

Research on the Impact of Green Finance on High-Quality Economic Development

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Abstract: To investigate the linkage between green finance and high-quality economic development across China, this research employs panel data from 30 provincial-level regions between 2011 and 2021. A comprehensive assessment framework for high-quality economic development is established, with indicator weights determined through the entropy method. A fixed-effects model is employed to explore the relationship between the two, investigating the mediating role of industrial structure upgrading and conducting heterogeneity analysis across eastern, central, and western regions. The findings reveal that: (1) Green finance actively contributes to high-quality economic development, demonstrating a significant positive correlation; (2) The upgrading of industrial structure serves as a positive mediating factor in this relationship; (3) The influence of green finance varies considerably across regions, with the most pronounced effect observed in the eastern area, a moderate impact in the central region, and the weakest effect in the western part of the country.

Keywords: Green Finance; High-quality Economic Development; Entropy Value Method; Mediating Effect.

1. Introduction

Since the reform and opening-up, China's economy has maintained rapid growth, but this has been accompanied by issues such as widening income disparities and worsening environmental pollution. This highlights the long-term unsustainability of the extensive development model, necessitating a shift in growth paradigms and a restructuring of economic drivers. The 19th CPC National Congress clearly articulated that China's economy has transitioned into a phase focused on high-quality development. Moreover, the establishment of the "dual carbon" goals further emphasizes the pressing need for a green transition. As an essential instrument facilitating low-carbon and green development, green finance does more than just enhance the efficiency of resource distribution and propel structural transformation of industries—it also plays an indispensable role in attaining the objectives of carbon peak and carbon neutrality. However, China's green finance development still faces challenges such as regional imbalances, low efficiency, and unclear operational mechanisms. Therefore, establishing an evaluation system for high-quality economic development and conducting in-depth research on the impact and mechanisms of green finance on high-quality economic development—particularly its mediating role in industrial upgrading and regional heterogeneity—holds significant practical importance for achieving the dual carbon goals and realizing high-quality economic development.

2. Literature Review

2.1. Green Finance

As a crucial branch of the financial sector, green finance is closely associated with environmental protection, climate change, and sustainable development. Meanwhile, it serves as a bridge connecting finance and environmental conservation, aiming to coordinate environmental protection and economic development through financial instruments [1]. Functioning as an innovative financial tool, green finance can improve environmental quality and manage environmental risks [2]. It

promotes energy conservation and emission reduction in enterprises, acting as a policy instrument for achieving sustainable development [3], and effectively supports the development of the ecological industry [4].

2.2. High-Quality Economic Development

Regarding high-quality economic development, relying solely on per capita GDP is insufficient to comprehensively measure development levels; dimensions such as culture and ecology should also be incorporated [5]. Furthermore, the quality of economic development should be analyzed from perspectives including environmental sustainability and social stability [6]. Domestic research emphasizes that high-quality development requires the implementation of the five development concepts [7], with efficiency and quality serving as guiding principles [8]. It constructs a multi-dimensional evaluation system for China's high-quality economic development and conducts systematic analysis of regional development trends [9].

2.3. Green Finance for High-Quality Economic Development

Existing studies examining the role of green finance in high-quality economic development have predominantly emphasized its capacities in resource allocation and risk management. Green finance enables the effective alignment of economic and environmental goals through the enhanced distribution of resources [10]. Green financial instruments and mechanisms are effective in mitigating environmental pollution risks [11], and they contribute to high-quality development by improving ecological conditions, fostering innovation, and upgrading the industrial structure [12]. As a fundamental engine, green finance is instrumental in facilitating the green transition of enterprises and improving the caliber of national economic growth [13].

