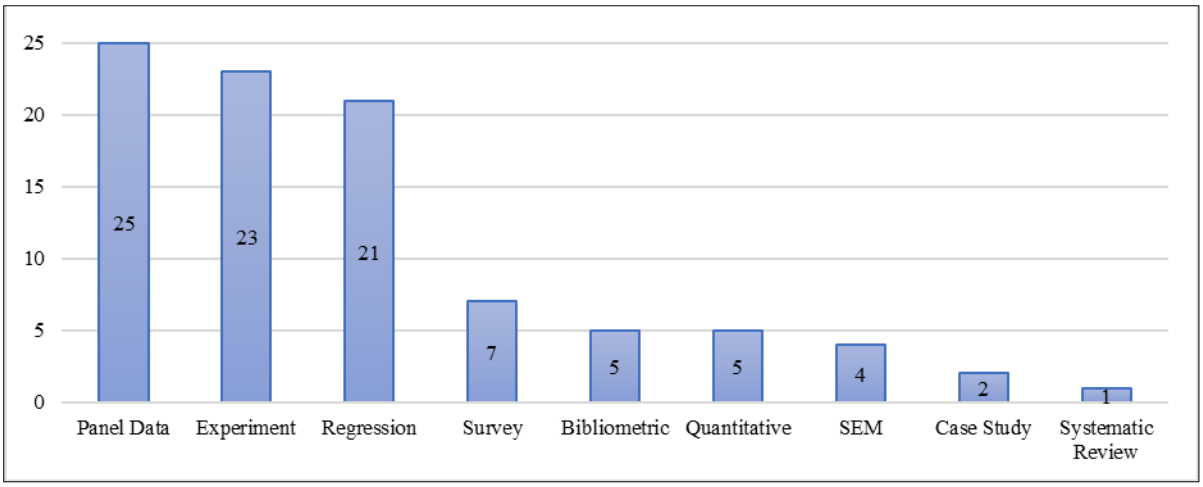


Figure 8. Prominent methodological approaches identified in the corporate governance and green innovation literature. Note: The figure presents 93 coded methodological occurrences across the reviewed studies. A single study may employ more than one methodological approach; therefore, the total represents the number of methodology codes identified, not the number of distinct studies.

6. Discussion

6.1. Corporate governance as a catalyst for green innovation

Corporate governance is one of the underlying factors affecting managerial incentives, corporate strategy, and investment decisions. According to the literature, including Fei et al. (2022) and Mohy-ud-Din (2024), the reviewed studies generally report positive associations among board independence, gender diversity, environmental expertise, and green innovation. Board diversity is not only a vehicle for increasing creativity, promoting diversity in management and raising awareness of social responsibility, but gender diversity in particular is associated with a higher level of awareness towards environmental and social issues, as well as with lower levels of short-term opportunism, as suggested by stakeholder theory, which also recommends that a firm balance the competing stakeholder claims for resources.

Board capital, comprising directors' knowledge, expertise, and social networks, also emerges as a significant driver of GI performance. CEO duality can also influence a firm's Board Capital by ensuring a definitive decision on the firm's GI. Still, excessive CEO power is harmful in many ways and can lead to myopic financial objectives.

The second part is executive pay plans. Linking executive pay to ESG or innovation performance significantly enhances GI performance. In fact, managers are less risk-averse and more strategic in their decision-making when their executive pay plans are linked to ESG or innovation metrics. This can be justified by agency theory, which ensures that managers' incentives align with shareholders' objectives. In fact, empirical analysis of data on CEO pay

and expenditure mix by Wu et al. (2022) shows that companies whose CEOs' executive pay plans were linked to performance (performance-based incentive plans) invested more in eco-patents and sustainable R&D projects.

