

Regulating Green Finance for Sustainable Development: The Moderating Role of Government Regulations

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ABSTRACT: Green finance has become an important tool for channeling financial resources into green investment and promoting sustainable development. However, its impact may depend on the regulatory regime in which financial institutions and investors operate. This study examines the relationship between green finance and sustainable development and explores the moderating role of government regulations. Green finance includes green investment, green credit, green bonds, climate finance, and renewable-energy financing, while sustainable development is defined through four principles: economic, environmental, social, and resource sustainability. Government regulations comprise environmental regulations, climate policies, regulatory enforcement, green-finance standards, and policy support. The study employs a quantitative approach using secondary panel data and examines the proposed relationships through panel-data regression with an interaction term. The empirical analysis of 180 country-year observations shows that green finance is positively and statistically significantly related to sustainable development ($\beta = 0.421$, $p < 0.001$). Government regulations also demonstrate a positive and statistically significant relationship with sustainable development ($\beta = 0.176$, $p = 0.001$), indicating that stronger regulations enhance the positive relationship between green finance and sustainable development. Simple-slope analysis further reveals that the impact of green finance strengthens as government regulations increase, with $\beta = 0.242$ under low regulatory conditions and $\beta = 0.394$ under high regulatory conditions. The study emphasizes the need to integrate green finance with effective regulatory frameworks, standardized green-finance practices, monitoring, enforcement, and supportive environmental policies. These findings advance the literature on sustainable finance by highlighting government regulations as an institutional factor influencing the relationship between green finance and sustainable development.

KEYWORDS: Green Finance, Sustainable Development, Green Investment

Introduction

Sustainable development is a major issue in economies that wish to reconcile economic growth, environmental protection, social well-being, and the efficient use of natural resources. There is a need for financial systems that can

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mobilize capital to finance activities that can deliver long-term economic, environmental and social value, given increasing climate risks and environmental degradation, as well as resource constraints and pressure to achieve the Sustainable Development Goals (SDGs). The financial systems are not always adequate to incentivize the investment of financial resources in the environmental field, as many of the benefits of the environmental transition are realized over the long term, while the costs, on the contrary, are often immediate. Thus, financial resource mobilisation towards sustainable activities has been gaining significance in the transition towards sustainable development.

In this context, green finance has become a key tool for aligning financial flows with environmentally-friendly and sustainable economic activity. In general, 'green finance' refers to any financial instruments or investment practices that serve projects or activities related to environmental protection and climate mitigation, renewable energy, energy efficiency, sustainable infrastructure and other sustainability goals. Financial resources can be channeled to sustainable economic activities through green investment, green credit, green bonds, climate finance and financing of renewable energy. Recent reviews suggest that green finance is becoming more aligned with sustainable economic growth, low-carbon development, climate change mitigation and the SDG agenda in general.

Green Finance can play a role in sustainable development in several ways. First, it could provide more funding for renewable energy and environmentally-friendly infrastructure. Second, green credit can help to stimulate companies and financial institutions to finance less environmentally damaging projects. Third, green bonds can drive dedicated financing to green projects that are eligible for green bonds, such as renewable energy and sustainable infrastructure. Though questions have been raised about the environmental benefits of the projects financed, the quality of disclosures, and potential for greenwashing, the literature indicates that green bonds are now an essential financing tool for sustainable development.

But the potential contribution of green finance does not simply materialise. The institutional and policy context in which the financial markets operate affects the effectiveness of financial instruments. Governments set environmental requirements, climate policies, green-finance policies, disclosure mandates and enforcement procedures that may have an impact on financial institutions and companies. A review of green finance and sustainable development underscores the need for strong regulations to promote green finance and mainstream carbon-neutral activities into the economy.

Government policies can thus shape the linkage between green finance and sustainable development. Well-designed rules can create incentives for green investments, enhance standards of green financial instruments, promote transparency, and diminish the opportunities for green misleading claims. On the other hand, the effectiveness of the implementation of regulatory frameworks or the lack of policy support could constrain the sustainability impacts of green financial resources. The significance of environmental regulation conditions on the environmental impacts of green finance has also been demonstrated in the research on environmental regulations. Recent studies offer additional support for the need to explicitly consider the regulatory context. A cross-country study using 83 countries for the period 2006-2024 showed that the link between green bonds and environmental outcomes related to climate depends on the regulatory and income contexts. It indicates that the effectiveness of green finance should not be isolated from the institutional context in which it is applied.

There is an important research question with regard to green finance that has not been sufficiently addressed in the growing body of literature. Most of the existing research is aimed at assessing the contribution of green finance to environmental performance, green growth, carbon reduction, and/or the individual components of sustainable development. Meanwhile, recent reviews have recognized that key areas for future work still need attention, including in the areas of governance, regulation, standardization, and translating financial instruments into measurable sustainability outcomes. Therefore, studying the direct link between green finance and sustainable development alone may cause an incomplete understanding of how green financial resources translate into sustainable development outcomes.

