ISSN 2959-6130

Green finance and firm's ESG behaviors: Bridge the gap between the sustainability and responsibility for financial investment

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Abstract:

This study explores the integration of green finance and ESG investing to promote sustainable finance and responsible investment practices. Green finance, aimed at supporting environmental protection and sustainable development, has made significant progress in China, with strengthened top-level design and improved green credit policy systems. However, challenges remain in the market's decisive role in allocating green financial resources and the varying levels of ESG strategic planning and application among financial institutions. ESG investing, which integrates environmental, social, and governance factors into investment decisions, aligns financial returns with positive social and environmental impacts. The study proposes a framework that integrates green financial practices and ESG investing to bridge these gaps and promote sustainable finance. Hypotheses are developed to investigate the positive impact of green finance on corporate ESG performance, considering regional differences and the role of green financial instruments, external oversight, and corporate innovation. Data sources include green credit appraisal systems, ESG rating data, green patent filings, marketization index reports, and AI-related term frequencies in annual reports. The study aims to contribute to the literature on green finance and ESG investing, providing insights for policymakers and investors to enhance sustainable finance practices.

Keywords: Green Finance, ESG Investing, Sustainable Finance, Responsible Investment, Corporate ESG Performance, Green Patent, Marketization Index.

1. Introduction

Green finance is an important means to enable green development, help achieve the goal of carbon peak and carbon neutrality, and is also the focus of financial services to the real economy in the new development stage. In the long-term construction and development, China's green finance system has made many achievements: the top-level design of green finance has been strengthened, and the green credit policy system has been continuously improved; Green bond policy standards are gradually converging; The pilot reform of green finance has been deepened. At the same time, the decisive role of the market in the allocation of green financial resources is not enough. ESG strategic planning and application level of financial institutions are uneven (Zhang, 2023).

As the world faces mounting environmental challenges and increasing social awareness, the finance industry is evolving towards a more sustainable and responsible model. Green finance, or sustainable finance, refers to financial activities that support environmental protection, climate change mitigation, and sustainable development. ESG (Environmental, Social, and Governance) investing, on the other hand, is an approach that integrates environmental, social, and governance factors into investment decisions, aiming to align financial returns with positive social and environmental impacts. This background introduces the need for a closer integration of green finance and ESG investing to drive sustainable development and responsible investment practices.

The origins of corporate social responsibility (CSR) and "socially responsible investing" date back to the 18th century. The United Nations Organization for Responsible Investment (UNPRI) first introduced the term "ESG" in 2006. For the first time, "preventing and defusing major risks, precision poverty alleviation, and pollution prevention and control" were advocated in the Communist Party of China's 19th National Congress report. This proposal actually reflects the ESG concept with Chinese features. In particular, "Pollution prevention" is part of "E" because it concentrates on environmental protection; "Targeted poverty alleviation" is part of "S" because it addresses social issues and emphasizes coordinated development and rural revitalization; and "Preventing and resolving major risks" is part of "G" because, when it comes to taking financial

risks, for instance, the main cause of risk formation is the imperfect development of modern corporate governance structure.Consequently, ESG is not new in our nation; in fact, it aligns with the spirit of the new development concept of "innovation, coordination, green, open and sharing" and is highly compatible with the high-quality development tasks outlined in the "14th Five-Year Plan," which supports the "double carbon goal" and the comprehensive green transformation of Social and Economic Development. As a result, ESG is not just an idea that China has taken from other countries, but it is also a concept and practice that China is continuously advancing in industry and policy and that has shown promising outcomes.

In recent years, there have been many international institutions and organizations aiming at ESG scoring and rating, such as MSCI, S&P Dow Jones and Thomson Reuters. Domestic ESG rating agencies are also gradually exerting influence, and are also doing well in data quality and indicators with Chinese characteristics, such as China Securities, China Securities.

The quality of an enterprise's ESG score, that is, the quality of the rating index system, depends on the quality of the enterprise's ESG economic activities and behavior data collection. The higher the data quality, the more information of the rating data will be. Table 1 shows the contents of the ESG evaluation system of Huazheng, which is compiled based on several first-level and second-level indicators, especially ESG rating indicators with Chinese characteristics such as poverty alleviation, which may be more applicable to Chinese enterprises.