In summary, although scholarly attention has extensively covered the domains of sustainable finance, high-caliber economic growth, and the advancement of industrial structural composition, it predominantly focuses on pairwise relationships. Exploration of the intrinsic mechanisms and

holistic connections among these three elements remains insufficient. Nevertheless, there is no widely accepted approach for the formulation of an evaluation system pertaining to superior economic growth, with several investigations not without limitations in terms of metric selection and conceptual representation. Additionally, most literature fails to adequately account for regional variations. To bridge these research deficiencies, this paper develops a set of 23 metrics to assess high-caliber economic development, anchored in the new development paradigm. Using this framework, the study empirically investigates how green finance influences such development, the intermediary role of industrial structural transformation, and the divergent patterns identified among China's eastern, central, and western regions.

3. Research Hypothesis

Underpinned by the principle of sustainability, superior economic development prioritizes the improvement of the standard of economic expansion, as opposed to solely chasing quantitative expansion. Its core lies in balancing environmental protection with resource utilization. From the supply side, efforts should focus on advancing industrial structure toward higher levels, strengthening the leading role of the tertiary sector, and promoting industrial integration. From the demand side, it is essential to guide green consumption and production to establish sustainable development models. According to externalities theory, corporate production activities generate both positive and negative externalities. Environmental pollution represents a classic negative externality, as its private costs are lower than its social costs. Green finance internalizes environmental

costs through policy instruments, raising the price of polluting behavior and incentivizing green technological innovation and transformation, thereby promoting green development and enhancing economic quality. Regarding industrial structure upgrading mechanisms, green finance supports green and low-carbon enterprises through preferential credit and subsidies, guiding capital flows toward high-tech and environmental industries to optimize resource allocation. Simultaneously, it constrains high-polluting enterprises, driving their upgrading and transformation. Drawing on production function theory, an expansion in green capital contributes to the growth of eco-efficiency in total factor productivity, which in turn facilitates high-quality economic development. As a pivotal mechanism for advancing such development, green finance serves a pivotal function in China's economic advancement. Grounded in sustainable development theory and externality theory, this paper puts forward the following hypotheses:

H1: Green finance exerts a significant positive effect on high-quality economic development.

H2: The modernization of the industrial sector is not a negligible channel through which green finance contributes to quality-oriented economic growth.

H3: Spatial disparities characterize the influence of green finance on high-quality economic development, with distinct patterns observed across eastern, central, and western China.

4. Measuring High-Quality Economic Development

4.1. Indicator System for High-Quality Economic Development

Table 1. Indicator system for High-quality economic development

	Primary Indicator	Secondary Indicator	Indicator Description
	Indicator System for High-Quality Economic Development	Technological advancement	Technology Transaction Activity
R&D Intensity			R&D expenditure of industrial enterprises above designated size / GDP
Human Capital			Number of higher education students per 100,000 people
Technological Innovation Level			Number of patents granted
Structural alignment		Urban-Rural Structure	Urbanization rate
		Industrial Structure(+)	Increase in the proportion of tertiary industry output to regional GDP
		Urban-Rural Consumption Coordination	Per capita consumption of urban residents / per capita consumption of rural residents
		GDP Growth Rate	Regional GDP growth rate
		GDP Per Capita	GDP per capita
Ecological conservation		Wastewater per Unit Output	Wastewater Discharge / GDP
		Emissions per Unit Output	Sulfur Dioxide Emissions / GDP
		Annual Average PM2.5 Concentration	Estimated global surface PM2.5 concentration data from the UW Atmospheric Composition Analysis Group
		Greening Level	Per Capita Park Green Area
		Environmental Protection Expenditure Level	Environmental Protection Expenditure / GDP
International cooperation		Energy Consumption Elasticity Coefficient	Energy Consumption Growth Rate / GDP Growth Rate
		Foreign Trade Dependence	Total Import and Export Volume / GDP
		Proportion of Foreign Investment (+)	Total Foreign Investment / GDP
Shared		Number of Foreign-Invested Enterprises	Number of Foreign-Invested Enterprises
		Medical Level	Number of Hospital Beds per 10,000 People
		Urban Registered Unemployment Rate	Urban Registered Unemployment Rate
		Consumption Level	Total Retail Sales of Consumer Goods / GDP
		Social Welfare	Social Security and Employment Expenditure / GDP
		Education Expenditure	Education Expenditure