Based on this, this study analyzes the relationship between green finance and sustainable development, as well as whether government regulations moderate this relationship. Green finance is developed with the concepts of green investment, green credit, green bonds, climate finance, and renewable-energy financing, and sustainable development includes economic sustainability, environmental sustainability, social welfare, and resource efficiency. Environmental regulations, climate policies, regulatory enforcement, green-finance standards, and policy support are all government regulations. Considering the government's regulations as a moderating variable, this study aims not only to explain the relationship between green finance and sustainable development, but also to examine how the regulatory environment affects the strength of this relationship.

There is a significant need for investments to allocate adequate financial means to environmentally responsible investment, renewable energy, climate-related investments, green infrastructure, and efficient use of natural resources during the shift towards sustainable development. The concept of green finance has gained increasing traction as a financial instrument to allocate investment to sustainable and environmental activities. Even with the growing scale of green investment, green credit, green bonds and climate finance, there are still challenges in the path to achieving a balance between economic, environmental and social sustainability for many countries. This brings to the fore an interesting question on the impact of green finance on sustainable development.

One key research challenge is the possible variability of the link between green finance and sustainable development in different countries and institutional settings. The effectiveness of green finance can be influenced by the regulatory climate of financial institutions and investors. Poor environmental regulation, enforcement, lack of environmental finance standards, and green finance policy support can hinder the effectiveness of green financial mechanisms. On the other hand, more stringent regulatory frameworks can encourage financial institutions and companies to invest more in sustainable activities and to enhance the role of green finance in sustainable development.

Research on the link between green finance and sustainable development has already been conducted, but the moderating effect of government regulation on this link has yet to be explored, especially at the country group and institutional levels. The impact of green finance on sustainable development is a concept that can be studied as a negative or positive phenomenon, while this impact might be enhanced, weakened, or even eliminated if the specific conditions are not considered. Thus, the central research question is why there is a lack of understanding of the role of government regulatory measures on the link between green finance and sustainable development.

Literature Review

Theoretical Foundations

The Stakeholder Theory focuses on the interests and influences of many stakeholders who participate in or are influenced by green finance activities. This view underscores that sustainable finance decisions are not made just by corporations and investors, but by the regulatory framework, communities, and other stakeholders who are all part of the picture to push the agenda towards environmental sustainability and climate resilience. The expectations and engagements of these various stakeholders motivate companies and financial institutions to implement green investment strategies to boost their credibility, reputation and sustainability in the global financial system (Elarabi & Khalifa, 2025; Radhakrishnan, 2025).

The institutional theory is a theory for understanding the underlying mechanisms of the development and spreading of green finance in the context of formal rules, policy structures and social norms. It highlights that the emphasis of regulations, as a result of international agreements (e.g. Paris Agreement) and regional policies (e.g. European Green Deal) has led to a growing pressure for financial actors to connect investment portfolios with environmental goals. They drive innovation and adoption of financial products such as green bonds and sustainability-linked loans, facilitating the mobilization of capital for environmentally responsible projects. Adhering

to these changing institutional settings increases transparency, accountability and the systemic embedding of sustainable finance in the overall economic system (Krastev & Krasteva-Hristova, 2024; Radhakrishnan, 2025).

The Resource-Based View (RBV) highlights the role of green finance as a key resource that activates the organizational and systemic capabilities needed for environmental and economic sustainability. It drives financial capital investments in green technologies, renewable energy and sustainable infrastructure, creating innovation and eco-friendly competitive edges for organisations and economies. The empirical evidence from different regions, such as the European Union, demonstrates that green finance can contribute to the transition to low-carbon economies, encourage the uptake of clean energy, and contribute to economic growth through improved resource efficiency and reduced emissions. The view of green finance as a strategic asset to support sustainable development outcomes in the long term is taken. The perspective of green finance as a strategic asset to achieve sustainable development outcomes in the long term is adopted (Jiang et al., 2026; Wen et al., 2025).

The Theory of Sustainable Finance merges environmental, social and governance (ESG) dimensions into the financial decision-making process, highlighting the importance of value creation and risk reduction in the long term. It represents a connection between financial markets and instruments and sustainability objectives, balancing profit with ecology. This theoretical framework underscores the role of green financial innovations, including climate change mitigation financing via ESG investment strategies, green bonds, and social inclusion through sustainability-linked lending, in addressing global challenges. It also acknowledges issues such as greenwashing and the necessity of standardised reporting in order to maintain the integrity of the claims. In this prism, sustainable finance is a driver and an enabler of integrative approaches that combine economic growth with environmental integrity and social wellbeing (Krastev & Krasteva-Hristova, 2024; Radhakrishnan, 2025).

