Financial Economics Insights

Review

Green Finance Reform and Corporate ESG Performance: Mechanisms, Empirical Evidence, and Future Research Directions

Yixiao Yin [1,*]

[1] University of Shanghai for Science and Technology, Shanghai, China
* Correspondence: Yixiao Yin, University of Shanghai for Science and Technology, Shanghai, China

Abstract: Green finance reform represents a crucial institutional mechanism designed to channel financial resources toward supporting the transition to a green economy and ensuring long-term sustainable development. Concurrently, corporate Environmental, Social, and Governance (ESG) performance serves as a fundamental indicator of a firm's operational sustainability and resilience in the contemporary business landscape. This paper provides a comprehensive review of the existing literature concerning the intersection of green finance reform and corporate ESG performance, subsequently developing a robust analytical framework that systematically links policy instruments, corporate strategic responses, and ultimate ESG outcomes. A critical synthesis of previous empirical studies reveals five primary channels through which green finance reform advances corporate ESG initiatives: alleviating financing constraints, stimulating green technological innovation, reinforcing institutional discipline, establishing robust corporate reputation systems, and integrating digital finance solutions. Despite these advancements, current scholarship exhibits several notable limitations, including the persistent irregularity of ESG measurement indicators, insufficient analytical differentiation among various policy instruments, incomplete identification of underlying micro-level transmission mechanisms, inadequate scholarly attention to the phenomenon of ESG greenwashing, and a lack of comprehensive international comparative analyses. To address these critical gaps, future research trajectories should prioritize the rigorous examination of diverse ESG indicators and their long-term dynamic effects on corporate value. Furthermore, subsequent investigations must explore firm-level heterogeneity, the transformative role of emerging digital technologies, and the implications of symbolic ESG disclosure practices to foster a more sustainable global economic paradigm.

Keywords: green finance; esg performance; sustainable development; green innovation; digital finance; corporate governance

Received: 05 April 2026
Revised: 25 May 2026
Accepted: 07 June 2026
Published: 12 June 2026

1. Introduction

With changes in climate and resources, increasing environmental risks have altered global economic growth patterns and expanded the role of the financial system from merely distributing capital to promoting sustainable development. Green finance directs funds towards the construction of low-carbon and environmentally friendly facilities, ecological protection, and cleaner energy production through mechanisms such as green credit, bonds, funds, carbon finance, and policies. It has gradually become an institutional tool to promote industrial restructuring and assist financial institutions in better assessing environmental risks for companies [1].

Firms are fundamental units of pollution emissions, technological innovation, employment creation, and governance practices. Therefore, evaluating whether green finance initiatives can enhance corporate ESG performance requires examining the micro-level effectiveness of these policies. ESG for enterprises encompasses three dimensions: Environment, Society, and Governance [2]. It reflects a company's approach to

environmental protection, employee rights, supply chain responsibility, community relations, and business ethics, while also addressing governance structures, internal controls, information disclosure, and risk management.

Previous research has explored green finance, corporate ESG, green innovation, financing challenges, and policy outcomes [3]. However, these studies have often been fragmented. Research on green finance has predominantly focused on macro-level outcomes such as environmental performance, carbon reduction, and green technology innovation, while comprehensive assessments of corporate ESG performance remain limited. Additionally, although various studies have collected extensive data on factors influencing ESG and their economic impacts, the effects of external institutional changes in green finance on corporate ESG behavior have not been thoroughly investigated.

This paper examines the relationship between green finance initiatives and the ESG performance of enterprises. Green finance and ESG studies should not be considered in isolation; their interconnections are also analyzed here. Specifically, this study explores how financial policy tools can drive the sustainable development of enterprises by influencing capital allocation, risk pricing, innovation incentives, institutional frameworks, market signals, digital finance, and other factors [4]. The paper proposes a framework linking policy tools to corporate behavior and corresponding ESG outcomes, presenting empirical data, analytical methods, limitations, and directions for future research.