Guided by the five new development concepts—technological advancement, structural alignment, ecological conservation, international cooperation, and sharing—China's pursuit of high-quality economic development follows a strategic path tailored to its national conditions. These principles formulate essential guidance for this transformative process. High-quality economic development possesses multidimensional and systemic richness, necessitating the establishment of a comprehensive evaluation system commensurate with its scope. Based on the foundational work of Zhan Shaowen and Jiao Yanan, this study develops an assessment framework for economically-sound and sustainable development guided by the five foundational development tenets, which comprises 23 detailed indicators. A full breakdown of these metrics is provided in Table 1.

4.2. Assessment of High-Quality Economic Development Employing the Entropy Method

An evaluation of high-quality economic development was conducted using the entropy method for 30 provinces in China, grouped into eastern, central, and western regions. The mean values for each region were computed over the period 2011–2021. The results, presented in Table 2, indicate a consistent upward trajectory in development levels across all provinces. Specifically, the mean score of the eastern region registered an increase from 0.352 in 2011 to 0.384 in 2021. The central region's score increased from 0.203 in 2011 to 0.216 in 2021, and the western region's score rose from 0.194 in 2011 to 0.206 in 2021. A distinct east-central-west gradient is evident in the level of high-caliber economic growth, with the eastern region being the most developed, the central region following closely, and the western region lagging behind. This pattern reveals that development across China is not uniform, indicating marked regional imbalances.

Table 2. Scores of High-Quality Economic Development by Region (2011-2021)

Region	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Eastern China	0.352	0.354	0.357	0.360	0.363	0.367	0.370	0.374	0.377	0.380	0.384
Central China	0.203	0.204	0.204	0.206	0.207	0.209	0.210	0.213	0.211	0.212	0.216
Western China	0.194	0.195	0.197	0.198	0.197	0.196	0.120	0.197	0.201	0.203	0.206

5. Empirical Research Analysis

5.1. Model Construction

5.1.1. Construction of a Two-Way Fixed Effects Model

This research utilizes a two-way fixed effects modeling approach. An F-test was first conducted, yielding an F-statistic of 109.41. Since this value exceeds the F-critical value at the 0.01 significance level, a model with fixed intercepts was constructed. Subsequently, a Hausman test was performed, with a p-value of 0.038, which is less than 0.05. Therefore, at the 5% significance level, the fixed effects model was selected for analysis. Within the regression model, high-efficiency and low-consumption is designated as the dependent variable, while green finance constitutes the core explanatory variable. Control variables include Human Capital Level, Degree of Government Intervention, Economic Development Level, and Degree of Openness. Data from 30 provinces spanning 2011-2021 were collected and organized for empirical testing using the fixed-effects model. The constructed regression model is as follows:

$$HED_{it} = \alpha_0 + \alpha_1 GF_{it} + \sum \alpha_i control_{it} + province_i + year_t + \varepsilon_{it} \quad (1)$$

5.1.2. Constructing the Mediated Effect Model

To examine Hypothesis H2 proposed above—which posits that green finance drives high-quality economic development through industrial upgrading—this study establishes a mediation model as follows:

$$IS_{it} = \beta_0 + \beta_1 GF_{it} + \sum \beta_i control_{it} + province_i + year_t + \varepsilon_{it} \quad (2)$$

$$HED_{it} = \gamma_0 + \gamma_1 GF_{it} + \gamma_2 IS_{it} + \sum \gamma_i control_{it} + province_i + year_t + \varepsilon_{it} \quad (3)$$