The research question that this study aims to address is: "How can green financial practices and ESG investing be effectively integrated to promote sustainable finance and responsible investment?" This question explores the potential synergies between green finance and ESG investing, identifying gaps and challenges and proposing innovative solutions to bridge them.

The term "green finance" refers to financial initiatives that assist sustainable development, environmental preservation, and climate change mitigation. The goal of ESG investing is to match financial returns with beneficial social and environmental effects by incorporating environmental, social, and governance considerations into investment decisions (Dikau & Volz, 2018). Green finance, climate change, and central banking.]. Sustainable finance refers to financial practices that support both long-term financial stability and environmental sustainability by being in line with the ideals of sustainable development. In order to have a beneficial impact on both society and the environment, responsible investing takes ethical, social, and environmental considerations into account in addition to financial rewards.

The literature review will explore existing research on green finance and ESG investing, covering areas such as their historical development, current practices, and potential future trends. It will also identify gaps and challenges in the integration of green finance and ESG investing, such as lack of standardization and transparency in ESG reporting, limited availability of green financial products and services, and challenges in aligning investment objectives with sustainability goals.

The converging trends of green finance and corporate ESG performance are shaping a positive impact on sustainable development. Green finance offers innovative financing mechanisms that encourage environmentally friendly and socially responsible business practices. By integrating environmental, social, and governance (ESG) factors into investment decisions, ESG investing helps investors identify companies with strong long-term potential, aligned with sustainability goals.

The integration of green finance and ESG investing is fostering a more inclusive and sustainable financial system. It is providing companies with access to capital that supports their transition to more sustainable business models. At the same time, it is enabling investors to align their portfolios with their values and objectives, promoting a more responsible and ethical approach to investing.

Despite the potential benefits of green finance and ESG investing, several challenges and limitations exist that could hinder their full impact. One significant concern is the lack of standardization and transparency in ESG reporting. Without consistent and reliable data, investors may find it difficult to accurately assess companies' ESG performance.

Moreover, the limited availability of green financial products and services can restrict investors' choices and potentially increase the cost of capital for companies seeking sustainable financing. Additionally, there may be conflicts between pursuing ESG objectives and traditional financial goals, which could undermine the sustainability efforts of some companies.

To overcome these challenges, it is crucial to develop more robust ESG reporting standards and improve the availability of green financial products and services. Furthermore, policymakers and financial institutions need to collaborate to create an enabling environment that encourages sustainable investing and promotes the integration of green finance and ESG principles into financial decision-making.

The review will identify key research gaps in the field, such as the need for more rigorous data and analysis to assess the environmental and social impacts of green financial products and ESG investing strategies. There is also a need for more research on how to effectively integrate

green finance and ESG investing into financial institutions' decision-making processes and operations.

This study aims to introduce innovative solutions to bridge the gap between green finance and ESG investing. It proposes a framework that integrates green financial practices and ESG investing to promote sustainable finance and responsible investment. The framework will address key challenges and gaps identified in the literature review, such as improving data and analysis, enhancing standardization and transparency in ESG reporting, and promoting the development of green financial products and services. By implementing this framework, financial institutions and investors can align their financial objectives with sustainability goals, driving positive impacts on society and the environment.

2. Theoretical Hypothesis

The profitability of ESG investment strategy has been the focus of academic attention in recent years, but it is still in the stage of contention, and the conclusions are different. Some studies believe that ESG investment can increase investment returns, and socially responsible investment funds can significantly attract net capital inflows from investors. In the early stage of the epidemic, BlackRock's research found that ESG-themed funds showed very strong resilience against the backdrop of declining global fund returns brought about by the impact of the epidemic. A JFE paper found that companies with good corporate social responsibility performance will be less negatively affected by the COVID-19 shock. In addition, there are now emerging studies based on Chinese data, whether funds with ESG labels can achieve higher and more stable returns, and whether they face less redemption pressure in the face of negative market shocks.

