



# The mechanism of green finance on the greenwashing behavior of companies in high carbon industries: A heterogeneous environmental regulation perspective

Xin Miao, Guiqing Li \*, Jingyu Fu, Meng Sun, Yaqing Zhang,

School of Management, Chengdu University of Information Technology, Chengdu, P.R.China, 610103

E-mail: henamx@163.com, e2001011@163.com, 1296974555@qq.com, 953166372@qq.com, yqzhang998@163.com

**Abstract.** From the perspective of the development level of green finance, this paper measures the greenwashing behavior of listed high-carbon enterprises based on their data from 2015-2018, and explores the impact of green finance on the greenwashing behavior of enterprises through the mediating effect model. The results of the study show that: there is an inverted U-shaped relationship between green finance and corporate greenwashing behavior, and command-and-control and market-incentive environmental regulations partially mediate the impact of green finance on corporate greenwashing behavior; public-influence environmental regulations do not mediate the impact of green finance on corporate greenwashing behavior. The role of public-influenced environmental regulation in the influence of green finance on corporate "greenwashing" behavior is not mediated.

**Keywords:** Green finance; Heterogeneity; Environmental regulation; Greenwashing behavior; High-carbon industries

## 1 Introduction

At present, China has entered a critical stage of transformation for high-quality development, and it has become common for high-carbon industries and others to use economic instruments for green transformation and upgrading. In 2007, China first proposed the use of a green credit policy to achieve environmental regulation (Dongwei Su, et al. 2018), but with the continuous development of the green credit policy, there are still reasons such as external institutional pressure, unified green financial standards, and information asymmetry, which have caused some enterprises to fictitiously construct green projects in order to obtain the supportiveness of green financial institutions, obtain lower green financing costs, improve the availability of green loans and attract green investment and other interests to fraudulently obtain bank. In July 2021, the "Green Finance Evaluation Program for Banking Financial Institutions" and the "Catalogue of Green Bond Support Projects (2021)" came into effect, showing that China's green financial products are gradually becoming diversified on the one hand,

and the country's determination and determination to vigorously promote the development of green finance on the other. Some "non-green" enterprises in this context, to obtain preferential support from the national financial policy, will be non-environmental green project products bleaching green treatment, to obtain low-cost green capital. This phenomenon of "greenwashing" in the name of "environmental protection" has threatened the healthy development of China's green financial system and adversely affected the further promotion of China's market-oriented environmental protection mechanism. At present, there is little literature to analyze this problem in depth, and research on this issue is urgently needed.

The term "greenwashing" was first introduced by Jay Westerveld in 1986 and refers to a behavior in which companies communicate more symbolically about environmental issues than they implement substantive actions to gain legitimacy rights<sup>[2]</sup>. Later on, some scholars defined corporate greenwashing from the perspective of information communication; Lyon et al. (2011) defined corporate greenwashing as an information management strategy, so, an act of selectively disclosing positive information and concealing negative information to enhance the image of the company. As for the drivers of "greenwashing", scholars at home and abroad have focused on external institutional pressures, internal communication, and coordination, such as environmental regulation and media attention<sup>[5]</sup>, as drivers of corporate "greenwashing" from the perspectives of neoclassical economics and information economics. The driving force of green finance on enterprises' "greenwashing" behavior is only from the perspective of green credit and green investment in green finance, while green finance and environmental regulation, as important support and driving force for achieving the goal of carbon neutrality in China, do not work in isolation, but are complementary and mutually reinforcing. Therefore, it is necessary to consider both green finance and environmental regulation as drivers of enterprises' "greenwashing" behavior from the perspective of green finance as a whole; based on this, this paper tries to focus on the relationship between these three, and analyze the influence mechanism of green finance and environmental regulation on greenwashing behavior in China from a non-linear perspective. Specifically, this paper selects 1307 listed companies in high-carbon industries to make the study more relevant and realistic, but it may also be limited and lack generalizability.