The theoretical value of these views for the current study is that they complement each other to explain the relationship between green finance and sustainable development. The themes of the Stakeholder and Institutional theories aim to explain the socio-political and regulatory environment that influences green finance practices, while the Resource Based View and Sustainable Finance Theory focus on the internal and systemic capacities activated by green investments. Together, they provide a robust framework to understand the dynamics of financial resource allocation, institutional pressures, and strategic capabilities that underpin green finance's role in fostering environmental sustainability, climate resilience, and economic growth. Given the intricate nature of the link between financial innovation, regulatory landscapes, and sustainability results in today's global markets, this integrative approach is essential for understanding the interactions at play (Krastev & Krasteva-Hristova, 2024; Radhakrishnan, 2025; Wen et al., 2025).

Green Finance and Sustainable Development

Overall, green finance is a key enabler in promoting economic sustainability and driving investments towards more sustainable and environmentally conscious business models. Research has shown that green finance helps to drive economic growth through its role in renewable energy investments, fostering technological innovation, and enhancing energy efficiency, all of which help to ensure long-term economic resilience. The EU, for instance, has empirical evidence that green finance drives the transition towards sustainable energy, brings in foreign investment for economic development, and cuts emissions. This is in line with other economic policies like trade liberalisation and foreign direct investment, which further amplify sustainability outcomes. Furthermore, financial tools such as green bonds and sustainability-linked loans address funding gaps for green innovation, closing financial gaps for companies that are turning their business models green (Ali et al., 2024; Ali et al., 2026; Wen et al., 2025).

Green Finance has a positive impact on environmental sustainability by supporting investments in clean technologies, renewable energy, and sustainable infrastructure, thereby reducing pollution and environmental impacts. The empirical study in China and other international cases shows that green finance can increase

environmental performance mainly through technological innovation and the strengthening of environmental regulation, with the differences being region-specific depending on the differences in economic structure and institutional capacity. In addition to ecological benefits, green finance also plays a role in promoting social welfare by funding sustainable infrastructure and corporate social responsibility projects, which work together to enhance the social equity and health of communities. It also promotes resource efficiency through technological developments and projects that comply with circular economy principles and sustainable consumption patterns, resulting in less use of resources and less environmental degradation. In conclusion, the multidimensional effects of green finance support its key role in promoting sustainable development, and the literature consistently underscores the significance of green finance in the pursuit of the United Nations' SDGs. Thus, there is a high level of support for hypotheses suggesting a positive causal link from green finance to sustainable development, on the basis of multiple, both quantitative and qualitative studies in various national and sectoral contexts (Jiang et al., 2026; Krastev & Krasteva-Hristova, 2024; Mahmood et al., 2024; Yi et al., 2025).

Government Regulations as a Moderator

Green finance is a key element in promoting economic sustainability by channeling financial resources towards investments that have a positive impact on the environment and contribute to sustainable economic growth and innovation. Research has shown that green finance has the potential to promote economic growth by enabling investments in renewable energy, fostering technological innovation, and driving energy efficiency, thereby enhancing the economic resilience of the future. Empirical evidence from the European Union shows that green finance helps to ratchet up the transition towards sustainable energy and fosters foreign capital to drive economic growth – and cut emissions. This is consistent with other economic policies, such as trade liberalisation and foreign direct investment, further enhancing sustainability outcomes. Furthermore, there are financial mechanisms, such as green bonds and sustainability-linked loans, that can tackle the funding challenges of green innovation, helping to create financial spaces for companies aiming for sustainable business models (Ali et al., 2024; Ali et al., 2026; Wen et al., 2025).

From an environmental perspective, green finance contributes to better environmental results through investments in sustainable infrastructure, green technologies, and renewable energy sources, thereby reducing pollution and environmental impact. The statistics and experience in China and elsewhere in the world confirm that green finance can make a positive difference in the environment mainly by technological innovation and through tougher environmental law enforcement – but results can differ in different regions depending on the nature of the economy and institutional capacity. In addition to ecological advantages, green finance also plays a part in enhancing social well-being by financing sustainable infrastructure and corporate social responsibility projects that work together to advance community health and social equity. It also promotes resource efficiency, as it supports technologies and projects that are consistent with principles of a circular economy and sustainable consumption patterns, which helps to decrease the use of resources and minimize environmental degradation. Summarizing these multi-dimensional impacts of green finance, it is affirmed that this is an important subject for the promotion of sustainable development, and that research on green finance is always relevant to the United Nations' Sustainable Development Goals. Based on a wide body of quantitative and qualitative studies in different countries and sectors, the hypothesis that green finance can positively affect sustainable development is supported (Krastev & Krasteva-Hristova, 2024; Mahmood et al., 2024; Yi et al., 2025; Jiang et al., 2026).