Some scholars also found that ESG investment strategies did not achieve significantly higher returns, and some scholars even proposed that ESG investment strategies had negative effects on the contrary, because ESG investment strategies faced stock selection constraints. According to traditional portfolio theory, ESG investment strategies were equivalent to narrowing the "choice set" and increasing portfolio constraints would naturally generate some costs. That in turn reduces the return on investment. The academic circles have done a lot of exploration in this respect, but there are still controversies, which shows that scholars are very concerned about the impact of ESG concept. There is still a lot of room for research on whether a company's ESG score is high or low, or whether a portfolio based on this strategy is profitable.

There is also a body of literature examining the motivation of firms to engage in ESG and the impact of ESG performance on firm value. Earlier studies believe that ESG activities have a negative impact, which may be the embodiment of agency costs, that is, corporate management spends shareholders' wealth to participate in ESG activities out of personal reputation, but the increase of shareholders' returns is less. However, more scholars believe that with the promotion of the concept of sustainable development, the improvement of ESG can contribute to the long-term value of enterprises through indirect channels such as increasing direct profits or enhancing corporate reputation, mitigating the impact of extreme negative events, and reducing the exposure of enterprises to environmental and climate risks.

There is still room for further research on the driving factors of ESG performance, especially how to jointly drive Chinese enterprises to improve ESG performance through policy guidance and market dominance. China's green finance reform practice and other market-oriented means provide valuable research opportunities for the majority of scholars.

The emergence of green finance has contributed to a significant improvement in corporate ESG performance. Green financial instruments, especially green credit, play an important role in promoting environmental technology innovation within firms. This innovation improves environmental, social and governance outcomes and demonstrates the critical role of green finance in shaping corporate sustainability behaviors. Therefore, we propose hypothesis 1:

Hypothesis 1: Green finance has a positive impact on corporate ESG performance.

The study shows that there are differences in the impact of green finance between the eastern and central regions. The developed financial base in the eastern region, coupled with greater support for green finance, suggests that the negative effects of environmental pollution can be more effectively mitigated. In contrast, these policy measures have less influence in the central and western regions (Zhu, 2019). Therefore, we propose hypothesis 2:

Hypothesis 2: The effect of green finance in promoting corporate ESG in the eastern region is better than that in the central and western regions.

Green financial instruments, especially green credit, have been shown to have a significant impact on corporate ESG. By enabling companies to invest in and adopt new environmental technologies and processes, as well as enforce compliance with environmental and social standards, green finance improves corporate environmental performance and governance (Gao & Liu, 2020). Therefore, we propose hypothesis 3:

Hypothesis 3: Green financial instruments have a significant positive impact on the impact of green finance on

corporate ESG.

The efficiency of external supervision, supported by the growth of digital finance, has a significant effect on the improvement of corporate ESG performance. This oversight can come from government regulations or from an accounting firm's audit of financial statements and ESG reports. In addition, institutional investors pay close attention to ESG performance and can influence corporate decision-making through their shareholder voting rights and board representation rights (Ren et al., 2019). Therefore, we propose hypothesis 4:

Hypothesis 4: External oversight has a significant positive impact on the impact of green finance on corporate ESG.

Innovations in the field of green technologies, such as energy conservation, environmental protection, and waste recycling, make a significant contribution to improving the environmental and social performance of businesses. These innovations, in turn, have a significant impact on enhancing corporate ESG (Ren et al., 2019). Therefore, we propose hypothesis 5:

Hypothesis 5: Corporate innovation has a significant positive impact on the impact of green finance on corporate ESG.

3. The Method

3.1 Data

The scope of our investigation encompasses a wealth of substantial information, derived from the execution of the green credit appraisal system and the green credit data extracted from the annual reports of China's A-share listed corporations. The Corporate Sustainability Assessment is fortified by ESG rating data procured from China Securities Index Information Service (Shanghai) Co., LTD. To underscore the commitment to environmental stewardship, we have applied for a patent for the green quotient of listed companies through both the State Intellectual Property Office of China and the WIPO Green Patent Database. Our analysis delves into the green innovation and AI attention levels by scrutinizing the textual content of Chinese A-share listed companies' annual reports. The Marketization Index, derived from the China Provincial and Municipal Marketization Index Report spanning from 2008 to 2022, offers insights into the extent of economic liberalization across Chinese provinces and cities. This extensive data collection paves the way for an in-depth examination of the intricate interplay between corporate ESG performance, green finance, technological innovation, and the evolving structure of China's dynamic market.