2. Conceptual Definitions and Theoretical Foundations

2.1. Green Finance and Green Finance Reform

The first discussions on green finance can be traced back to environmental finance and sustainable finance. Scholars have argued that financial activities should aim to create economic value while considering ecological protection, resource efficiency, environmental risk, and other factors. Research has also explored how the financial system can be leveraged for corporate social responsibility, encouraging businesses to prioritize environmental and societal well-being [5, 6]. With the increasing risks associated with climate change, studies on green finance and the transition to sustainability have expanded, focusing on how financial systems can support sustainable development and facilitate this transition. Green finance has evolved from a set of rules to a comprehensive institutional framework encompassing green credit, green bonds, green funds, carbon trading, fiscal coordination, and more.

The development of green finance does not align entirely with the broader concept of green finance and is characterized by policy experimentation, institutional adjustments, and localized applications. Since 2017, initiatives have been undertaken to establish Green Finance Pilot Zones in China. These pilot areas aim to explore standards for green finance, including products, information sharing, and risk management, at the regional level [7]. This approach enables the study of the impact of green finance policies on enterprises through controlled experiments. Green finance initiatives influence the availability and cost of corporate funding and, through mechanisms such as financial oversight, environmental information disclosure, green credit evaluation, and market reputation, may also shape corporate decision-making.

2.2. Corporate ESG Performance

The three parts of ESG are Environment, Society, and Governance. The environmental aspect is concerned with energy use and pollution emission, carbon management, resources, green technology, and related areas [8]. The social aspect includes the rights of workers, responsibility in the supply chain, protection of consumers, and public welfare. Governance refers to the structure of the board, shareholder rights, internal controls, and information disclosure. ESG indicators are utilized to evaluate a company's capacity for sustainable development and its interactions with external stakeholders.

Third-party rating agencies, corporate disclosure reports, and organized databases are commonly used to evaluate a company's ESG performance. Many studies have analyzed ESG ratings provided by organizations such as Huazheng, SynTao Green Finance, Wind, MSCI, and Bloomberg. The design of indices, weighting methods, industry-specific adjustments, and data sources differ across rating agencies. Consequently, the ESG scores of the same company may vary across different rating systems. As a result, research on green finance and corporate ESG performance should avoid reliance on a single, fixed, and comprehensive ESG index [9]. The issue of measurement heterogeneity remains a challenge in this field.

2.3. Theoretical Foundations

Many studies have shown that the development of green finance affects the ESG performance of enterprises. The theory of financing limitations suggests that due to information asymmetry, financial institutions may raise interest rates and reduce credit supply as a result of higher risk. Consequently, enterprises may face difficulties in obtaining external funds; small and medium-sized private enterprises, innovation-oriented companies, and others are particularly affected. As ESG investment generally requires a relatively large amount of initial funds, has a longer payback period, and yields unstable short-term profits, financing limitations may be one of the reasons why companies do not invest in environmental protection, employee welfare, governance structure, and information disclosure. Green financial initiatives can improve the detection of environmental risks, implement green credit ratings, and flexibly adjust the allocation of funds, among other measures.

Schumpeter's theory of innovation and studies on invention and knowledge spillovers are also foundational. In the future, new ideas in technology and management will be essential. Through mechanisms such as risk compensation, green research and development loans, green industrial funds, and patent pledge financing, green finance can reduce the cost and risk associated with green technology innovation. Stakeholder theories also provide a rationale for ESG. Enterprises are now expected to respond to investors, regulators, consumers, employees, suppliers, and others. Green financial initiatives have drawn greater attention from capital markets and financial institutions toward environmental and social responsibility, thereby enhancing the ESG performance of enterprises [10].

Institutional theory and signaling theory are also relevant [11]. According to signaling theory, observable signals can reduce information asymmetry and reveal the quality of an entrepreneur. Green finance policies have recently emphasized the consideration of environmental risks, information disclosure, and other factors in fund allocation, creating external institutional pressures on enterprises. At the same time, companies that secure green finance support or publish high-quality ESG reports are often perceived by capital markets as low-risk, well-governed entities with strong long-term development potential. This perception may encourage increased ESG investment.

