Frontiers in Economics and Management Volume 5 Issue 9, 2024
ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

Literature Review on the Impact of Green Finance on Carbon Emissions

Zhanlei Xing, Xiaopo Sun*

Shaanxi University of Science and Technology, Xi'an,710021, China

*Corresponding Author

Abstract

As an important tool to promote the green transformation of the economy, green finance has a profound impact on carbon emissions through policy guidance, resource allocation and technical support. This paper summarizes the research status of the impact of green finance on carbon emissions, and analyzes the development of green finance in China and the world and its inhibitory effect on carbon emissions. Foreign scholars mainly study the role of green finance in reducing environmental pollution from a global perspective, while domestic scholars pay more attention to the specific impact of green finance practice on carbon emissions in China. Studies have shown that green finance has significantly reduced carbon emissions, especially in green credit, green securities and green investment. However, the specific measurement standards of green finance have not yet been unified, and the comprehensive disclosure of carbon emission data is also insufficient, so it is necessary to further improve the relevant research system. In addition, the inhibitory effect of green finance on carbon emissions through indirect paths such as industrial structure and technological innovation also needs to be further explored. Future research should focus on improving the data system, expanding research perspectives, and promoting international cooperation to jointly address the challenges of global climate change.

Keywords

Green Finance; Carbon Emissions; Literature Review.

1. Introduction

In recent years, China 's economic development mode is undergoing profound changes. In the past, China 's economy mainly relied on the high-speed growth model dominated by heavy industry. While promoting rapid economic development, this model also brought problems such as large resource consumption and serious environmental pollution. In order to cope with these challenges, the Chinese government has shifted its focus from quantitative growth to qualitative improvement, focusing on a new growth model that improves total factor productivity and resource utilization efficiency.

In September 2015, the Central Committee of the Communist Party of China and the State Council jointly issued the " Overall Plan for the Reform of the Ecological Civilization System. " In this paper, the important strategic concept of " building a green financial system " was clearly put forward and advocated for the first time. At the same time, the system was placed in a key policy position to lead all sectors of society to participate in environmental governance practices and accelerate the economy 's progress towards a high-quality development stage. Green finance is regarded as one of the key means to achieve the goal of green and low-carbon development, and has developed rapidly in China in recent years. The 2023 Central Financial Work Conference clearly pointed out that China should accelerate the strategy of building a strong financial country and devote itself to deepening the innovation and development of five

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

major fields : science and technology finance, green finance, pension finance, inclusive finance and digital finance. The 2024 government work report also incorporates " strengthening the construction of ecological civilization and promoting green and low-carbon development " into the ten major tasks of government work, and proposes to vigorously develop a green and low-carbon economy. Under the joint action of policy promotion and market demand, China 's green financial policy framework has been continuously improved, a multi-level green financial market system has been formed, and international cooperation in green finance has been deepened. These have played an important role in promoting carbon emission reduction and improving carbon emission performance for green finance.

Green finance has an impact on carbon emissions through policy guidance, resource allocation, technical support and other ways. On the one hand, green financial policies can guide the development of green and low-carbon fields, promote technological innovation and industrial transformation and upgrading ; on the other hand, green finance can improve energy efficiency and reduce carbon emission intensity by means of financial support and market incentives. In view of this, this paper systematically analyzes the impact of green financial development on carbon emissions from the perspective of literature review, in order to enrich the research content of green finance and provide useful reference for carbon emission reduction.

2. Green Finance Overview

In the study of green finance abroad, Cowan first proposed " green finance " and attributed it to the category of " environmental management, " defining green finance as a financing method in the field of managing the environment. In China, the concept of green finance was first formally proposed in 2015.In the " overall plan for the reform of the ecological civilization system " issued by the CPC Central Committee and the State Council, the important task of " building a green financial system " was clarified for the first time.