6.2. ESG performance, disclosure, and green innovation

Lu et al. (2024) highlight the complexity introduced by incorporating ESG into the governance process. They explain that a good ESG record can make it easier for companies to access the capital markets and create an aura that fosters innovation. Investors are increasingly channeling funds to companies that incorporate ESG into their business strategies, as they have greater confidence in their ability to address environmental challenges and capitalize on opportunities associated with the low-carbon transition (Yang et al., 2024).

By using ESG disclosure and assurance, the organization may have stronger effects on stakeholders due to greater information parity and its commitment to sustainable development goals. Based on the theory of signaling, clear and precise disclosures about green technology projects could minimize doubts about greenwashing, which has significant effects on investors' decisions. The disclosure can thus be an expensive signal that differentiates genuine commitment and honorable intention from the mere rhetoric of organizations, in a manner specified by signaling theory (Mohy-ud-Din, 2024). On the other hand, according to institutional theory, ESG disclosure is enforced as a means of complying with more stringent rules and meeting the increasing number of standards associated with societal norms.

Recent insights indicate that ESG disclosure not only enhances external perceptions but also strengthens internal systems. Companies that disclose fully in one or more ESG categories must monitor specific environmental indicators, embed sustainability principles, such as sustainable supply chains, into their business strategies, and build internal controls. Disclosure is therefore a communications and governance tool, used to both convey messages and to institutionalize competencies (Mohy-ud-Din, 2024).

6.3. Geographic, industrial, and institutional contexts

The majority of existing studies are from China, accounting for more than half of the samples in the literature (Fei et al., 2022). That is not surprising given China's focus on green finance and detailed disclosure for individual firms. These concepts may be valid in the Chinese context, but there is also a need to reflect on their applicability in other contexts. For example, successful forms of governance in the Chinese context (e.g., the monitoring function of the state over state-owned enterprises) may not be transposed automatically to a market-economy context, calling for international cross-country comparisons.

Board independence, stakeholder engagement, and ESG are the drivers of GI in advanced economies. In contrast, governmental participation, ownership concentration, and informal institutions are the key drivers of GI in emerging economies (Fei et al., 2022). Interestingly enough, the effectiveness of government in advanced economies is also driven by the underlying institutional structure. On the one hand, institutions can act as a safeguard against merely symbolic compliance and thus assure an effective implementation of green institutional practices. On the other hand, in cases of a poor institutional framework,

compliance may be merely formal, with green practices being merely superficial (Wu et al., 2022).

The industry-level analysis also points out significant differences. As mentioned, sectors with high potential for positive impact, such as energy and manufacturing, are generally more influenced by governance measures due to their high visibility. Other sectors such as health, agriculture, and digital services remain relatively under-researched, despite their growing importance. The digital economy is rapidly advancing toward eco-efficiency and carbon reduction, yet the effectiveness of governance-inspired GI measures in this context remains largely unexplored.

In addition, institutional factors, including law enforcement, social norms, and stakeholders' expectations, have a significant impact on governance outcomes. For example, Yang et al. (2024) found that companies located in countries with stricter environmental regulations and ESG disclosure requirements have better GI scores. Institutional voids in developing countries, however, often undermine good governance practices. Governance is a practice that is embedded within institutions.

6.4. Methodological contributions and gaps

New methods, such as machine learning-based text mining of ESG reports, increase measurement precision. Yet, the inherent lack of precision means that there are always several firms for which a determination cannot be made because the differences are qualitative (Lu et al., 2024). The dearth of case studies, ethnographies, and process-tracing methodologies also creates a substantial gap in understanding how the principles of corporate governance are actually implemented by managers. Further, more qualitative research into boards of directors' workings, executives' cognitions, and firm-level culture could yield more profound insights into how governance innovation relationships work.

Similar limitations also affect longitudinal studies, although, arguably, the GI effects are more frequently developed over time. Multi-level models combining firm-level governance with country-level institutional variables are not yet common. Some methodological innovations and more interdisciplinary approaches are therefore needed.