3. Research Progress on Green Finance Reform

3.1. Studies on Green Finance Policy Instruments

The policy tools of green finance are a typical starting point in the literature. Green credit is one of the oldest and most commonly used instruments in the system of green finance. Environmental risks and a company's green performance are assessed to determine credit allocation, interest rates, and other financial terms. Research has highlighted that financial institutions can influence the environmental behavior of enterprises through mechanisms such as risk pricing and green loans. Green bonds, as instruments in the capital market, are utilized to fund long-term green projects, including clean energy initiatives and pollution control efforts. Studies on green finance for green buildings have demonstrated that sector-specific financial instruments can support the sustainable and low-carbon development of green construction.

Green funds, carbon finance, and transition finance are also integral components of green finance. Research has emphasized that green finance tools play a role in advancing sustainable development goals and enhancing energy security. Studies examining the relationship between green finance and carbon reduction at cross-country and macro levels have concluded that green finance can improve the environmental performance of enterprises by reducing capital costs, facilitating the adoption of clean technology, and optimizing energy structures [12].

3.2. Studies on Green Finance Reform and Innovation Pilot Zones

China's Green Finance Reform and Innovation Pilot Zones serve as valuable case studies for analyzing the impact of green finance policies. Establishing a pilot area necessitates collaboration among local governments, financial institutions, industries, and markets. These zones regularly release databases of green projects, green credit assessments, environmental information exchanges, innovative green financial products, and risk-sharing mechanisms. Rather than being a single entity, the Pilot Zone represents a system of interconnected institutions [13]. Its influence extends beyond increasing capital availability to reshaping regional governance frameworks and corporate behavioral norms.

Previous research has predominantly utilized methods such as the difference-in-differences model, event-study approach, and spatial econometric analysis to evaluate the economic effects of green finance pilot zones [14]. These studies aim to foster green technology development, reduce pollution, enhance enterprise capital efficiency, and alleviate financing challenges. For instance, research has demonstrated that green finance policies encourage enterprises to adopt measures that promote green value creation. Such policies have been shown to influence corporate strategies while driving advancements in technology and governance at the micro level.

3.3. Environmental, Economic, and Social Effects of Green Finance

At the macro level, green finance has increasingly been applied to both economic development and environmental protection. Studies based on OECD countries indicate that green finance and innovation can jointly support environmental improvement. Research at the global level has further shown that green finance contributes to sustainable development through resource allocation and industrial upgrading. Other studies have suggested that green finance can narrow regional development gaps by expanding inclusive finance and strengthening ecological compensation mechanisms [15].

At the micro level, the effects of green finance on corporate behaviour are more complex. Green finance can provide funding support for environmentally friendly firms while simultaneously increasing the financing costs of highly polluting industries, thereby encouraging green transformation. From the perspective of the circular economy, green finance can improve resource-use efficiency through resource reallocation and the internalisation of pollution costs [16]. It can also guide capital flows and technological diffusion toward the development of renewable energy and has been linked to improvements in energy efficiency and renewable energy expansion. Therefore, the role of green finance extends beyond the achievement of environmental objectives and may also influence the ESG performance of enterprises through investment in research and development, new technologies, and related activities.

4. Research Progress on Corporate ESG Performance

4.1. Determinants of Corporate ESG Performance

ESG performance of enterprises is influenced by the environment of institutions, market demands, and internal governance [17]. External factors include the environment and policies of the industry, development of finance, the digital economy, investor attention, etc. Pollman discussed the formation and meaning of ESG and how ESG affects corporate strategy and operations. Rau and Yu reviewed ESG from the perspectives of

investors, institutions, and enterprises and suggested that ESG has begun to influence corporate behavior at the level of capital markets.

Digital technology is now one of the subjects of recent ESG studies [2]. Li and Zhu found that there is a positive correlation between the level of digitalization in a region and corporate ESG performance. Mu and Ren studied how to help enterprises better carry out ESG work in the digital economy and believed that digital finance could reduce barriers to green development by easing financing, improving environmental risk pricing, etc. Based on the above research, it can be seen that digital infrastructure and financial technology have modified the external environment of corporate ESG governance.

The following factors of a company's internal governance, management behavior, board composition, ownership structure, internal control, and human resources all influence its ESG performance. He and others took Chinese listed companies as the object of their research to find that strong internal governance quality is necessary for good ESG performance. Shen and others studied ESG practice and research in China, and it was found that more research is needed on corporate governance integration under the institutional environment of China.