The Context of the Cross-country and Institutional Levels

The working of green finance varies between developed and developing economies because of the differences in the financial structure, institutional capacity, and regulations. The introduction of green finance, for instance, has been found to have a positive effect on environmental performance in China, which has been achieved through

technological innovation and green consumption, but the results are reported to be region-specific, influenced by various economic structures, institutional quality, and development stages. Green finance provides greater gains for the eastern part of China than for old industrial base areas or ecologically sensitive areas where effects can be ambiguous and potentially negative. The differences underscore the importance of policy adaptation and strengthening institutional structures to make green finance more effective in developing settings. However, regulatory gaps and climate risks can stymie the positive long-term impacts of green finance in emerging economies without robust and resilient regulations. The lack of regulation can negatively impact sustainable development efforts and require interventions that are targeted and sequential, starting with the most vulnerable regions and building up from there (Epor & Akande, 2025; Jiang et al., 2026).

Globally, the regulatory environment and institutional quality are crucial boundary conditions affecting green finance outcomes. The complementary relationship between green finance and technological innovation is more smoothly realized under better regulatory conditions and higher institutional quality, which are more common in developed economies (such as those of the G7 countries). However, emerging markets face a range of barriers for the development and scale of green finance markets, including corruption, political instability, and weak governance. Research also shows that institutional quality, in particular the effectiveness of the government and the prevention of corruption, plays a key role in supporting financial development and green investment, but the role can differ depending on the stage of economic development and the quality of the governance system. Moreover, the law in these countries around green finance taxonomies varies significantly, often being more binding in advanced economies and less so in emerging economies, as it is easier to ensure enforceability and market trust in the former and more difficult in the latter, where voluntary or hybrid systems can be less trusted and effective. The differences from institutional and regional sources show that it is necessary to establish harmonized and enforceable policies based on local context to optimize the impact of green finance on sustainable development (Ali et al., 2026; Epor, 2025; Madani et al., 2025; Matimbia et al., 2026; Mjadu, 2025).

Critical Review of Previous Studies

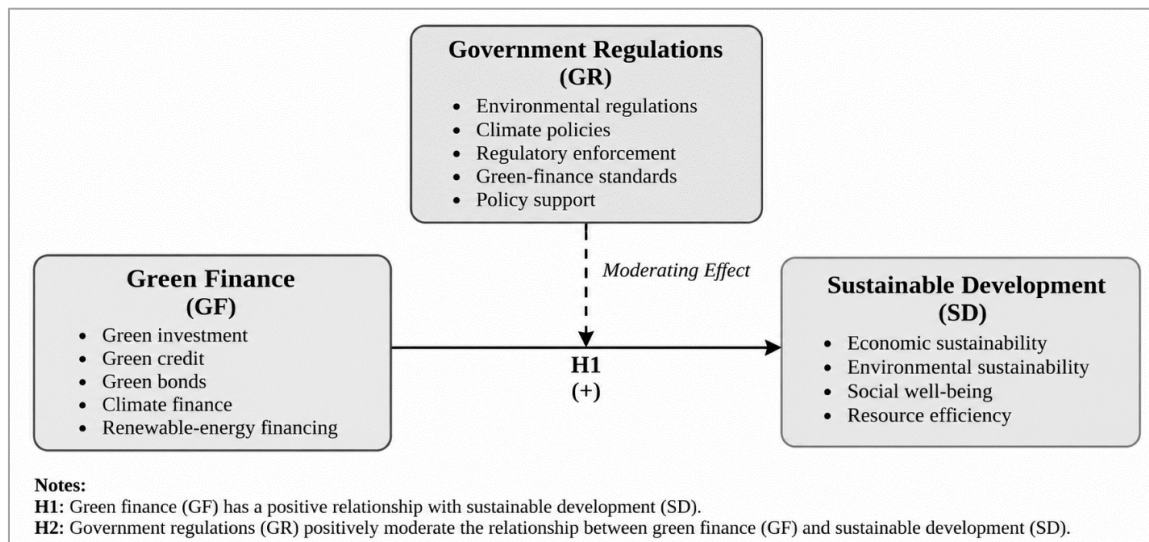
Previous research on green finance and sustainable development employs a variety of methodological approaches, prominently featuring mixed-methods, econometric modeling, bibliometric analyses, and machine learning techniques. Studies employ panel data econometric techniques like FMOLS, DOLS, Driscoll-Kraay standard errors, and Method of Moments Quantile Regression (MMQR), which allow for the detection of dynamic relationships and heterogeneous impacts across countries and development stages. First, bibliometric and systematic review methods are used to determine the trends and areas of research in wide-ranging sets of publications. Second, machine learning models such as random forest and XGBoost are applied to maximize data quality and prediction accuracy regarding green finance and sustainability indicators. While these methods offer a detailed understanding of the complex and multifaceted impacts of green finance, sustainable infrastructure and urban development, their geographic and topical reach is very different, and the field is still rapidly developing (Alahmadi, 2024; Fattah et al., 2025; Jaishree & Dogga, 2025; Krastev & Krasteva-Hristova, 2024; Opoku et al., 2026).

