



Can Green Finance Promote Corporate Green Transformation?

— Empirical Evidence from China's A-Share Listed Companies

Ruoxi Yu* 

School of Business Administration, Northeastern University,
Shenyang 110169, Liaoning, China

*Haha2950769740@qq.com

Abstract. Using China's A-share listed companies as a sample, this study empirically examines the effects of green finance on corporate green transformation, its operational mechanisms, and heterogeneous characteristics. Findings reveal that green finance significantly accelerates corporate green transformation through two pathways: environmental financing constraints and reduced financing costs. Heterogeneity analysis indicates that non-state-owned enterprises exhibit greater sensitivity to green finance, yielding more pronounced transformation effects. Notably, green finance significantly influences the transformation of technology-intensive enterprises but shows no significant impact on capital-intensive or labor-intensive firms.

Keywords: green finance; corporate green transformation; financing constraints; financing costs; heterogeneity analysis

1 Introduction

Currently, green finance is shifting from being driven by market self-exploration to being guided by regulations, helping enterprises overcome the problem of insufficient motivation for transformation. Green finance can reallocate capital toward less polluting, environmentally friendly enterprises. This not only mitigates environmental pollution but also supports sustainable economic development ^[1]. An increase of one standard deviation in credit supply raises the likelihood of green investment by 1.9 to 3.4 percentage points ^[2]. Simultaneously, issuing green bonds subjects enterprises to stricter market discipline, thereby genuinely driving their green transformation ^[3]. In recent years, green finance tools have become increasingly diverse. Taking China as an example, by the end of 2024, the outstanding balance of green loans exceeded 36.6 trillion yuan ^[4], while the cumulative issuance of green bonds surpassed 4.1 trillion yuan ^[5]. These two sets of data vividly illustrate the gradual maturation of China's green finance market. Among these instruments, green credit is frequently adopted by scholars as the starting point for studying the micro-level impacts of green finance. For instance, Dai Qiwen et al. (2025) found that green credit significantly promotes

green production, environmental quality improvement, and the refinement of green institutional systems ^[6]. Concurrently, pilot policies markedly enhance corporate green innovation activity, with stronger incentive effects observed among enterprises exhibiting higher pollution intensity ^[7].

Therefore, this research contributes to expanding the boundaries of theoretical exploration in the fields of green finance and corporate sustainability. The marginal contributions of this study manifest in two key aspects: First, it breaks through the limitations of previous literature that focused more on green innovation and pollution emissions, instead examining corporate green transformation as a systemic whole. Second, this paper examines the intrinsic relationship between green finance and corporate green transformation from the perspectives of financing constraints and financing costs.

2 Experimental Design

2.1 Sample Selection and Data Sources

This study selected Chinese A-share listed companies from 2012 to 2023 as the initial research sample. Corporate green transformation data is derived from annual reports of listed companies; green finance data originates from national and provincial statistical yearbooks, environmental status bulletins, and specialized statistical yearbooks; other firm-level data is sourced from the Guotai An database (CSMAR); macro-level data is obtained from the Wind database.

2.2 Variable Definitions.

Dependent Variables. Regarding corporate green transformation, this study measures it based on information disclosed in corporate annual reports. Specifically, 113 keywords related to green transformation were selected across five dimensions: advocacy initiatives, strategic concepts, technological innovation, pollution control, and monitoring management. The frequency of each keyword's appearance in listed companies' annual report texts was then counted to form a green transformation keyword frequency count. This count was increased by 1 and its natural logarithm taken to characterize corporate green transformation.