4.2. Economic Consequences of Corporate ESG Performance

Many studies have examined whether the ESG performance of a company will affect its values and financial indicators. Research has explored the business value of ESG and proposed that it can improve the long-term operating level of a company through changes in response to demands from all sectors of society [18]. Other studies have analyzed how the ESG performance of enterprises affects their financial results, suggesting that good environmental governance can boost economic growth. Additional investigations into information technology companies have shown that ESG factors are also related to the values of high-tech industries.

The linkage between ESG and firm value is not a simple function. Some researchers have pointed out that there is uncertainty in ESG ratings for sustainable investment. Comparative analyses using factor models have demonstrated that ESG leaders and laggards face different risks and allocate resources differently [19]. Further findings indicate that ESG risks can affect the value of a company due to environmental and social externalities. Therefore, good ESG performance may increase the value of a company's shares to some extent, but the scale of this effect varies with the specific rating system and other factors.

4.3. ESG Rating Divergence and Greenwashing

Rating divergence is one of the main challenges in ESG research. The indicators, data sources, industry adjustments, and weights of rating agencies vary significantly [20]. As a result, the same company may receive different ESG scores across various databases, making empirical results difficult to compare and potentially influencing enterprise investment decisions. Studies on improving ESG scores and sustainability concepts also highlight that the rating system is shaped by how sustainability dimensions are translated into measurable indicators. In analyzing ESG performance within green finance, relying solely on the overall ESG score may obscure the distinctions among its three components: environmental, social, and governance.

Another issue is ESG greenwashing. With the growing demand for green finance and ESG, some enterprises may selectively disclose information or engage in "greenwashing" to gain support from green finance systems, often without achieving meaningful environmental improvements. Research has explored how ESG-related crises impact enterprise values, revealing that strong governance can mitigate such damage [21]. Moving forward, it will be essential to distinguish between genuine advancements in ESG performance and actions driven solely by disclosure requirements. This differentiation will help ensure that ESG report statements or higher ratings are not conflated with actual progress in corporate social responsibility.

5. Mechanisms Linking Green Finance Reform and Corporate ESG Performance

5.1. Financing Constraint Alleviation

Reducing barriers to accessing financing is a primary method through which green finance initiatives enhance the ESG performance of enterprises. Due to challenges such as information asymmetry and difficulties in risk assessment, certain enterprises, particularly private companies, small and medium-sized enterprises, and innovation-driven firms, often struggle to secure stable and cost-effective external funding. ESG investments, characterized by their long-term focus and modest returns, are less suited for generating quick profits. Consequently, companies may face limitations in acquiring green technologies, improving employee welfare, or strengthening governance systems.

Green finance initiatives enhance funding opportunities for environmentally responsible enterprises through mechanisms such as environmental credit ratings, green project certifications, interest subsidies for environmentally focused financing, green bond issuance, and risk compensation frameworks. By offering lower interest rates and increased funding to companies with strong environmental performance, financial institutions incentivize these enterprises to invest more in ESG-related activities. Conversely, companies with high pollution levels or significant environmental risks encounter stricter financial conditions, encouraging them to adopt greener practices and reduce their environmental impact.

5.2. Green Innovation Incentives

Green innovation is another approach. Based on the theory of innovation, it drives enterprise development and comprehensive economic growth. Research and development in green technology require significant capital and involve considerable risks, yet the outcomes have been promising. It is challenging for companies to pursue green innovation solely through internal funding. Mechanisms such as green industrial funds, technology loans, intellectual property pledge financing, risk mitigation measures, and government-supported funding can help reduce the costs and risks associated with research and development.

The enhancement of ESG performance through green innovation is most evident in environmental aspects, while also positively influencing social and governance dimensions [22]. To minimize pollution and comply with environmental standards, technologies such as clean-production methods, energy-efficient equipment, green processes, and low-carbon solutions are employed. Additionally, innovation processes foster improved research management, intellectual property oversight, and cross-departmental collaboration, strengthening governance. The development of green products and services boosts consumer confidence and reinforces the company's image of social responsibility.