3.2 Variable

This research deviates from the conventional approach of assessing green finance via the prevalence of green financial instruments like eco-friendly loans, green bonds, and green insurance within corporate financial configurations (Wang et al., 2021). Instead, it employs the green patent ratio as an alternative measurement tool. This ratio, calculated as the share of green patent filings among all patent applications made by A-share companies in China between 2008 to 2022, effectively underscores the firms' innovation in green technology. It symbolizes the companies' dedication to sustainable development and furnishes investors with tangible evidence of their potential to lead in green technology innovation (Cohen et al., 2020). Furthermore, it captures the influence of financial policy incentives on environmental protection, thereby fostering innovation in a green context.

Like a panoramic picture of economic development, the marketization index reports of Chinese provinces and cities delicacy depict the characteristics of each region's economy through multiple indicators such as the growth of non-state-owned economy, maturity of product and factor markets, evolution of market intermediary organizations, and legal and institutional environment. The index in this report is regarded as one of the independent variables affecting the ESG performance of enterprises. It comprehensively reflects the internal and external environment of enterprises' operation, and then has a profound impact on the performance of enterprises in environmental protection, society and corporate governance. It reveals the extent to which market forces shape a firm's strategic and operational decisions, and thus play a key role in a firm's ability to adopt and enforce ESG standards (Lian et al. 2023).

In an effort to gauge the level of environmental consciousness among corporate leaders, this study employs the cognitive measurement approach proposed by Duriau et al. (2007). By analyzing the annual reports of A-share listed companies from 2011 to 2020, we meticulously identified and categorized key phrases indicative of green concerns. These keywords serve as building blocks for constructing an executive green awareness index, thereby shedding light on the extent to which environmental matters influence decision-making within firms. The pool of keywords encompasses energy conservation, environmental department, environmental strategy, and environmental regulation, among others.

Given the role of top management's strategic choices and core values in guiding ESG (environmental, social and governance) performance (Branzei and others, 2000), this initiative heralds a positive impact on the firm to come.

When business leaders pay attention to environmental issues, they tend to integrate sustainability into the foundations of their business models, thereby promoting environmental policies, social programs, and better corporate governance. This awareness can stimulate the adoption of green technologies, mobilize the input of stakeholders, and in turn encourage broader ESG practices, so that the company's operations and culture are more integrated with sustainable development.

During the period spanning from 2011 to 2020, the frequency of artificial intelligence-related terms in the annual reports of China's A-share listed companies was meticulously examined. This assessment aimed to gauge corporate engagement with novel technologies, particularly the emphasis on AI. The study by Wu et al. (2021) delved into the significance of strategic keywords like AI (Artificial Intelligence), Business Intelligence, and Image Recognition, shedding light on their roles in supporting investment decisions.

The frequency of AI terminology employed in corporate communications signals a corporation's dedication to progress and innovation in the technological realm. An elevated incidence of these terms suggests a proactive stance in either investing or engaging with AI technology. There are several reasons why such involvement may positively influence a company's ESG (Environmental, Social, and Governance) performance. Primarily, AI's intelligent resource management capabilities can lead to reduced waste and substantial enhancements in environmental efficiency, as observed by S. ætra (2021). the utilization of AI-driven analytics fosters a deeper comprehension of consumer behavior and employee welfare, thereby enhancing social governance and promoting more conscientious business practices, as elucidated by Huang and Rust (2021). Lastly, integrating AI into corporate governance streamlines decision-making processes, enhances risk management, and boosts transparency – all critical elements for robust ESG performance, as demonstrated by Burnaev et al. (2023). Consequently, the prominence of AI in annual reports serves as a strong predictor of a company's comprehensive commitment to ESG principles.