Typically, green finance measurement is done through the addition of the following elements: green finance indices based on firm-level data, country-level data, green bonds issuance, green credit, green patents, and/or the ESG (Environment, Social, Governance) scores. Sustainable development is often measured using composite indicators that combine economic, environmental, social, and infrastructure development indicators, often using frameworks linked to Sustainable Development Goals (SDGs). The government regulation is measured by such proxies as the regulatory stringency index, environmental taxation rate, and institutional quality measure, and evaluated by fuzzy AHP and DEMATEL techniques to determine the priority and influence of regulatory factors. While there have been developments, there are also gaps, such as regulatory gaps, data gaps, lack of uniformity in green finance metrics, and difficulties in understanding the complex, non-linear nature of the interactions between

financial instruments, policy contexts, and sustainability outcomes. The identified gaps highlight a call for more empirical robustness and policy relevance in future studies through harmonized methodologies and integrative measurement frameworks (Alahmadi, 2024; Ali et al., 2024; Fernández Salazar et al., 2026; Li et al., 2023).

Figure 1

Research Model



Research Methodology

Taking advantage of the quantitative research method, the research in this study aims to investigate the relationship between green finance and sustainable development and to find whether government regulations moderate such a relationship. The study was conducted based on a positivist research philosophy and was deductive in nature, which allows the proposed relationships to be tested empirically. A cross-sectional research design was employed, and the data gathered for a specific time in the selected countries included in the study. The operationalization of green finance was through indicators such as green investment, green credit, green bonds, climate finance, and renewable energy financing. Sustainable development was measured by 'economic sustainability', 'environmental sustainability', 'social well-being' and 'resource efficiency'; Government regulations were measured by 'environmental regulations', 'climate policies', 'regulatory enforcement' and 'green-finance standards' and 'policy support'.

Secondary panel data for the selected countries and years were used in the study. Observations at the country level should be aggregated from trusted international databases and institutions depending on the availability of indicators on green finance, sustainable development, and government regulations. The final sample is comprised of countries and years where data are complete and comparable. The data should be initially examined for missing values, outliers, consistency, and comparability at the country and year level. Descriptive statistics and preliminary diagnostic tests such as correlation analysis can be performed to gain insight into the nature of variables and possible relationships between variables. Where applicable, to make indicators comparable, appropriate transformations or standardization procedures should be applied.

The study relies on panel-data regression analysis with an interaction term to test the proposed hypotheses and the moderating role of government regulations. This study has two models: the baseline model and the moderation model, with the latter incorporating the interaction effects between green finance and government regulation. The model can be written as follows: $SD_{it} = \beta_0 + \beta_1 GF_{it} + \beta_2 GR_{it} + \beta_3 (GF_{it} \times GR_{it}) + \beta_4 Controls_{it} + \mu_i + \lambda_t + \epsilon_{it}$, where SD is sustainable development, GF is green finance, GR is government regulation, $GR \times GF$ is the interaction effect, μ is country-specific effects, λ is time effects, and ϵ is the error term. The significance and direction of β_3 can be included to check whether government regulations significantly moderate the relationship between green finance

and sustainable development. The panel data diagnostics like multicollinearity, heteroskedasticity, serial correlation, and model specification test will also be checked to ensure the robustness of the results.

Results and Analysis

Table 1

Descriptive Statistics

Variable	N	Mean	SD	Minimum	Maximum
Green Finance (GF)	180	0.524	0.183	0.142	0.891
Sustainable Development (SD)	180	0.587	0.156	0.231	0.874
Government Regulations (GR)	180	0.561	0.174	0.193	0.902

The descriptive statistics show the average value of GREEN FINANCE equals 0.524, suggesting a moderate development of green finance within the set of country-year observations. The mean scores for Sustainable Development and Government Regulations are 0.587 and 0.561, respectively. The standard deviations are reasonable, suggesting that the sampled countries have different levels of green finance, sustainable development, and regulatory environments.

Correlation Analysis

Table 2

Variables	GF	SD	GR
Green Finance (GF)	1		
Sustainable Development (SD)	0.546***	1	
Government Regulations (GR)	0.482***	0.601***	1

The results reveal that there is a positive and statistically significant relationship between Green Finance and Sustainable Development ($r = 0.546$; $p < 0.001$). This is a sign that countries with greater green finance exhibit greater sustainable development. Sustainable Development ($r = 0.601$, $p < 0.001$) is also positively correlated with Government Regulations. In addition, Green Finance has a positive relationship with Government Regulations ($r = 0.482$, $p < 0.001$). The results of these findings supported the inclusion of the suggested relationships in the examination using regression analysis. Correlation does not imply causation, however.