## **2 Theoretical basis and research hypothesis**

### **2.1 Status of research on the relationship between green finance and corporate "greenwashing" behavior**

At present, there are three main views of domestic and foreign scholars on the impact of green finance on the "greenwashing" behavior of enterprises. Firstly, based on the neoclassical perspective of information economics, green finance can exacerbate corporate "greenwashing" behavior. In the pursuit of profit maximization, enterprises may adopt measures such as verbal promises and symbolic disclosures to maximize their profits before green finance-related policies are in place (Horiuchi et al., 2009); From the perspective of stakeholders, in the case of high uncertainty in the regulatory effectiveness of relevant policies and regulations such as green finance and environmental

regulation, enterprises will vigorously promote the environmental image and performance of enterprises to "greenwashing" due to the dual pressure of customers and investors (Vos, 2009). Secondly, green finance can, to a certain extent, discourage companies from "greenwashing". Anderson (2016) argues that green finance can, to a certain extent, guide the transformation and development of high-carbon industries through financial and economic instruments to encourage cleaner production, thereby restraining high-carbon emissions and achieving industrial transformation and upgrading. Thirdly, the relationship between green finance and corporate "greenwashing" behavior is non-linear and complex. Zhang Yu et al. (2021) argue that green finance has both a facilitating and inhibiting effect on the development of green transformation of enterprises, the effect of which depends on the intensity of environmental technological progress. In addition, the mechanism of green finance's influence on the green transformation of enterprises is determined by the relationship between the scale, technology, and structural effects <sup>[10]</sup>.

Based on the perspective of information economics and stakeholder theory, this paper argues that at the early stage when green finance is in the process of expanding its scale to promote economic growth, high-carbon enterprises take advantage of gaps such as uncertainty and information asymmetry in the development of green finance, and to seek profit maximization, they adopt channels such as verbal promises or false green certification to make great false green publicity for their enterprises, thus intensifying their "However, with the continuous development of green finance, enterprises will be incentivized to carry out green technological innovation based on preferential policies such as lower investment costs for green products, thus reducing the energy consumption of high-carbon enterprises and thus inhibiting their "green drift" behavior. "At the same time, with green finance continuously guiding the concept of green development, the development of high-carbon enterprises will be increasingly hindered and subject to greater business risks, thus forcing high-carbon enterprises to carry out the substantial transformation of their industrial structure, thereby reducing the emergence of symbolic "greenwashing" behavior. Therefore, based on the above analysis, this paper proposes the following hypothesis.

H1: There is an inverted "U" shaped relationship between the impact of green finance on corporate "greenwashing" behavior.

## **2.2 The mediating role of environmental regulation in the relationship between green finance and "greenwashing" behavior**

### **2.2.1 The mediating role of command-and-control environmental regulation in the relationship between green finance and "greenwashing" behavior.**

This paper draws on the study of Zhang Jiangxue et al. (2015) to classify environmental regulation tools into three categories: command-and-control, market-incentive, and public participation. Command-and-control environmental regulation is a series of laws and regulations enacted by the State Environmental Protection Administration and other departments, using direct control and other means to regulate the pollution reduction and energy consumption of enterprises and to enforce the reduction of environmental pollution by enterprises. According to the factor endowment hypothesis, when

the cost of environmental compliance is lower than the endowment benefit from environmental regulation, firms can accept strict environmental regulation<sup>[15]</sup>, increase environmental protection investment and improve the transparency of environmental information to reduce corporate information "greenwashing" behavior. However, when green finance is in the initial development stage of promoting economic growth, high-carbon enterprises tend to shift their highly polluting operations to regions with less intense environmental regulations, resulting in enterprises not engaging in substantive green behaviors, but instead taking advantage of the information asymmetry between creditors, consumers and other stakeholders to conceal negative information about the enterprise or whitewash its environmental image. Therefore, based on the above analysis, this paper proposes the following hypothesis.

H2a: The role of command-and-control environmental regulation in mediating the inverted U-shaped relationship between green finance and corporate "greenwashing" behavior.

### **2.2.2 The mediating role of market-incentivized environmental regulation in the relationship between green finance and "greenwashing" behavior.**

Market incentive-based environmental regulation is to regulate the emission behavior of high-carbon industries through the government's use of market-based instruments, thereby incentivizing enterprises to accelerate the green transformation and improve green innovation (Peng Xing, et al. 2016), to achieve market-based incentive compensation for enterprises' environmental behavior. Market-incentivized environmental regulation often promotes enterprises to increase substantive green behaviors through levying emission fees and government subsidies, however, as the levy of emission fees and so on will crowd out the enterprises' investment in green innovation and research and development, high-carbon enterprises will, at the early stage of green finance development, take advantage of the gap of unified standards of green regulatory bodies' certification and so on, to "bleach green" for non-green projects to obtain funds, and use the green investment funds obtained for high-carbon pollution projects and a series of "bleaching green" behaviors. "However, with the gradual improvement of the development of green finance, the emission fees charged by the government will increase the production costs of enterprises, while green finance can ensure that high-carbon enterprises can obtain green investment funds for green technology research and development through economic means, and eventually high-carbon enterprises will have to carry out substantial In the end, high-carbon enterprises will have to make substantial green transformation and upgrade and green technology innovation to avoid greater business risks, thus inhibiting the occurrence of enterprises' "green drift" behavior. Based on the above analysis, this paper proposes the following hypothesis.