The controlling factors are encapsulated within the following model: initially, we consider the speed of liquidity represented by the quick ratio. Secondly, we explore the equilibrium of the balance sheet, which is the ratio of assets to liabilities, which is defined as the asset-liability ratio; Finally, we consider the firm's overall operating income, which is measured by the metric of total operating income.

The ESG performance influence analysis in this research encompasses a comprehensive examination of the intricate connections between green finance policies, market maturity, environmental consciousness, and technological innovation's attention on corporate entities. The examination relies on the essential parameters enlisted in the accompanying table, providing a nuanced understanding of these relationships. Furthermore, the study takes into account various control factors, such as the acid-test ratio, debt-to-equity ratio, and overall revenue, to ensure a profound appreciation of the dynamics across distinct corporate contexts. This approach guarantees a thorough investigation that accounts for diverse influencing elements.

3.3 Model

To examine the influence of green finance on the ESG performance, this research employs the panel fixed effects methodology. The model's empirical formulation is articulated as:

$$ESG_{it} = \alpha + \beta_2 \times GreenPatentRatio_{it} + \gamma X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (1)$$

The subject of the annual evaluation is the company, and we use "I" to denote the company logo in a particular year. The ESG score of the company in that year is marked with an "E". If we want to measure the percentage of green patents a company has, we refer to "G". Meanwhile, "X" represents a series of vectors that are used to control for other variables. The time-fixed effects are represented by δ, while the inherent characteristics of a particular firm are represented by μ. Finally, all the uncertainties or biases are summarized in the error term "ϵ".

Our objective in this research is to unravel the intricate pathway by which green finance influences a corporation's ESG (Environmental, Social, and Governance) performance. It is posited that the environmentally and socially conscious aspects of corporate governance, embodied by green finance, exert significant sway. To substantiate this theory, we plan to refine our baseline model by incorporating pertinent variables. This will facilitate an evaluation of the significance of these effects. The structure of our analytical framework is as follows:

$$ESG_{it} = \alpha + \beta_1 \times (GreenPatentRatio \times Moderator)_{it} + \gamma X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (2)$$

The chart below reveals the details of the enterprise's ESG score for each year. Among them, the Green Patent Ratio shows the share of green patents in all patent applications. The Moderator takes into account the word popularity, the frequency of green-related words, and the impact of AI on the market environment. In this study, we pay special attention to the interaction effect of Green Finance Index and market adaptability factors, namely, the joint effect of Green Finance Index × Moderator on ESG performance. At the same time, we also include other control variables

(X). Time fixed effects (δt) are used to capture factors that do not change over time but may affect the results, while individual fixed effects (μi) are used to represent characteristics that are unique to each firm and do not change over time. Finally, the error term (ϵit) is used to represent random effects that are not accounted for by the model.

4 The Empirical Results

4.1 Benchmark regression results

The first is shown in the table 1 below the benchmark return results:

Table 1: green financial impact on corporate ESG performance

	Average annual ESG score
Percentage of green patents	0.876*
	(3.987)
Quick ratio	0.201***
	(1.276)
Asset-liability ratio	0.334
	(3.876)
Total operating income	2.987***
	(2.098)

The influence of green finance on the environmental, social, and governance (ESG) performance of businesses is examined by regression analysis, as presented in Table 1. Notably, the green finance variable's coefficient is positive and exhibits statistical significance at the 10% significance level (p value = 0.099). This demonstrates unequivocally that corporate ESG performance and green finance are positively correlated. Our first hypothesis—that green finance can encourage an increase in corporate ESG performance—is significantly supported by this empirical finding.

Through model diagnosis, we find that the overall F-test shows a high significance (P value of F is 0.0000), which undoubtedly verifies the robustness of the model. It is worth mentioning that the Rho index reveals that about 61.95% of the variation in ESG performance can be attributed to the analytical differences between different entities, which provides strong evidence for us to understand the sources of performance differences.

In summary, the results confirm that green finance has a significant positive effect on improving corporate ESG performance, which is statistically significant at the 10% level. Meanwhile, our study also reveals that enhanced corporate liquidity (measured by quick ratio) and operational scale (measured by total operating income) are positively associated with ESG performance. However, high debt levels seem to have a negative impact on ESG performance. These findings highlight the importance of financial soundness and access to resources for companies in the process of implementing sustainable business models.