Core Explanatory Variable. Regarding green finance, this study employs the entropy weight method to calculate the green finance index for prefecture-level cities across China. The entropy weight method is a mathematical technique used to assess the dispersion of an indicator, greater dispersion indicates a stronger influence on the comprehensive evaluation. The comprehensive evaluation system is shown in Table 1:

Mediating Variables. First, the Financing Constraint (SA) Index, following the methodology of Hadlock and Pierce ^[8], is calculated as:

$SA=-0.737\times Size+0.043\times Size^2-0.040\times Age$. Where Size is the natural logarithm of total corporate assets, Age is the number of years since the company's establishment, and a higher absolute value of the SA index indicates stronger financing constraints. Second, Debt Financing Cost (Cost): Measured as the ratio of interest expenses to interest-bearing liabilities.

Table 1. Green Finance Evaluation System

Dimension	Indicator	Calculation Formula
Green Credit	Share of Environmental Protection Project Loans	Total Environmental Protection Project Loans in the Province / Total Loans in the Province
Green Investment	Environmental Pollution Control Investment as a Percentage of GDP	Environmental pollution control investment / GDP
Green Insurance	Degree of environmental pollution liability insurance promotion	Environmental pollution liability insurance revenue/total premium income
Green bonds	Green Bond Development Level	Total Green Bond Issuance / Total Bond Issuance
Green Support	Share of Environmental Protection Expenditures in Fiscal Budget	Fiscal Environmental Protection Expenditures / Fiscal General Budget Expenditures
Green Funds	Green fund share	Total Market Value of Green Funds / Total Market Value of All Funds
Green equity	Green Equity Development Depth	Carbon Trading, Energy Rights Trading, Pollution Rights Trading / Total Trading Volume in Equity Markets

Control variables. To control for other factors potentially influencing corporate green transformation, this study incorporates the following control variables: Enterprise size (Size), Profitability (ROA), Financial leverage (Leverage), Liquidity, Board size (Board), Executive compensation (Salary), Company age (Age), Price-earnings ratio (PE), Shareholding Concentration (Top 5), Industrial structure (Industry), Economic development level (GDP).

2.3 Model Specification

Benchmark Regression Model. The following two-way fixed-effects model is constructed:

$$GTI_{i,t}=\alpha+\beta_1GFI_{i,t}+\sum_{j=1}^k\gamma_jControls_{i,t}^j+\mu_i+\lambda_t+\epsilon_{i,t}$$

$GTI_{i,t}$: Green transformation index for firm i in year t ; $GFI_{i,t}$: represents the level of green finance development faced by firm i in year t ; $Controls_{i,t}^j$: denotes the aforementioned k control variables; μ_i : Fixed effects for individual enterprises, controlling for firm heterogeneity that does not change over time; λ_t : Represents the annual fixed effect, controlling for time trends and macroeconomic shocks; $\epsilon_{i,t}$: is the random disturbance term. The coefficient β_1 is the core parameter of interest in this study.

2.4 Descriptive Statistics

Table 2 reports the descriptive statistics for key variables.

Table 2. Descriptive Statistics Table

VarName	Obs	Mean	SD	Min	Max
Green Transition Index	25701	1.997	0.847	0.000	3.970
Green Finance Index	24451	0.412	0.101	0.090	0.664
Size	25486	3.093	0.061	2.848	3.357
ROA	25485	0.052	0.061	-0.163	0.171
Leverage	22908	1.172	0.564	0.630	4.947
Liquidity	25457	0.780	2.047	-5.723	8.204
Board	17692	8.331	1.646	0.000	17.000
Salary	17644	0.312	0.376	0.005	1.689
Age	25483	9.213	8.380	0.000	27.000
PE	21658	58.711	86.751	6.843	550.452
Top5	25241	0.483	0.187	0.200	0.991
Industry	25691	55.495	10.550	34.500	84.800
GDP	25691	10.775	0.748	6.565	11.818

3 Empirical Findings and Analysis

3.1 Benchmark Regression Analysis

Results are presented in Table 3. As shown in Column (1), the coefficients of the Green Finance Index (GFI) remain significantly positive at the 1% level as different variables are progressively introduced. This demonstrates that green finance development significantly promotes corporate green transformation.