H2b: Market-incentivised environmental regulation plays a mediating role in the inverted U-shaped relationship between green finance and corporate 'greenwashing' behavior.

**2.2.3 The mediating role of public participatory environmental regulation in the relationship between green finance and "greenwashing" behavior.**

Public participation-based environmental regulation is the public's revelation and accusation of corporate pollution behavior to safeguard their rights and interests (Huang, Qing Huang, et al., 2017), thus supervising corporate emissions reduction behavior. With the gradual prosperity of economic development, the public's demand for quality of happy life has improved and environmental awareness has been strengthened, which is conducive to supervising enterprises to respond to the public, the government, and other interest subjects. However, because China's public rights protection mechanism is still in the development and improvement stage, public supervision is in the passive participation party after the fact, and the public's attention to corporate environmental information disclosure is low, so the influence on corporate information "bleaching green" behavior is weak. Based on the above analysis, this paper proposes the following hypotheses.

H2c: Public participation in environmental regulation does not mediate the inverted U-shaped relationship between green finance and corporate "greenwashing" behavior.

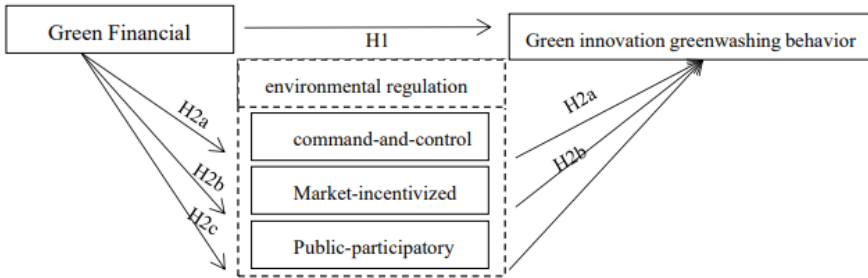


Fig. 1. Theoretical model [Photo credit: Original]

**3 Research design**

**3.1 Sample selection**

This paper selects the period of 2015-2018 as the study time interval to evaluate the effect of the green financial development system on supporting high-carbon enterprises in recent years. The statistical analysis of the data was done using Stata and Excel software, respectively. Based on the above conditions, the panel data of 1307 high carbon enterprises with a total of 1716 valid observations were screened out to form. The required data were obtained from CSMAR, annual reports of listed companies, China Environmental Yearbook.

### 3.2 Variable description

#### 3.2.1 Explanatory variable: level of green financial development (GF).

Drawing on the practice of domestic and foreign scholars, this paper uses the entropy value method to fit five indicators such as green credit, green securities, green insurance, green investment, and carbon finance into a green finance index, representing the development level of green finance in various regions.

#### 3.2.2 Explained variable: green innovation "greenwashing" behavior (GI).

Based on the experience of the relevant literature, 10 relevant items were selected for corporate "greenwashing" behavior, as well as the disclosure characteristics of the relevant items, and the "greenwashing" index (GI) was also defined (see the formula below).

$$GI = \frac{\sum_i^{10} X_i}{\sum_i^{10} Y_{i+1}} \quad (1)$$

If the relevant items of the enterprise have symbolic disclosure characteristics,  $X_i$  is scored as 1, and if they have substantive disclosure characteristics,  $Y_i$  is scored as 1. To prevent the denominator of the formula from being zero, 1 is added to the denominator.

#### 3.2.3 Other variables: as in Table 1.

**Table 1.** Variable description table [Photo credit: Original]

Variable Type	Variable symbol	meaning
Explanatory variables	GF	The entropy method fits five green financial indicators
Explained variables	GI	$GI = \frac{\sum_i^{10} X_i}{\sum_i^{10} Y_{i+1}}$
Regulating variables	PITI	Pollution source regulatory information disclosure index
	Flwd	Annual sewage fee income of each region
	Public	logarithm of Public telephone network environment reporting
Control variables	Growth	Revenue growth
	Lev	Total liabilities/total assets
	ROE	The logarithm of total income

## 4 Empirical Results and Analysis

### 4.1 Regression analysis

This study obtains a high degree of correlation between variables through correlation analysis. To further understand the impact of various variables on innovation performance, a regression model will be established for in-depth discussion. The regression results are shown in Table 2.