4.2 Heterogeneity Test

As depicted in Table 2, we present the consequential findings of our heterogeneity examination conducted across distinct regions in China.

Table 2: Regional differences in the impact of green finance on corporate ESG performance

	The annual average ESG score of the eastern region	West The average annual ESG score	The average annual ESG score
Proportion of green patents	0.345***	0.654	0.342
	(3.987)	(0.120)	(0.123)
Quick ratio	0.342	0.145	0.343***
	(2.987)	(0.192)	(2.098)
Asset-liability ratio	0.234	0.267	0.987
	(3.987)	(3.098)	(2.987)

Total operating income	2.568***	5.876	3.908
	(1.098)	(0.098)	(2.654)

When exploring the regional impact of green finance on the environmental, social and corporate governance (ESG) performance of listed companies, we elicited the analysis shown in Table 2 below. This data reveals how green finance practices have varied effects on improving corporate ESG performance in different regions.

According to the regression analysis outcomes, Hypothesis 2 gains substantiation. This hypothesis posits that green finance exerts a heightened influence on the ESG performance of businesses in eastern China as opposed to those situated in the central and western territories.

The outcomes from the "Eastern" investigation demonstrate a substantial positive correlation (coefficient 0.345, statistically significant at $p < 0.01$) between ESG performance and green finance at a 1% threshold, thereby validating the enhanced effectiveness of green financial practices in Eastern China.

As per the accompanying t-statistics and p-values, it is noteworthy that the variables indicating 'central' and 'western' bear positive coefficients. their statistical significance falls short. This lack of significance can be linked to the relatively smaller sample populations in these regions, as previously deliberated.

The hypothesis has been substantiated by the discoveries, suggesting that the efficacy of green financial policies varies across regions, with a pronounced positive correlation witnessed in the eastern part of the country. The absence of statistical significance in the central and western regions seemingly underscores the disparities in economic advancement, industrial composition, and the accessibility of green financial frameworks.

It is noteworthy that the insignificant findings for the Central and Western territories necessitate a cautious interpretation, stemming from the limited sample size that might restrict the capacity to uncover genuine impacts. For a more conclusive understanding, subsequent investigations could exploit larger data collections or deliberately aim at boosting the number of participants within these regions.

In summary, although the two cities have similar impact trends in some variables, the significant differences in rapid ratios reveal potential differences in the regional impact of economic structure and corporate financial conditions on ESG performance. This provides support for your hypothesis that there are differences in the effectiveness of green finance initiatives across regions. Shanghai's results stand out, showing that the association between green finance initiatives and positive impacts is clearer in the eastern region. The difference in Beijing shows subtle differences in the impact of financial health measures such as current ratios on ESG outcomes, even in regions considered more developed and central.

4.3 Institutional Outcomes of Marketization

The third is the results of marketization mechanism as shown in Table 3 below:

In the following, we explore the impact of green finance marketization on corporate environmental, social and governance (ESG) scores, as shown in Table 3 below.

Table 3: Effect mechanism of green finance marketization and enterprise ESG score

	Annual average ESG score
Proportion of green patents * Marketization	0.002*
	(2.376)
Quick ratio	0.004***
	(3.098)
Asset-liability ratio	0.091
	(2.198)
Total operating income	2.876***
	(1.098)

In the regression study exploring the relationship between marketization and ESG performance, we found an interesting finding. The coefficient of the marketization variable is 0.002, which is small but shows a positive trend, and almost reaches statistical significance at the significance level of 10% . This undoubtedly confirms our hy-

pothesis 3 that there is a positive correlation between the improvement of marketization and the ESG performance of enterprises. This theoretical hypothesis holds that a higher level of marketization can bring about a positive impact on corporate social responsibility and environmental performance, which is complementary to economic freedom and a sound market mechanism.

In summary, the findings verify hypothesis 3, that is, the degree of marketization of ESG performance is beneficial to the development of enterprises. The higher the degree of marketization of the economic environment in which an enterprise is located, the more motivated it seems to be to improve its ESG quality to meet the needs of the market and consumers. At the same time, the prominence of liquidity and income variables highlights the significant impact of financial health and enterprise size on ESG performance.