To ensure the reliability of the baseline conclusions, this study conducted robustness tests from multiple dimensions. The results are summarized in Column (2) to Column (4). By lagging the green finance index by one period (Column 1), we observe that the coefficient remains significantly positive. As shown in Column 2, the coefficient for green finance remains significantly positive. Column 3 shows that the coefficient for the core explanatory variable remains significant, while the signs and significance levels of control variables align with the benchmark model, further validating our conclusions.

Table 3. benchmark regression analysis and robustness test

VARIABLES	(1) Green Transition Index	(2) Lagged terms	(3) Exclusion from green finance reform and innovation pilot zones	(4) Exclusion of outliers
Green Finance Index	0.8462*** (5.59)		0.8962*** (5.62)	0.7300*** (4.78)
Lag_Green Finance Index		0.9271* ** (5.15)		
Control variables	YES	YES	YES	YES
Observations	14,993	11,115	12,932	14,993

Note: z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

3.2 Mechanism Analysis

The results are presented in Table 4. Column (1) shows that the coefficient of the green finance index on SA_index (a proxy for financing constraints) is highly significant at the 1% level. Simultaneously, observing column (2), the coefficient of SA_index also exhibits a significantly negative coefficient. This allows us to conclude that alleviating financing constraints plays a mediating role in the process of green finance driving green transformation. Column (3) in the table indicates that green finance significantly reduces corporate debt financing costs. Observing column (4), the coefficient of debt financing cost also exhibits a significantly negative coefficient. It indicates that reduced financing costs also play a mediating role in green finance's promotion of corporate green transformation.

Table 4. Mechanism Analysis

VARIABLES	(1) SA_index	(2) Green Transition Index	(3) Debt Financing Cost	(4) Green Transition Index
SA_index		-0.3682*** (-8.34)		
Green Finance Index	-0.5483** *	0.7091*** (4.67)	-0.0333*** (-4.17)	0.8298*** (5.48)
Debt Financing Cost				-0.3669*** (-2.91)
Control variables	Yes	Yes	Yes	Yes
Observations	14,993	14,993	14,993	14,993

Note: z-statistics in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.3 Robustness Analysis

Lagged Explanatory Variable. By lagging the green finance index by one period (Column 1), we observe that the coefficient remains significantly positive. This indicates that, conversely, higher green transformation among enterprises in a region can also drive the development of green finance in that region. This demonstrates that the impact of green finance on corporate green transformation is persistent and, to a certain extent, excludes the influence of reverse causality.

Excluding samples from green finance reform and innovation pilot zones. Since 2017, China has successively established numerous pilot zones for green finance reform, and these pilot zones typically receive greater policy support. To eliminate the interference of pilot zone policies on the green finance index, we can exclude pilot zone enterprises from the sample and rerun the regression. As shown in Column 2, the coefficient for green finance remains significantly positive. This indicates that green finance can also drive enterprises' green transformation process in non-pilot zones.

Outlier Removal. To mitigate the impact of individual outliers, we applied 3 σ truncation to primary continuous variables. Column 3 shows that the coefficient for the core explanatory variable remains significant, while the signs and significance levels of control variables align with the benchmark model, further validating our conclusions.

Table 5. Robustness Analysis

VARIABLES	(1) Lagged terms of explanatory variables	(2) Exclusion of enterprise samples from green finance reform and innovation pilot zones	(3) Exclusion of outliers
Lag_Green Finance Index	0.9271*** (5.15)		
Green Finance Index		0.8962*** (5.62)	0.7300** * (4.78)
Control variables	YES	YES	YES
Observations	11,115	12,932	14,993
Number of stkcd	2,661	2,734	3,092

3.4 Heterogeneity Analysis

Property Rights Heterogeneity. From the perspective of ownership structure, the results in Column (1) and Column (2) of Table 5 are markedly different. The coefficient for the green finance index in non-state-owned enterprises is 0.9883 and significant at the 1% level, whereas in state-owned enterprises, it is not only negative (-0.3267) but also insignificant. This indicates that green finance plays a greater role in promoting the green transformation of non-state-owned enterprises.