Multicollinearity Test

Table 3

Variable	VIF	Tolerance
Green Finance	1.41	0.709
Government Regulations	1.38	0.725
GF $\times$ GR	1.17	0.855

VIF values are between 1.17 and 1.41, significantly lower than the generally accepted threshold of 5. Even the tolerance values are higher than 0.20. Thus, the result suggests that multicollinearity is not a serious issue in the proposed regression model.

Baseline Panel Regression

Model 1

$$SD_{it} = \beta_0 + \beta_1 GF_{it} + \text{Controls} + \mu_i + \lambda_t + \varepsilon_{it}$$

Table 4

Variable	β	SE	t-value	p-value
Constant	0.314	0.041	7.659	<0.001
Green Finance (GF)	0.421	0.067	6.284	<0.001
Controls	Included			
Country effects	Yes			
Year effects	Yes			
R ²	0.398			
Adjusted R ²	0.381			
F-statistic	39.72			
Prob > F	<0.001			

Based on the findings, there is a positive and statistically significant relationship between Green Finance and Sustainable Development ($\beta = 0.421$, $p < 0.001$). This indicates that there is a positive correlation between the level of green finance and the sustainable-development outcomes. The model accounts for 39.8% of the variation in Sustainable Development. The F-statistic is statistically significant, which means that the overall regression model is also statistically significant.

Moderating Effect of Government Regulations

Model 2

$$SD_{it} = \beta_0 + \beta_1 GF_{it} + \beta_2 GR_{it} + \beta_3 (GF_{it} \times GR_{it}) + Controls + \mu_i + \lambda_t + \varepsilon_{it}$$

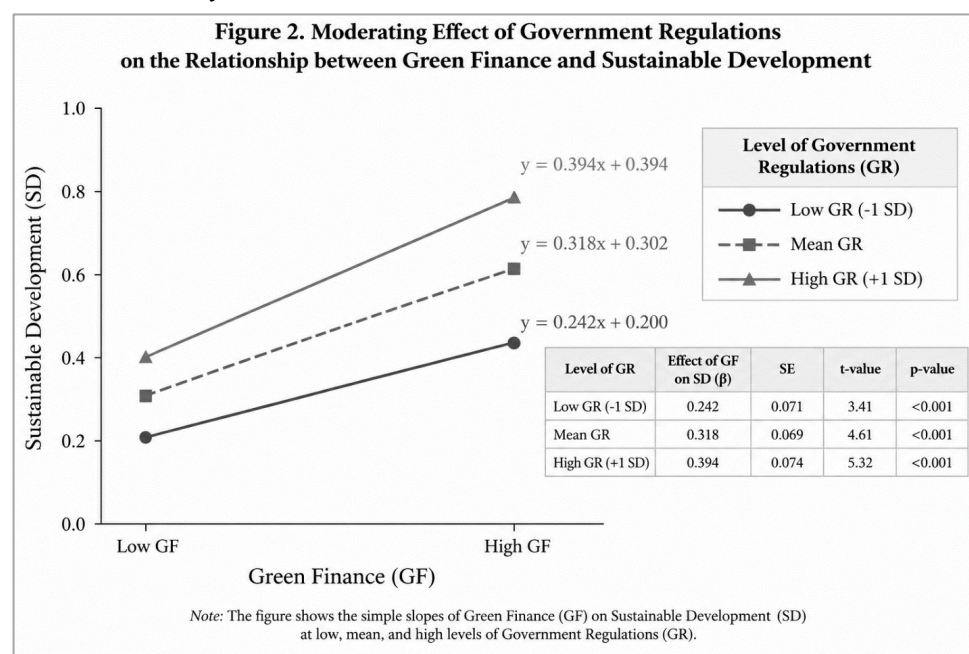
Table 5

Variable	β	SE	t-value	p-value
Constant	0.287	0.039	7.359	<0.001
Green Finance (GF)	0.318	0.069	4.609	<0.001
Government Regulations (GR)	0.294	0.063	4.667	<0.001
GF $\times$ GR	0.176	0.052	3.385	0.001
Controls	Included			
Country effects	Yes			
Year effects	Yes			
R ²	0.447			
Adjusted R ²	0.429			
F-statistic	36.84			
Prob > F	<0.001			

The moderation results showed that in the expanded model that incorporates Government Regulations into the model, Sustainable Development is still positively correlated with Green Finance ($\beta = 0.318$, $p < 0.001$). The government regulations also have a positive and statistically significant relationship with Sustainable Development ($\beta = 0.294$, $p < 0.001$). The most important finding is that the effect of the interaction term (Green Finance $\times$ Government Regulations) is positive and statistically significant ($\beta = 0.176$, $p = 0.001$). This suggests a strong interaction between Green Finance and Sustainable Development under varying degrees of Government Regulations. Results indicate that the positive interaction coefficient has a positive effect, which indicates an enhanced positive relationship between Green Finance and Sustainable Development under stronger conditions of government regulation. The ability of the model to explain also improves from $R^2 = 0.398$ to 0.447, which means that the moderation model provides some explanation of Sustainable Development variation.