5.3. Institutional Pressure and Governance Improvement

The transformation of green finance represents a shift in financing policy and institutional governance. When financial institutions provide credit, environmental factors in corporate operations are incorporated into risk evaluations, potentially influencing the approval process or the terms of financing. Consequently, institutional pressures encourage companies to enhance their environmental management systems, improve transparency in information disclosure, establish ESG committees or sustainability offices, and integrate environmental risk management into board governance and internal controls.

Institutional pressures also alter how companies perceive long-term risks. Previously, firms may have viewed environmental investments solely as costs [23]. However, with the evolution of green finance, environmental risks are increasingly linked to challenges such as restricted funding access and elevated capital costs. To ensure a steady flow of financial resources and maintain a positive reputation in capital markets, companies are compelled to strengthen governance frameworks and enhance information disclosure, thereby improving their ESG performance.

5.4. Reputation Incentives and Market Signaling

The advancement of green finance will also influence the ESG performance of listed companies through reputation and market signals. Information asymmetry arises when the quality of a product cannot be directly observed, prompting producers to issue alternative signals. A company that secures green loans, issues green bonds, is included in the green project database, or receives third-party green certification may demonstrate its capability to operate in an environmentally sustainable manner and maintain a robust governance framework.

This can create a positive feedback loop through the signaling effect. Strong ESG performance can enable a company to secure favorable terms for green loans, reducing capital costs and enhancing its public image, thereby attracting more ESG-focused investments. However, the signaling effect may weaken if companies exploit ESG labels to raise funds and improve their image without implementing substantive changes. Consequently, the reputation mechanism must be evaluated alongside the potential risks of ESG greenwashing.

5.5. Digital Finance Empowerment

The new technological environment of digital finance has transformed the impact of Green Finance initiatives on ESG performance [14]. Financial technology can be utilized to gather environmental data and other information related to corporate credit, green projects, and more. Banks can leverage big data, artificial intelligence, remote sensing, text analysis, and similar tools to identify environmental risks, green patents, ESG disclosure quality, and supply chain connections, thereby reducing information asymmetry in green finance.

Digital finance is also being applied to expand the reach of green financial services [8]. Small and medium-sized enterprises and private enterprises, which traditionally face challenges in accessing credit due to insufficient collateral and limited information transparency, can benefit from digital finance. It facilitates access to credit through online financial services and enhanced credit information. Research has shown that digital finance can support enterprises in achieving strong ESG performance by providing them with increased funding and cost-effective credit for environmentally sustainable development. Moving forward, greater emphasis should be placed on integrating digital technology with green finance policies (As shown in Table 1).

Table 1. Main Mechanisms through Which Green Finance Reform Affects Corporate ESG Performance

Mechanism	Main logic	Main ESG dimension	Potential risk
Financing constraint alleviation	Green credit, green bonds, subsidies, and risk compensation reduce financing costs for green firms.	Environmental, social, and governance	Policy arbitrage and resource misallocation
Green innovation incentives	Financial support and risk sharing promote green R&D, green patents, and clean production.	Mainly environmental, with spillovers to governance	Low conversion efficiency of innovation inputs

Institutional pressure	Environmental information, credit evaluation, and disclosure quality are embedded in financial resource allocation.	Environmental and governance	Excessive compliance costs
Reputation incentives	Green certification, green finance support, and ESG disclosure send sustainability signals to the market.	Social and governance	Selective disclosure and ESG greenwashing
Digital finance empowerment	Big data, AI, and online risk control improve green project identification and risk monitoring.	Environmental and governance	Data bias and algorithmic opacity

6. Empirical Evidence and Methodological Review

6.1. Policy Evaluation Studies

Difference-in-differences models are frequently employed in studies examining the development of green finance. Given the clear delineation of the implementation areas and timeline for the Green Finance Pilot Zones, researchers can designate firms within these zones as the treatment group and those outside as the control group. By analyzing changes before and after the policy's introduction, the average treatment effect of the policy can be identified, addressing some endogeneity concerns inherent in simple correlation analyses.

The Parallel Trend Assumption of the DID model is a critical requirement. The treatment and control groups must exhibit similar trends prior to the policy's implementation [24]. If the pilot areas already possess a robust green industrial foundation, advanced financial systems, and effective regulatory frameworks, the estimated policy impact may be overly optimistic. To enhance the robustness of research findings, various methods such as parallel trend tests, placebo tests, propensity score matching, alternative variable measurements, and sample exclusions have been applied in existing studies.