6.5. Theoretical integration

The study is based on principles of signaling theory, agency theory, stakeholder theory, RBV, and institutional theory. While each of the mentioned management theories individually provides a wealth of information, applying each theory solely to a business is a very reductionist way of looking at things.

Recent literature suggests the use of dynamic capabilities theory, which highlights organizations' reconfiguration of resources during periods of uncertainty. The upper echelons theory may provide insights into how top executives' personal characteristics affect their propensity to adopt green innovation. Integrating signaling theory with the resource-based view elucidates the dual nature of ESG disclosure, both signaling trustworthiness and bolstering internal capabilities (Mohy-ud-Din, 2024; Yang et al., 2024).

6.6. Practical implications

The findings offer practical implications for managers, policymakers, and accounting professionals. Managers should strengthen governance mechanisms and integrate environmental objectives into strategic decision-making to support green innovation. Policymakers can encourage green innovation through effective ESG disclosure requirements, environmental regulations, and green investment incentives. Accounting professionals can contribute by improving the quality, transparency, and consistency of ESG and environmental reporting, thereby supporting informed decision-making and stakeholder trust.

7. Conclusion

The study investigates the impact of corporate governance on firms' green innovation performance. The investigation is based on 213 publications from 2015 to 2025. This brings together diverse theoretical lenses, geographic contexts, and methodological approaches. Strategic and institutional contexts within which organizations pursue sustainable innovation are shaped, in part, by governance mechanisms, including board independence, gender diversity, ownership structure, CEO power, and ESG disclosure. The data demonstrate that governance is not only about rule compliance; it is an instrument that shapes actions, possibilities, and relationships among stakeholders so they can pursue both environmental and business outcomes.

It is necessary to explore the relationship between governance and green innovation using multiple theoretical perspectives. This study is based on an integrated framework that synthesizes the views of signaling theory, agency theory, stakeholder theory, RBV, and institutional theory to theoretically analyze the relationship between corporate governance and green innovation. Signaling theory further explains how governance practices and ESG disclosures communicate firms' commitment to sustainability and reduce information asymmetry among stakeholders. Agency theory holds that the long-term value created by the board of directors for enterprises comes from three aspects: independence, supervision, and incentives. Stakeholder theory focuses on the impact of various stakeholders on enterprises' governance and innovation activities from the perspectives of investors, regulatory bodies, customers, and society. From the perspectives of RBV and dynamic capacity, governance is considered a strategic resource that helps enterprises acquire knowledge and implement innovation in a volatile and uncertain environment. Institutional theory holds that governance is part of the macro-cultural and institutional environment.

The reviewed studies suggest that firms with stronger governance mechanisms tend to be more successful in green innovation. Studies examining women and experienced board members generally report a positive association with green innovation activities. Diverse boards have different skill sets and perspectives and are therefore more adept at managing a wide range of tasks. This includes dealing with complex social and environmental issues. High environmental knowledge on the board, as well as high levels of board independence and the board's ability to make sustainability a key strategic component, are other important governance mechanisms that enhance the relationship between green innovation and long-

term firm performance. It shows that if the objective of large minority shareholders is short-term profit, it may lead to the blocking of innovation.

On the other hand, if large minority shareholders have a long-term perspective, care about sustainability, and are aware of the benefits that long-term shareholders gain from investing in green R&D, the desired link between green innovation and long-term firm performance is established (Shi et al., 2023). Finally, finding the appropriate balance of power between the CEO and the board of directors is crucial. Although a strong CEO can facilitate the process of greening, giving the CEO too much power can stifle the process, as it can deter certain actions that are seen as unfamiliar or unconventional. Therefore, it is the combination of governance practices that must be taken into account when assessing the impact of governance on environmental innovation.

As an increasing number of organizations adopt and apply environmental, social and governance (ESG) principles to their governance, more sustainable forms of innovation are likely to be supported. Improved ESG performance and disclosure can help organizations signal that they are more open, socially responsible, and growth-oriented. The reviewed literature suggests that organizations with higher ESG ratings tend to demonstrate greater innovation capacity, attract more long-term-oriented shareholders, and have better access to green finance. Disclosure of ESG factors, in particular, appears to enhance companies' reputations, equalize access to information for all stakeholders, and allow stakeholders to hold management to account.