Industry Heterogeneity. Further analysis from an industry perspective reveals that columns (3) to (5) in Table 5 present the regression results for technology-intensive, asset-intensive, and labor-intensive industries, respectively. The data reveals that the green finance coefficient is significantly positive only in technology-intensive industries (1.5287), while it is not significant in asset-intensive or labor-intensive sectors.

Table 6. Heterogeneity Analysis

VARIABLES	(1) State-owned enterprises	(2) Non-state-owned enterprises	(3) Technology-inte nsive	(4) Asset-Inten sive	(5) Labor-inten sive
Green Finance Index	-0.3267 (-1.16)	0.9883*** (5.19)	1.5287*** (7.09)	0.2587 (0.84)	0.1885 (0.72)
Control variables	YES	YES	YES	YES	YES

Observations	3,866	10,121	7,306	2,457	5,097
Number of stkcd	777	2,365	1,647	513	1,044

4 Conclusions and Implications

First, green finance can significantly accelerate corporate green transformation. This conclusion holds true regardless of whether outliers are excluded or pilot zone samples are removed from the measurement. Second, alleviating financing constraints and reducing financing costs represent two crucial intermediary pathways through which green finance drives corporate green transformation. Third, from the perspective of ownership structure, the green finance coefficient for non-state-owned enterprises is highly significant at the 1% level, whereas it is not significant for state-owned enterprises. Analyzing by industry type, the green finance coefficient is only significantly positive in technology-intensive industries, while coefficients are insignificant in both asset-intensive and labor-intensive sectors.

References

1. Ma Jun. On Building China's Green Finance System [J]. Financial Forum, 2015, 20(5): 18-27. Link: http://greenfinance.org.cn/upfile/file/20150527161430_836986_43648.pdf
2. ACCETTURO A, BARBONI G, CASCARANO M, et al. Credit supply and green investments (Working Paper No. 615). Coventry: Centre for Competitive Advantage in the Global Economy (CAGE), University of Warwick, 2022. Link: https://www.bancaditalia.it/pubblicazioni/temi-discussione/2024/2024-1456/en_tema_1456.pdf
3. People's Bank of China. 2024 China Green Finance Development Report [R]. Beijing: People's Bank of China, 2024. Link: <https://www.pbc.gov.cn>
4. China Securities Regulatory Commission. 2024 China Green Bond Market Development Report [R]. Beijing: China Securities Regulatory Commission, 2024. Link: <http://www.csrc.gov.cn>
5. Dai Qiwen, Guo Zhongyuan, Lai Xuan Yu, et al. Impact Mechanism of Green Finance Policies on Corporate Green Development [J]. Journal of Natural Resources, 2025, 40(3): 667-691. DOI: <https://doi.org/10.31497/zrzyxb.20250307>
6. Wang Shiqi, Wang Yongqiao. Study on the Impact of Green Credit Policies on Green Innovation in Heavy Polluting Enterprises [J]. Industrial Technology Economics, 2025(3): 67-77. Link: <https://qikan.cqvip.com/Qikan/Article/Detail?id=7200272464>
7. Qi, H. J., & Liu, S. Q. Do Green Finance Policies Promote Corporate Green Innovation? Evidence from China's Green Finance Reform and Innovation Pilot Zones [J]. Contemporary Finance and Economics, 2023(3): 94-105. Link: <http://cfejxufe.magtech.com.cn/ddcj/CN/Y2023/V0/I3/94>
8. Hadlock C J, Pierce J R. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index [J]. The Review of Financial Studies, 2010, 23 (5): 1909-1940. DOI: <https://doi.org/10.1093/rfs/hhq009>

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 3.0 International License (<http://creativecommons.org/licenses/by-nc/3.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