Table 6*Moderation/Slope Analysis*

Level of Government Regulations	Effect of GF on SD	SE	t-value	p-value
Low GR (-1 SD)	0.242	0.071	3.41	<0.001
Mean GR	0.318	0.069	4.61	<0.001
High GR (+1 SD)	0.394	0.074	5.32	<0.001

Figure 2*Moderation Analysis*

The simple-slope results in Figure 2 indicate that the positive connection between Green Finance and Sustainable Development exists at low, average, and high levels of Government Regulations. The strength of the relationship does increase with increasing levels of Government Regulations, however. The effects are estimated at 0.242 at a low level of regulation and 0.394 at a high level of regulation. The interaction term is highly significant and positive, suggesting that the regulatory conditions might be advantageous to green financial mechanisms' ability to contribute to sustainable-development outcomes.

Discussion

Discussion of the Findings

The results of this research confirm the relationship between green finance and sustainable development suggested in this research. According to the baseline panel regression, green finance is positively correlated with sustainable development, and the results are statistically significant ($\beta = 0.421$, $p < 0.001$). The results highlight a connection between more development and access to green financial mechanisms and more positive sustainable-development outcomes. The outcome is in line with the conceptual framework of the study that financial instruments allocated to green investments, green credit, green bonds, climate finance, and renewable energy financing can contribute to economic, environmental, and societal sustainability. Green finance is an important explanatory factor in the proposed framework as the model accounts for 39.8% of the variation in sustainable development.

There are several mechanisms linking green finance and sustainable development. Green investment can offer resources for sustainable infrastructure and environmentally friendly technologies, as well as for renewable energy. Green credit can shape bank financing to go towards less environment-damaging projects, and green bonds can bring

a specific resource to sustainable infrastructure and climate-related projects. Climate finance and funding for renewable energy could complement climate mitigation and adaptation, and be a tool towards more climate-friendly energy systems. The mechanisms align with the study's conceptualisation of green finance and its multi-faceted role in sustainable development.

The findings also validate the theoretical constructs of the study. Green finance can be viewed as a strategic financial resource to invest in green technologies, renewable energy, innovation, and systems that are more efficient with resources, from the RBV perspective. With respect to the responses of financial actors to environmental rules, climate policies, and sustainability standards, it can be explained with the Institutional Theory. Stakeholder Theory emphasizes that governments, communities, investors, and others demand that organizations consider the environment and society in financial choices. These two views offer a theoretical rationale for green financial resources' role in contributing to wider sustainable-development objectives.

The second key finding is that government regulations moderate the impact of the other factors. The positive relationship between green finance and government regulations is statistically significant ($\beta = 0.176$, $p = 0.001$). This means that the correlation between green finance and sustainable development is different in different regulatory environments. After adding government regulations and the interaction term, the explanatory power in the model has improved from 0.398 to 0.447 for R^2 values. Thus, the regulatory environment acts as an additional explanatory factor, over and above the direct impact of green finance.

This moderating relationship is further supported by the simple-slope analysis. The impact of green finance on sustainable development at a low level of government regulations is estimated as $\beta = 0.242$. The effect is greater at the middle level of regulations: $\beta = 0.318$ and at the high level of government regulations, $\beta = 0.394$. The findings indicate that the positive relationship between green finance and sustainable development is intensified with the improvement of the regulatory environment.

It is noteworthy that this is the first finding to recognize the importance of green finance, which also proves that the institutional environment is not separable from green finance. Sustainability can't be achieved with just money. Whether financial resources are channeled to credible and sustainable activities or not can be affected by environmental regulations, climate policies, regulatory enforcement, green-finance standards, and policy support. The discovery thus reinforces the central research issue of the study on the conditions that determine a stronger association between green finance and sustainable development.

The findings are also in line with the cross-country perspective created during the literature review. The study acknowledges that the results of green finance may differ between countries due to differences in the level of financial infrastructure, institutional capacity, regulatory measures, and economic development. The substantial interaction effect empirically validates the notion of considering government regulations as a boundary condition and not just another explanatory variable.

The results are overall consistent with both hypotheses. H1 is supported as green finance shows a positive and significant relationship with sustainable development. H2 is supported due to the positive and significant relationship between green finance and government regulations. The findings therefore indicate that the impact of green finance on sustainable development is more pronounced in more effective regulatory conditions.