In terms of methodology, the review reveals a significant increase in quantitative analysis, but with limited diversity and depth. A large number of studies use econometric techniques such as panel regressions, the Generalized Method of Moments (GMM), and quasi-experimental methods to test the causal relationship between governance and firms' environmental innovation performance. Qualitative and mixed-methods research, however, remains insufficiently developed, especially in relation to the analysis of the behavioral and cognitive aspects of governance. Few studies investigate the effects of boardroom politics, managers' skills, and organizational culture on the green innovation process. Similarly, works analyzing the temporal evolution of governance-driven environmental innovation performance are rare. However, this requires a long-term perspective that aligns with the long gestation period of sustainable investments. Furthermore, the preponderance of quantitative analyses at the firm level leads to the neglect of multi-level interactions between firm-level governance and national-level institutions, which further weakens the capacity to explain firms' environmental innovation performance. In summary, although empirical studies on the relationship between corporate governance and environmental innovation have reached a statistically sound level, they lack sufficient interpretative power to fully understand the underlying mechanisms.

Overall, this review concludes that corporate governance serves as both a control and capability mechanism in driving green innovation. It aligns managerial incentives, mobilizes resources, and legitimizes sustainability-oriented strategies within firms and across markets. Governance effectiveness, however, is not uniform; it is shaped by contextual contingencies such as institutional quality, regulatory strictness, cultural norms, and industry dynamics. The

synthesis affirms that governance should be conceptualized not as a static compliance structure but as a dynamic, multi-layered system that integrates strategic, ethical, and institutional functions. In this regard, effective governance represents a cornerstone of sustainable competitiveness and an essential pathway through which firms contribute to global sustainability transitions. Firms that view governance as a strategic enabler rather than a procedural necessity are more likely to achieve enduring innovation capacity, environmental responsibility, and long-term value creation.

8. Future research agendas

It has been observed that the literature on green innovation and corporate governance has reached a certain level of maturity, yet many areas still need further research. Incorporating dynamic capabilities, signaling, and upper echelons theories should be considered to advance understanding of the role of governance structures in building cultures that are dynamic, adaptable, and innovation-focused.

Second, comparative and cross-country analysis is needed. The vast majority of the current evidence base is drawn from a small number of case studies in China and a handful of other emerging markets. Further research is urgently needed in a wider range of governance and institutional settings, including in developing countries in Africa, Latin America and Europe. The current focus is also heavily skewed towards a small number of high-technology sectors. Other priority areas for further research that are currently poorly understood include agriculture, healthcare and other large and increasingly important service-oriented sectors, where the potential impact of new digital models on employment, incomes, and living standards could be substantial.

Third, methodological diversification is necessary. Scholars should complement econometric modeling with qualitative case studies, mixed-method research, and longitudinal designs. These approaches can uncover the behavioral and cognitive dimensions of governance, such as executive decision-making, boardroom dynamics, and organizational learning. Multi-level modeling that integrates firm-level governance with national institutional indicators would provide richer, context-sensitive insights.

Finally, the intersection of digital governance and sustainability represents a promising frontier. The rise of AI, big data, and blockchain technologies opens new opportunities to enhance transparency, monitor ESG commitments, and integrate real-time sustainability metrics into governance processes. Investigating how digitalization reshapes governance structures and accelerates green innovation could significantly advance both theory and practice.

The future of the discipline will undoubtedly depend on addressing these deficiencies and garnering increased focus from interdisciplinary research, contextualized data collection, and varied data analysis. By combining the structural, behavioral, and technological aspects, academics may more effectively analyze how governance systems can foster sustainable innovation, facilitating the global economy's shift towards low-carbon, resilient, and equitable development.

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