**Table 2.** Regression analysis [Photo credit: Original]

	m1	m2	m3	m4	m5	m6	m7	m8
VARIABLES	GI	GI	PITI	FLwd	Public	GI	GI	GI
PITI						0.050*		
						(1.78)		
FLwd							0.069**	
							(2.56)	
Public								0.035
								(1.37)
GF <sup>2</sup>		-0.047***	-0.230***	0.319***	-0.283***	-0.035**	-0.069***	-0.037**
		(-2.95)	(-16.82)	(22.40)	(-18.65)	(-2.07)	(-3.82)	(-2.13)
GF	0.089***	0.163***	0.891***	-0.874***	0.757***	0.118***	0.223***	0.136***
	(4.06)	(4.90)	(31.23)	(-29.35)	(23.89)	(2.84)	(5.48)	(3.55)
Constant	-0.000	0.047*	0.230***	-0.319***	0.283***	0.035	0.069**	0.037
	(-0.00)	(1.75)	(9.96)	(-13.27)	(11.05)	(1.28)	(2.45)	(1.34)
Observations	1,716	1,716	1,716	1,716	1,716	1,716	1,716	1,716
R-squared	0.197	0.201	0.410	0.358	0.272	0.203	0.204	0.202
Year	YES	YES	YES	YES	YES	YES	YES	YES

In the Model 1 analysis of green finance and corporate greenwashing behavior, green finance is significantly positively correlated with corporate greenwashing behavior, with the promotion effect on corporate greenwashing behavior being 0.089, which is significant at the 1% level of significance. Model 2, with the inclusion of a quadratic term for green finance GF, shows a negative correlation with corporate greenwashing behavior at the 1% significance level, and the fit of the model is significantly more toxic. Therefore, hypothesis 1 is tested and there is an inverted U-shaped relationship between green finance and corporate 'greenwashing' behavior. Further calculations show that when the GF of green finance is 1.235, the most serious "greenwashing" behavior of enterprises is observed, and the range of green finance is -1.330-3.047, which further verifies that the relationship between green finance and enterprises' "greenwashing" behavior is This further demonstrates that there is an inverted U-shaped relationship between green finance and corporate greenwashing behavior.

From Model3 and Model6, it can be verified that command-and-control environmental regulation has a mediating role in the positive relationship between green finance and corporate greenwashing behavior, and from the significance of the coefficients, it can also be seen that command-and-control environmental regulation plays a partial mediating role, so, hypothesis H2a is valid. From Model4 and Model7, it can be verified that market-incentivized environmental regulation plays a mediating role in the negative relationship between green finance and corporate greenwashing behavior, so,

Hypothesis H2b holds. From Model5 and Model8, it can be verified that public participation in environmental regulation does not play a mediating role in the positive relationship between green finance and corporate greenwashing behavior, and the significance of the coefficient also shows that public participation in environmental regulation plays a partial mediating role, so, hypothesis H2c is not valid.

## 4.2 Robustness test

Currently, there are according to the 2016 meeting of China's central deep reform group considered and adopted the "Guidance on Accelerating the Construction of Green Financial System", which requires to further improve the quality of environmental information disclosure of listed enterprises, the comparability of accounting data brought by the current corporate accounting standards will be affected. Therefore, to test the robustness of the results of the above study, this section uses data from 2013 to 2016 instead and performs regression analysis for each component separately, with the same regression results as above.

## 5 Conclusion

(1) The relationship between green finance and corporate "greenwashing" behavior is not a simple linear relationship. This result shows that when the scale effect of green finance is greater than the technical effect, high-carbon industries take advantage of gaps such as uncertainty in environmental regulations and information asymmetry to increase the frequency of "greenwashing" behavior of enterprises; When the technical effect of green finance is greater than the scale effect, the high-carbon industry has to carry out green technology reform and innovation based on the avoidance of business risks and the incentive and support of green finance for clean technology innovation, so as to effectively reduce the emergence of "greenwashing" behavior. Therefore, relevant departments should increase the innovation of green financial instruments to provide financial guarantees for the transformation of high-carbon industries into green industries, and at the same time, in order to reduce the frequency of "greenwashing" behavior, legal departments should gradually improve carbon benchmark regulatory standards, and increase the supervision of enterprises' green assets, refine their regulatory processes, and ensure the accuracy of green product characteristics and reporting standards.