6.2. Mechanism Identification Studies

Mechanism identification is central to research on the development of green finance and corporate ESG performance. Historically, factors such as financial limitations, green innovation, investment efficiency, environmental information disclosure, and enterprise governance structures have been utilized as mediating variables in studies examining the impact of policies on ESG [5]. Financial limitations are typically represented by SA, KZ, or WW indices, while green innovation is often quantified through metrics such as the number of green patents, green invention patents, and R&D intensity.

The effectiveness of policies can be understood through mechanism analysis, though this approach has its limitations. Mediating variables may exhibit endogeneity, and the

mechanisms themselves are interconnected. For instance, alleviating financial pressures can simultaneously promote green innovation and information disclosure, while green innovation can enhance corporate reputation and governance. Future research will delve deeper into these interconnected mechanisms using dynamic mediation models, structural equation modeling, text analysis, and case studies.

6.3. Heterogeneity and Spatial Spillover Studies

The responses of enterprises to green finance initiatives vary greatly. Ownership type, pollution intensity, firm size, financial limitations, and regional financial development are all related to the effectiveness of such policies. Most studies have found that private enterprises, small-and-medium enterprises, financially weaker companies, and firms in high-polluting industries are more susceptible to the challenges posed by green finance measures. Therefore, these initiatives can be leveraged to expand credit for small and micro enterprises and address the issues of environmental risk and financial limitations within the structure of enterprises.

Spatial spillovers are also a focus in studies on green finance initiatives. Pilot policies may influence firms outside the pilot area through industrial chains, regional competition, cross-regional financial cooperation, and environmental governance coordination. A Spatial Econometric Model can analyze the geographical proximity of regions and the mechanisms of diffusion, though it is sensitive to the choice of the spatial weight matrix and regional division. Future research will explore the connections among industrial chains, financial networks, and policy diffusion mechanisms to better understand how green finance initiatives impact various sectors of society [25] (As shown in Table 2).

Table 2. Common Methods in Studies on Green Finance Reform and ESG Performance

Method	Applicable question	Strength	Limitation
Difference-in-differences	Identifying the effect of green finance pilot policies	Suitable for quasi-natural experiments and stronger causal identification	Depends on the parallel trend assumption
PSM-DID	Reducing differences between treatment and control groups	Improves sample comparability	Results depend on matching variables
Event study	Observing dynamic changes before and after policy implementation	Identifies pre- and post-policy trends	Sensitive to event window selection
Mediation model	Testing channels such as financing constraints and innovation	Provides intuitive mechanism explanation	Limited causal chain identification
Spatial econometric model	Analyzing policy diffusion and regional spillovers	Useful for regional policy research	Spatial weight matrix affects results

Text analysis	Measuring ESG disclosure, digital transformation, and green narratives	Can process unstructured data	Dictionary construction and semantic recognition may contain errors

7. Research Limitations in the Existing Literature

First, ESG measurement remains inconsistent. Existing studies often directly use third-party ESG total scores, but rating agencies differ in their weights for environmental, social, and governance dimensions. Ignoring rating divergence may weaken the comparability of findings. Future research should use multi-source ESG data, dimensional indicators, and textual disclosure indicators for cross-validation.

Second, green finance policy instruments are not sufficiently differentiated. Some studies discuss green finance, green credit, green bonds, green finance pilot zones, and digital finance together, but different tools operate through different mechanisms. Green credit is mainly related to bank lending and risk pricing; green bonds are more closely related to capital market financing; pilot zones have a comprehensive institutional innovation attribute. Future research should distinguish policy tool types more carefully.

Third, micro-level mechanism identification requires further development. Existing literature focuses heavily on financing barriers and green innovation, but pays less attention to managerial cognition, board governance, supply chain pressure, customer demand, employee participation, and organizational culture. Whether green finance initiatives truly change corporate strategy rather than only financing structure remains an important question.