In the model, IS represents the variable denoting industrial structure upgrading. The first step involves performing a regression on Model (1). The presence of a positive and statistically significant coefficient α_1 indicates a beneficial effect of the influence of sustainable finance on qualitatively advanced economic progress. Proceed to the subsequent test using Model (2) to assess how green finance influences the advancement of industrial structural modernization, with the regression coefficient being β_1 . Lastly, empirical specification (3) is employed to estimate the causal effect of green finance on high-quality economic development, controlling for the mediating role of industrial structure upgrading. The regression coefficients are γ_1 for green finance and γ_2 for industrial structure upgrading. If β_1 and γ_2 are significant while γ_1 is insignificant, a full mediation effect exists. If β_1 , γ_2 , and γ_1 are all significant, a partial mediation effect is present.

5.2. Variable Selection and Data Sources

5.2.1. Dependent Variable

The dependent variable is high-quality economic development. A comprehensive framework for assessing high-quality economic development was developed and employed, encompassing 23 variables across the five dimensions of holistic development. The entropy method was

utilized to compute the high-quality economic development index for 30 provinces over the period 2011-2021, enabling a comprehensive assessment of regional development levels.

5.2.2. Core Explanatory Variable

The core explanatory variable is green finance (GF).

Drawing upon the methodology of Fang Jianguo et al., a green finance evaluation system was constructed based on seven dimensions including green credit and green investment, as shown in Table 3. An entropy-based measurement approach was utilized to derive the composite green finance index, with data undergoing standardization processing.

Table 3. Green Finance Evaluation System

Region	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Eastern China	0.352	0.354	0.357	0.360	0.363	0.367	0.370	0.374	0.377	0.380	0.384
Central China	0.203	0.204	0.204	0.206	0.207	0.209	0.210	0.213	0.211	0.212	0.216
Western China	0.194	0.195	0.197	0.198	0.197	0.196	0.120	0.197	0.201	0.203	0.206

5.2.3. Mediating Variable

The intermediate variable is industrial structure upgrading (IS). The industrial structure level coefficient, which reflects the comprehensive level of industrial upgrading, is constructed based on assigned values and weights applied to the three sectors. The industrial structure upgrading coefficient is constructed by assigning weighted values to each sector based on its share of GDP. Specifically: Industrial Structure Upgrading = (Primary Industry / GDP) × 1 + (Secondary Industry / GDP) × 2 + (Tertiary Industry / GDP) × 3. The resulting value falls within the interval [1, 3], with higher values—particularly those approaching 3—indicating a greater degree of industrial advancement.

5.2.4. Control Variable

The study incorporates the following control variables: human capital endowment, government intervention, regional economic development, and openness to foreign trade. Among these, the level of human capital is proxied by the enrollment rate in higher education institutions relative to the total population. Human capital serves as the foundation for technological innovation and scientific advancement, and its enhancement contributes to promoting high-caliber economic growth. The level of governmental intervention is quantified by the ratio of fiscal expenditure to regional GDP. Moderate government intervention can mitigate market failures and stabilize economic operations; however, excessive intervention may stifle market vitality, rendering its impact uncertain. Economic development is captured by the log of

per capita GDP—a key indicator and expected catalyst for high-quality development. Openness is defined as the total trade value (imports plus exports) divided by GDP. Openness facilitates the international flow of technology, knowledge, and talent, serving as a catalyst for high-quality economic development.

5.2.5. Data Sources

The data used in this study are mainly derived from authoritative statistics published by the National Bureau of Statistics, such as China Statistical Yearbook and China Tertiary Industry Statistical Yearbook, as well as the official website of the People's Bank of China, Wind database and other databases.

5.3. Descriptive Statistics

Table 4 shows a mean value of 0.261 and a standard deviation of 0.118 for high-quality development, with values spanning from 0.117 to 0.625. This range reflects significant regional variation in economic development quality. The considerable divergence in green finance—yielding a minimum value of 0.058 and a maximum of 0.881—points to a pronounced interprovincial imbalance in its development. By comparison, the estimated parameters for both the mediating factor of industrial structural advancement and the set of controlled covariates all fall within an acceptable and empirically plausible range, suggesting no systematic skew or outlier issues.