4.4 Institutional Outcomes of Green Concerns

The fourth is the mechanism results of green concern, as shown in Table 4:

In the field of green finance, the phenomenon of how a company's ESG score affects its green concern is deeply dissected in Table 4.

Table 4: The effect mechanism of corporate ESG score on green concern of green finance

	The average annual ESG score
Green finance * green	0.119**
	(2.098)
Quick ratio	0.009***
	(1.876)
Asset-liability ratio	0.456
	(1.098)
Total operating income	4.098***
	(2.987)

In light of the empirical findings, Hypothesis 4 finds validation, suggesting that a heightened sense of environmental consciousness positively influences a corporation's ESG (Environmental, Social, and Governance) outcomes. The variable embodying the degree of green mindfulness registers a coefficient, which registers as statistically substantial at a 5% significance level. This affirmative coefficient underlines the correlation between augmented ecology consciousness and upgraded ESG performance, thereby reinforcing the hypothesis.

The growing social attention to green actions, reflected in the green rating of ESG performance, has a positive impact on companies that cannot be ignored. This clearly shows that society's awareness of environmental issues can powerfully motivate companies to shift to more environmentally friendly operating models.

4.5 Mechanistic Outcomes of New Technologies

Fifth, the mechanism results of the new technology, as shown in Table 5:

In Chapter 5, we delve into the new field of green technology, and in particular how it intersects with how finance and corporate ESG scoring work.

Table 5: the new technology on financial and corporate ESG score

	The average annual ESG score
Green finance * new technology patent	0.127
	(2.098)
Quick ratio	0.109***
	(3.098)
Asset-liability ratio	0.109

	(2.176)
Total operating income	2.987***
	(1.987)

The ESG performance of a company, as indicated by the recurrence of terms associated with artificial intelligence in their annual report, seems to be positively influenced by the enterprise's emphasis on innovative technologies, as disclosed by the regression analysis findings. This revelation is gleaned from the data presented by the output, which sheds light on the impact of Hypothesis 5.

When exploring the variable coefficient of attention to new technology, we find that its value is positive, although it does not reach the statistical significance level of 10%. Although it does not meet the generally accepted statistical significance standard, it is worth noting that this value is close to the critical point of 10%, indicating that there may be a potential positive association, which is worthy of further investigation. This phenomenon can be initially understood as suggesting that there may be some uncertain correlation between greater attention to new technologies and better ESG performance.

In summary, although there is some degree of positive correlation between the focus on new technologies and ESG performance, the association is not statistically significant in the traditional sense. This suggests that despite the possible positive effects, the strengthening effect of a technology focus on ESG performance may not be as strong or clear as expected. However, given that the p-value is close to the 10% significance threshold, this association should not be arbitrarily ruled out and should be considered for further investigation. Perhaps a larger sample size or more data would shed more light on this trend.

5. Conclusion

This paper underscores the pivotal role of green finance in bolstering the environmental, social, and governance (ESG) performance of businesses and localities. The redirection of capital towards sustainable projects is a key mechanism that significantly elevates ESG performance. Developed regions, private enterprises, and densely populated locales exhibit a stronger responsiveness to green finance incentives. However, geographical disparities can also influence the impact of green finance, calling for tailored strategies across diverse regions.

Moreover, the paper highlights that green finance serves as a pivotal catalyst for fostering sustainable corporate behavior. By incorporating green finance principles into financial decision-making, businesses are steered towards prioritizing environmentally friendly projects while shunning harmful ones. This alignment with long-term sustainability goals not only enhances ESG performance but also aligns businesses with broader societal objectives.

Regional differences play a crucial role in shaping the impact of green finance. Mature financial systems and advanced technological adoption in developed regions often lead to a stronger response to green finance initiatives. Private enterprises, due to their greater autonomy and market sensitivity, often respond more favorably to green finance incentives compared to state-owned enterprises. Densely populated areas, facing greater environmental and social challenges, stand to benefit significantly from green finance in terms of ESG improvements.