Fourth, ESG greenwashing has not received sufficient attention. Green finance initiatives may improve substantive ESG performance, but they may also encourage strategic disclosure and symbolic compliance. If researchers observe only ESG rating improvement, they may not be able to determine whether firms have truly reduced pollution, improved employee rights, or optimized governance. Future research should combine emissions data, environmental penalties, green patent quality, and ESG-related events to identify substantive improvement.

Fifth, international comparison and China-specific theoretical interpretation need to be strengthened. China's green finance initiatives are strongly characterized by government guidance and policy experimentation, while green finance in Europe and the United States relies more heavily on capital markets, institutional investors, and disclosure rules. The mechanisms through which green finance affects ESG may differ across institutional environments. Future research can strengthen cross-country comparison and refine the theoretical contribution of China's green finance practices.

8. Future Research Directions

First, future research will focus more on the dimensions of ESG analysis rather than total ESG score analysis. Green finance initiatives may have a relatively immediate impact on environmental factors, while their effects on social and governance aspects are likely to be influenced by institutional frameworks and evolving public opinion. Dimensional analysis can help identify the specific impacts of green finance policies.

Secondly, long-term considerations are essential. The effects of green finance initiatives may take time to materialize, as green innovation, governance improvements, and enhanced social responsibility typically require extended periods. Future studies will employ dynamic difference-in-differences models and event studies to analyze whether the effects are sustained, diminishing, or evolving over time.

Third, increasing the heterogeneity of firms is crucial. Various factors influence how different enterprises respond to green finance initiatives. Instead of focusing solely on

average policy effects, research can identify which companies adapt more effectively and which face greater challenges under the new policies.

Fourthly, greater attention should be directed toward the governance effects of digital technology in green finance. Technologies such as artificial intelligence, big data, satellite remote sensing, blockchain, and natural language processing are transforming the informational foundation of green finance [26, 27]. These advancements may enhance ESG disclosure quality, improve digital risk control, and reduce greenwashing, thereby promoting the availability of green credit for small and medium-sized enterprises.

Fifth, ESG greenwashing should be incorporated into the evaluation of green finance policies. Future assessments should move beyond rating improvements and focus on actual emission data, environmental fines, supply chain management practices, and ESG controversies [16]. By integrating genuine sustainable development metrics into the evaluation system, the true outcomes of green finance policies can be accurately determined.

9. Conclusion

The relationship between green finance policy adjustment and corporate ESG performance has become an important topic in sustainable finance, corporate governance, and green development. The preceding analysis indicates that changes in green finance influence enterprises through the allocation of financial resources, the pricing of environmental risks, incentives for green innovation, institutional constraints, market reputation, and digital financial technologies. Green finance policy adjustment can help more enterprises obtain financing and improve the construction of ESG management systems.

At the same time, important challenges remain in measurement, mechanism analysis, and causal identification in this field. Differences in ESG ratings, the diversity of policy instruments, the complexity of transmission channels, and the risk of greenwashing may all affect the validity of research conclusions. Future studies require more precise data and a clearer theoretical framework to better explain how changes in green finance contribute to substantive sustainable development. To support effective policy implementation, it is necessary to improve green finance standards, strengthen environmental information disclosure, and introduce third-party verification and digital regulatory systems, so that green finance can better support high-quality enterprise development and ESG governance.

References

1. S. Duchêne, "Review of handbook of green finance," 2020.
2. S. Zadek, "Financing a just transition," *Organization & Environment*, vol. 32, no. 1, pp. 18–25, 2019.
3. M. A. Khan, H. Riaz, M. Ahmed, and A. Saeed, "Does green finance really deliver what is expected? An empirical perspective," *Borsa Istanbul Review*, vol. 22, no. 3, pp. 586–593, 2022.
4. M. S. Meo and M. Z. Abd Karim, "The role of green finance in reducing CO2 emissions: An empirical analysis," *Borsa Istanbul Review*, vol. 22, no. 1, pp. 169–178, 2022.
5. K. J. Arrow, "Economic welfare and the allocation of resources for invention," in *Readings in Industrial Economics: Volume Two: Private Enterprise and State Intervention*, London: Macmillan Education UK, 1962, pp. 219–236.
6. B. Scholtens, "Finance as a Driver of Corporate Social Responsibility: Bert Scholtens," *Journal of Business Ethics*, vol. 68, no. 1, pp. 19–33, 2006.
7. E. Cowan, *Topical Issues in Environmental Finance*, Economy and Environment Program for Southeast Asia (EEPSEA), 1998, no. sp199801t2.
8. J. E. Stiglitz and A. Weiss, "Credit rationing in markets with imperfect information," *The American Economic Review*, vol. 71, no. 3, pp. 393–410, 1981.
9. P. K. Ozili, "Green finance research around the world: a review of literature," *International Journal of Green Economics*, vol. 16, no. 1, pp. 56–75, 2022.
10. M. Spence, "Job market signaling," in *Uncertainty in Economics*, Academic Press, 1978, pp. 281–306.
11. G. Desalegn and A. Tangl, "Enhancing green finance for inclusive green growth: A systematic approach," *Sustainability*, vol. 14, no. 12, p. 7416, 2022.