(2) The role of control-based environmental regulation and market-incentive-based environmental regulation in the influence of green finance on the greenwashing behavior of high-carbon enterprises is partially mediated, whereas public participation-based environmental regulation does not play a mediating role in the influence of green finance on the greenwashing behavior of high-carbon enterprises. The reason for this may be that public participation is currently not a major issue in China. The reason for this may be that China's current mechanisms for public participation in environmental advocacy are in a state of improvement and that public attention to disclosure of corporate 'greenwashing' behavior is low, so the impact on substantive green transformation



behavior is weak So, China should flexibly apply environmental regulations according to the characteristics of different industries, adopt the practice of supervision and encouragement, and use green economic means to introduce green financial resources into the green environmental protection industry, give full play to its backward effect on industrial optimization, and promote green transformation and development.

## Acknowledgement

This paper is supported by “Research on the Impact of Human-machine Cooperative Behavior Characteristics on Enterprise Human Resource Management System in the Era of Artificial Intelligence”(NSSFC:19BGL123); “Research on the strategy of introducing scarce high-end scientific and technological talents in Chengdu”(2021-RK00-00106-ZF); “Research on innovation and expansion of state-owned capital industrial investment” (SCTTC2022011); “Digital intellectualization and ideological politicization: the innovative practice of the training system of compound talents in human resources management specialist with the integration of technique and morality” (JG2021-1000).

## References

1. Su, Dongwei, Lian, Lili. Does green credit affect the investment and financing behavior of heavy polluters? [J]. *Financial Research*, 2018(12):123-137 (In Chinese)
2. Polonsky M J, Carlson L, Grove S, et al. International environmental marketing claims: Real changes or simple posturing? [J]. *International Marketing Review*, 1997, 14(4): 218-232.
3. Lyon TP, Maxwell J W. Greenwashing: Corporate environmental disclosure under threat of audit[J]. *Journal of economics & management strategy*, 2011, 20(1): 3-41
4. Da Yuan, Jia Xiaolin, Xin Lina. Review and Prospects of Research on Corporate Greenwashing Behavior[J]. *Foreign Economics and Management*, 2015 (12): 86-96. (In Chinese)
5. Horiuchi R, Schuchard R, Shea L, et al. Understanding and preventing greenwashing: A business guide[J]. London: Futerra Sustainability Communications, 2009: 1-39.
6. Vos J. Actions speak louder than words: Greenwashing in corporate America[J]. *Notre Dame JL Ethics & Pub. Pol'y*, 2009, 23: 673.
7. Anderson J. *Environmental Finance* [M]//Ramiah V, Gregoriou G. *Handbook of Environmental and Sustainable Finance*. London: Academic Press, 2016: 307- 333
8. Zhang Y, Qian S.-T. Green finance, environmental technology progress bias and industrial structure clean-up[J]. *Research Management*, 2022, 43(04):129-138. (In Chinese)
9. Li Mingwei. The impact of green finance on regional carbon emissions under environmental regulation[D]. Shandong University of Finance and Economics, 2022 (In Chinese)
10. Zhang Jiangxue, Cai Ning, Yang Chen. The Impact of Environmental Regulation on China's Industrial Green Growth Index[J]. *Chinese, Resources and Environment*, 2015(1):24-31 (In Chinese)
11. Gou Qianwen, Cai Ning. Institutional complexity and corporate environmental strategy choice: an interpretation based on the perspective of institutional logic [J]. *Comparative Economic and Social Systems*, 2015(1):125-138 (In Chinese)

12. Tang Guoping, Li Longhui, Wu Dejun. Environmental regulation, industry attributes and corporate environmental investment [J]. Accounting Research, 2013 (6): 83-89+96 (In Chinese)
13. Wang Banban, Qi Shaozhou. The technological innovation effects of market-based and command-based policy instruments for energy conservation and emission reduction: empirical evidence based on patent data of Chinese industrial sectors [J]. China Industrial Economy, 2016 (6): 91-108 (In Chinese)
14. Huang Qinghuang, Gao Ming, Wu Yu. The impact of environmental regulatory instruments on China's economic growth [J]. Journal of Beijing University of Technology (Social Science Edition), 2017 (5): 33-42 (In Chinese)

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), 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.