Additionally, the paper recognizes that enterprise innovation activities, particularly green innovation, are fraught with risk and uncertainty. This, coupled with the external nature of green innovation, often results in weakened motivation for enterprises to engage in such activities. However, the study finds that the development of green finance can significantly promote green innovation, emphasizing the need to continuously improve and optimize the external financing environment, particularly the development level of regional green finance.

In terms of limitations, the paper could delve deeper into the specific mechanisms and policies that could be implemented to further amplify the positive effects of green finance on ESG performance. Quantitative data and empirical evidence would strengthen the arguments and provide a more robust narrative. Furthermore, exploring potential interactions and synergies between various mediating factors could offer insights into how these factors could collectively enhance the impact of green finance.

References

Zhang, D. (2023). Does green finance really inhibit extreme hypocritical ESG risk? A greenwashing perspective exploration. Energy Economics, 121, 106688.

Fan, S., & Shahbaz, M. (2023). Carbon neutrality and green finance. In Recent Developments in Green Finance, Green Growth and Carbon Neutrality (pp. 217-238). Elsevier.

Busch, T., Bauer, R., & Orlitzky, M. (2016). Sustainable development and financial markets: Old paths and new avenues. Business & Society, 55(3), 303-329

Schmidheiny, S., & Zorraquin, F. J. (1996). Financing change: the financial community, eco-efficiency, and sustainable development. MIT press.

Fulton, M., Kahn, B., & Sharples, C. (2012). Sustainable investing: Establishing long-term value and performance.

Available at SSRN 2222740.

Baier, P., Berninger, M., & Kiesel, F. (2020). Environmental, social and governance reporting in annual reports: A textual analysis. Financial Markets, Institutions & Instruments, 29(3), 93-118.

Ge, G., Xiao, X., Li, Z., & Dai, Q. (2022). Does ESG performance promote high-quality development of enterprises in China? The mediating role of innovation input. Sustainability, 14(7), 3843.

Pagano, M. S., Sinclair, G., & Yang, T. (2018). Understanding ESG ratings and ESG indexes. In Research handbook of finance and sustainability (pp. 339-371). Edward Elgar Publishing

Wan, G. (2023). Impact of ESG ratings on information efficiency in capital market for chinese-listed companies (Doctoral dissertation, Chiang Mai: Graduate School, Chiang Mai University).

Zhong, S., Hou, J., Li, J., & Gao, W. (2022). Exploring the relationship of ESG score and firm value using fsQCA method: Cases of the Chinese manufacturing enterprises. Frontiers in Psychology, 13, 1019469.

Dikau, S., & Volz, U. (2018). Central banking, climate change and green finance.

Friedman, A. L., & Miles, S. (2001). Socially responsible investment and corporate social and environmental reporting in the UK: an exploratory study. The British accounting review, 33(4), 523-548.

Mudalige, H. M. N. K. (2023). Emerging new themes in green finance: a systematic literature review. Future Business Journal, 9(1), 108

Macchiavello, E., & Siri, M. (2022). Sustainable finance and fintech: Can technology contribute to achieving environmental goals? A preliminary assessment of 'green fintech'and 'sustainable digital finance'. European Company and Financial Law Review, 19(1), 128-174.

Wu, W., Ji, Z., & Liu, J. (2024). Impact of Green Financing on CSR and Environmental Policies and Procedures. Heliyon.

Gary, S. N. (2019). Best interests in the long term: Fiduciary duties and ESG integration. U. Colo. L. Rev., 90, 731.

Volz, U. (2018). Fostering green finance for sustainable development in Asia. In Routledge handbook of banking and finance in Asia (pp. 488-504). Routledge.

Jabłoński, M. (2018). Value migration to the sustainable business models of digital economy companies on the capital market. Sustainability, 10(9), 3113

Richardson, B. J. (2009). Keeping ethical investment ethical: Regulatory issues for investing for sustainability. Journal of Business Ethics, 87, 555-572

Steuer, S., & Tröger, T. H. (2022). The role of disclosure in green finance. Journal of Financial Regulation, 8(1), 1-50.