Table 4. Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
HED	330	0.261	0.118	0.117	0.625
IS	330	2.380	0.129	2.166	2.836
GF	330	0.494	0.179	0.058	0.881
HC	330	0.020	0.056	0.008	0.042
GI	330	0.249	0.103	0.107	0.643
lnpGDP	330	10.875	0.444	9.706	12.123
Open	330	0.264	0.289	0.008	1.548

5.4. Base Regression Results

Table 5 reports the results of the base regression. The baseline regression in column (1), controlling for time and region effects, shows a significantly positive coefficient of 0.092 for GF at the 1% level, suggesting a strong preliminary correlation between green finance and the outcome variable. The coefficient estimates for Green Finance in Column (2), after controlling for additional variables, stand at 0.045 and are statistically significant at the 1% level. This suggests that

green finance plays a stabilizing role in economically-sound and sustainable development, a outcome that correlates positively with progress in the green finance sector. The regression coefficients for all other control variables are significantly positive. Factors including human capital, government intervention, economic development, and external openness yield favorable impacts on high-quality economic development—a result in full accordance with theoretical premises.

Table 5. Base Regression Results

VARIABLES	(1)	(2)
	HED	HED
GF	0.092***	0.045***
	(6.91)	(2.84)
HC		0.800***
		(3.12)
GI		0.423
		(0.68)
lnpGDP		0.106***
		(6.39)
Open		0.063***
		(4.37)
Constant	0.205***	-1.032***
	(30.88)	(-5.53)
Observations	330	330
R-squared	0.579	0.665

5.5. Mechanism Regression Results

As summarized in Table 6, green finance significantly drives industrial structure upgrading, with a coefficient of 0.104 (1% significance) in column (1). Column (2) shows a

coefficient of 0.072 for industrial upgrading (1% significance) and 0.037 for green finance (5% significance), supporting the conclusion that industrial upgrading serves as a partial mediator in the relationship between green finance and high-quality development, with a significant mediation effect.

Table 6. Mechanism regression results

VARIABLES	(1)	(2)
	IS	HED
IS		0.072***
		(20.55)
GF	0.104***	0.037**
	(4.36)	(2.23)
HC	10.556***	0.040***
	(3.83)	(4.00)
GI	3.299	0.185
	(0.61)	(0.24)
lnpGDP	0.952***	0.038***
	(5.34)	(3.39)
Open	0.364**	0.037***
	(2.35)	(3.97)
Constant	-8.656**	-0.409***
	(-4.32)	(-3.34)
Observations	330	330
R-squared	0.512	0.741

5.6. Robustness Test

5.6.1. Replacement Variable Method

To address potential estimation biases resulting from variable construction, this study recalculates the high-caliber economic growth variable by adopting the methodology proposed by Sun Hao and Gui Heqing et al. The regression outcomes are reported in Table 7. Column (1) includes only the core explanatory variable, green finance, while controlling for year and region fixed effects. The estimated coefficient of GF is 1.190, which is statistically significant at the 1% level. After incorporating control variables, as shown in column (2), the coefficient of GF remains positively significant at 1.178, passing the 1% significance test. These results reinforce a positive association between green finance and high-quality economic development, aligning with the baseline regression findings and confirming the robustness of the study's conclusions.

5.6.2. Change the Study Interval

The time periods 2012-2021 and 2011-2020 are selected respectively to reconstruct the panel data and conduct regression. The outcomes displayed in Table 8 demonstrate that green finance persists in demonstrating a measurable and contributory influence on the advancement of high-quality economic growth. This finding aligns with the core regression results, further confirming that the benchmark conclusions remain robust across the temporal dimension.