12. S. S. Alharbi, M. Al Mamun, S. Boubaker, and S. K. A. Rizvi, "Green finance and renewable energy: A worldwide evidence," *Energy Economics*, vol. 118, p. 106499, 2023.
13. K. H. Wang, Y. X. Zhao, C. F. Jiang, and Z. Z. Li, "Does green finance inspire sustainable development? Evidence from a global perspective," *Economic Analysis and Policy*, vol. 75, pp. 412–426, 2022.
14. B. Kumar, L. Kumar, A. Kumar, R. Kumari, U. Tagar, and C. Sassanelli, "Green finance in circular economy: a literature review," *Environment, Development and Sustainability*, vol. 26, no. 7, pp. 16419–16459, 2024.
15. E. Rasoulinezhad and F. Taghizadeh-Hesary, "Role of green finance in improving energy efficiency and renewable energy development," *Energy Efficiency*, vol. 15, no. 2, p. 14, 2022.
16. E. Pollman, "The making and meaning of ESG," *Harvard Business Law Review*, vol. 14, p. 403, 2024.
17. A. A. Egorova, S. V. Grishunin, and A. M. Karminsky, "The Impact of ESG factors on the performance of Information Technology Companies," *Procedia Computer Science*, vol. 199, pp. 339–345, 2022.
18. P. R. Rau and T. Yu, "A survey on ESG: investors, institutions and firms," *China Finance Review International*, vol. 14, no. 1, pp. 3–33, 2024.
19. L. Pérez, V. Hunt, H. Samandari, R. Nuttall, and K. Biniek, "Does ESG really matter—and why," *McKinsey Quarterly*, vol. 60, no. 1, p. 9p, 2022.
20. M. Umar and A. Safi, "Do green finance and innovation matter for environmental protection? A case of OECD economies," *Energy Economics*, vol. 119, p. 106560, 2023.
21. S. Chen, Y. Song, and P. Gao, "Environmental, social, and governance (ESG) performance and financial outcomes: Analyzing the impact of ESG on financial performance," *Journal of Environmental Management*, vol. 345, p. 118829, 2023.
22. H. Naffa and M. Fain, "A factor approach to the performance of ESG leaders and laggards," *Finance Research Letters*, vol. 44, p. 102073, 2022.
23. D. Avramov, S. Cheng, A. Lioui, and A. Tarelli, "Sustainable investing with ESG rating uncertainty," *Journal of Financial Economics*, vol. 145, no. 2, pp. 642–664, 2022.
24. G. Cohen, "The impact of ESG risks on corporate value," *Review of Quantitative Finance and Accounting*, vol. 60, no. 4, pp. 1451–1468, 2023.
25. A. A. Elamer and M. Boulhaga, "ESG controversies and corporate performance: The moderating effect of governance mechanisms and ESG practices," *Corporate Social Responsibility and Environmental Management*, vol. 31, no. 4, pp. 3312–3327, 2024.
26. A. Clément, É. Robinot, and L. Trespeuch, "Improving ESG scores with sustainability concepts," *Sustainability*, vol. 14, no. 20, p. 13154, 2022.
27. M. Asif, C. Searcy, and P. Castka, "ESG and Industry 5.0: The role of technologies in enhancing ESG disclosure," *Technological Forecasting and Social Change*, vol. 195, p. 122806, 2023.