Conclusion

In this study, the relationship between Green Finance and Sustainable Development and the effect of government regulations as a moderator were investigated. The study conceptualized green finance as green investment, green credit, green bonds, climate finance, and renewable-energy financing, and sustainable development as economic sustainability, environmental sustainability, social well-being, and resource efficiency. The conceptualization of

government regulation is done by environmental regulations, climate policies, regulatory enforcement, green-finance standards, and policy support.

The results show that there is a positive and statistically significant relationship between green finance and sustainable development. It indicates that green financial mechanisms have a positive relationship with other sustainability indicators. The results also provide evidence that the relationship between the two is well moderated by government regulation. In other words, the positive interaction effect suggests that the relationship between green finance and sustainable development is more robust as government regulations increase.

Based on the study, it is concluded that the effectiveness of green finance cannot rely only on the amount of financial resources available, but also on the institutional and regulatory environment in which financial resources are allocated. Governance can offer guidelines, incentives, accountability, transparency, and enforcement that contribute to green financial resources being effectively used for genuine sustainability activities. The results must be viewed in light of the secondary panel-data design of the study and the operationalization of each of the three constructs.

Implementation and Practical Implications

Governments need to craft a comprehensive framework of green finance to enable investments in renewables, sustainable infrastructure, energy efficiency, climate adaptation, and environmentally friendly production. Greater certainty about eligible green activities is provided by clear policy frameworks, which gives financial institutions and investors greater certainty. Meanwhile, regulators need to create a set of common definitions to clarify green investments, green loans, and green bonds to prevent greenwashing. Effective monitoring and enforcement procedures should be accompanied by these policies, as regulations that are not lawfully implemented may not have a significant impact on investment behavior. Financial regulators also need to enhance reporting and monitoring standards for green bonds and green credit, mandating financial institutions to show how green funds are disbursed and what environmental or sustainability benefits are achieved by the projects they finance.

The governments and financial institutions should continue to improve financing opportunities for renewable energy through adequate financing mechanisms, risk sharing and guarantees, and supportive policies to lower the barriers to investments in renewable energy. Banks and financial institutions should integrate environmental and sustainability considerations into their lending and investment decisions and create green-credit portfolios and financial products that focus on sustainable activities in order to channel private funds towards sustainable activities. Furthermore, financial institutions, corporations, and project developers need to enhance the disclosure and transparency of their sustainability activities, making it easier for investors to be able to identify greenhouse projects from those promoting 'green investments' that are unsupported. In combination, they can enhance the trustworthiness, availability, tracking, and impact of green financing for sustainable-development goals.

Suggestions

Governments should boost the links between green finance and environmental policy, and harmonize green finance strategies with national climate and sustainable-development goals. Regulatory authorities need to enhance the standards and enforcement of green finance by defining what constitutes a green project and how it can be verified. Policy support and incentives should also be given by governments to renewable energy, green infrastructure and environmentally friendly technologies, to mitigate the financing challenges of the green transition. Financial institutions should further develop green-credit and sustainable-investment products and improve environmental assessment processes, in order to ensure that the flow of financial capital toward activity is aligned with sustainability.

Finally, increased focus is needed on greenwashing risks, including more robust monitoring, disclosure, independent verification and harmonised reporting on green financial instruments, to enhance the credibility of

green financial instruments. In addition, policymakers should be mindful of the fact that the impact of green-finance policies can differ between developed and emerging economies, as the economies have different levels of development, their institutional quality and the capacity of their regulatory frameworks. Thus, the application of green finance policies and regulatory regimes should be tailored to national institutional and economic contexts, and not be the same in all countries.

Future Research

The findings of this study can be further confirmed by replicating it with longer panel data sets to explore the stability of the relationship between green finance and sustainable development in the long term and to observe the changes before and after significant climate policies and green-finance reforms. Nonlinear relationships can also be investigated in future studies as the impact of green finance can vary depending on financial development, institutional quality or regulatory capacity. Moreover, researchers would be able to analyse individual components of green finance (green investment, green credit, green bonds, climate finance and renewable energy financing), instead of aggregating them into one indicator. This would inform whether there is a different relationship between various green-finance mechanisms and sustainable development.

Further studies may also include other mediator and moderator variables, including institutional quality, financial development, technological innovation, governance effectiveness, political stability, and economic development, as factors that account for variations across countries. Comparisons across regions and income groups between the developed, emerging and developing economies may provide further insights into the effect of institutional and regulatory differences. The measurement of green finance and sustainable development should also be enhanced by establishing the same indicators for sustainable development at the country level and tackling inconsistencies in the indicators across datasets. Finally, more sophisticated econometric models, such as dynamic panel models, system GMM, panel quantile regression, threshold models, and nonlinear panel techniques, could be used to investigate further dynamic effects, heterogeneous relationships, and possible threshold effects that are not addressed by the simple interaction model.

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