5.7. Heterogeneity Analysis

A heterogeneity analysis was conducted across the 30 provinces categorized into eastern, central, and western regions. The empirical estimates presented in Table 9 demonstrate a discernible promotive effect of green finance on high-quality economic development across all three regions, albeit with discernible regional heterogeneity. The corresponding coefficients are estimated to be 0.057, 0.042, and 0.037, respectively, revealing a gradient of diminishing

efficacy from east to west—thus lending support to Hypothesis 3. This divergence may be attributed to the relatively underdeveloped state of green finance in western

regions, which attenuates its positive impact compared to that observed in more economically advanced central and eastern areas.

Table 7. Descriptive Statistics

VARIABLES	(1)	(2)
	HED2	HED2
GF	1.190***	1.178***
	(12.03)	(9.51)
HC		0.311*
		(1.71)
GI		0.034
		(0.70)
lnpGDP		0.003
		(0.22)
Open		0.011
		(0.97)
Constant	-0.007	-0.050
	(-1.56)	(-0.38)
Observations	330	330
R-squared	0.866	0.864

Table 8. Change the Study Interval

VARIABLES	2012-2021	2011-2020
	HED	HED
GF	0.043***	0.049***
	(2.81)	(3.06)
HC	0.711***	0.819***
	(2.98)	(3.17)
GI	0.432	0.361
	(0.83)	(0.61)
lnpGDP	0.096***	0.134***
	(5.29)	(7.29)
Open	0.042*	0.073**
	(1.81)	(2.09)
Constant	-0.963***	-1.084***
	(-4.37)	(-5.59)
Observations	300	300
R-squared	0.569	0.632

Table 9. Heterogeneity Analysis

VARIABLES	Eastern	Central	Western
	HED	HED	HED
GF	0.057***	0.042***	0.037***
	(3.61)	(3.06)	(3.45)
HC	0.711***	0.719**	0.829**
	(2.68)	(2.29)	(2.17)
GI	0.832	0.691	0.697
	(0.83)	(0.51)	(0.47)
lnpGDP	0.086***	0.194**	0.124**
	(5.29)	(2.16)	(2.08)
Open	0.052***	0.062***	0.067***
	(4.38)	(3.81)	(3.87)
Constant	-0.963**	-0.884***	-0.684**
	(-2.37)	(-3.69)	(-2.09)
Observations	121	88	121
R-squared	0.578	0.630	0.686

6. Conclusion

This study yields the following key findings: (1) a strong and stable correlation is evident between green finance and high-quality economic development; (2) industrial structure

upgrading acts as a pivotal mediator in the mechanism linking green finance to enhanced economic quality; (3) marked regional variations characterize China's high-quality development landscape, typically following a declining gradient from eastern to western regions. Furthermore, while green finance demonstrates a substantial positive influence

across all zones, its efficacy weakens gradually from east to west. Based on these findings, the following policy recommendations are proposed:

First, priority should be given to improving the green financial system, which requires robust policy support and enhanced market regulation. We should expedite the establishment of a robust legal and regulatory framework for green finance. This includes clarifying property rights responsibilities and standardizing business processes. Furthermore, policy incentives such as preferential interest rates and repayment priority should be implemented to stimulate green investment. At the same time, we should expand the market scale of green credit and green securities, promote product innovation, and make up for the shortcomings of the system and mechanism.

Second, promote the greening and advanced transformation of industrial structure. Combined with local advantageous industries, we should accelerate the ecological and technological modernization of conventional industries, focus on cultivating sustainable and low-carbon industrial zones, and build high-tech and advanced manufacturing bases. Strengthen green technology research and development and talent cultivation to provide sustainable impetus for industrial upgrading.

Thirdly, promote synergistic regional development. Encourage in-depth cooperation between East, Central and West China, promote experience learning and policy synergy, and support less developed regions to explore unique development paths. Strengthen interregional information sharing, mutual recognition of standards and financial interoperability, narrow the gap in green financial effects, and promote high-quality and coordinated economic development.

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