Green finance aims to promote the optimization of environmental quality, effectively cope with the challenges of climate change, and promote the efficient use and conservation of resources. This concept includes economic activities that provide comprehensive financial services for environmental protection projects, energy conservation and emission reduction technologies, clean energy development, green transportation system construction, and green building fields. These services involve investment and financing support, professional assistance in project operation management, and the provision of a comprehensive set of risk management strategies. This concept emphasizes the role of financial activities in promoting environmental protection and sustainable development. At present, the research on green finance mainly focuses on two aspects. One is about the construction of green finance index, so as to measure the development level of green finance. The second is the relevant policies on green finance, which measures the policy effect of green finance.The measurement of green finance usually includes secondary indicators such as green credit, green securities, green investment and green insurance. The measurement of green finance usually includes multiple aspects, which aim to comprehensively evaluate the environmental, social and economic benefits of green finance projects, policies or institutions. Specifically, green finance promotes high-quality economic development, and technological innovation plays both an intermediary role and a positive regulatory role in the process of green finance promoting high-quality development. Under the constraints of industrial structure upgrading, green finance has a non-linear impact on high-quality economic development. In the field of green financial policy research, Liu Chuanjiang and other scholars (2022) conducted an in-depth empirical analysis of the ' Green Credit Guidelines ' policy. The study points out that the green credit policy has a slowing effect on the progress of green technology in heavy polluting industries to a certain extent. Turning to the field of green bonds, the research results of You Zhiting et al. (2022) show a positive

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

trend, indicating that the green bonds issued in the eastern part of China have achieved remarkable results in promoting carbon emission reduction. In addition, about the green financial policy itself, in recent years, the academic community has carried out in-depth discussions from the two dimensions of policy evolution and characteristics.Through a systematic review, Du and Zheng (2019) summarized the development process of China 's green financial policy into three stages : initial establishment, rapid development and differentiated development, providing a clear framework for understanding its development context. Xin Yao Yao and Tang Juelan (2021) focused on the analysis of policy characteristics, and proposed that China 's current green financial policy system highlights the three core characteristics of strategy, integration and coordination. These characteristics jointly cast a solid foundation for promoting the steady development of China 's green finance.

3. Overview of Carbon Emissions

Since the industrial revolution, human beings have enhanced the ability to develop and transform nature. While promoting social progress and economic development, this process has also been accompanied by a huge consumption of natural resources, which has brought unprecedented damage to the environment. This kind of environmental degradation not only has a far-reaching impact, but also directly engulfs human beings. It is manifested in the severe challenge of global warming, the crisis of ozone layer damage, and the frequent occurrence of serious environmental pollution incidents in recent years. They are constantly warning us that the living environment of human beings is facing a huge threat. Therefore, improving environmental quality and actively reducing carbon emissions have become a global consensus and urgent task, which is imperative.

Environmental Kuznets Curve (EKC), as a typical research tool to explore the relationship between environment and economy, expounds the dynamic relationship between environmental degradation and per capita income growth. The theory points out that in the process of gradual increase in per capita income, the level of environmental pollution will increase accordingly. However, when the economic and social development reaches a critical threshold, the environmental pollution situation will gradually improve with the further growth of income. This finding reveals that there is an inverted U-shaped nonlinear relationship between environmental quality and income level. Shi Jianwen et al. (2024) believe that the environmental Kuznets curve indicates that there may be a negative relationship between economic growth and carbon emissions, emphasizing the importance of coordinated economic-environmental development. In view of the fact that the issue of carbon emissions has spawned a wide range of research interests, many scholars and experts have discussed in depth the multiple factors affecting carbon emissions based on the environmental Kuznets curve (EKC) theory. At the same time, the analysis methods for carbon emissions have also been gradually expanded and improved.

As an analytical tool, the structural decomposition method (SDA) deconstructs and analyzes the research objectives in detail by deeply using the data structure of the input-output table, thus providing rich and effective information support for the subsequent result analysis. This method has been paid more and more attention since the 1970 s, and its background is closely related to the oil crisis experienced by the world at that time. The crisis not only profoundly changed the pattern of the energy market, but also led to the continuous rise of energy prices to historical highs. This chain reaction has aroused widespread concern and in-depth research on energy issues in academia. Okushima and Tamura conducted an in-depth analysis of carbon emissions using the structural decomposition method. The results show that although Japan 's economic growth has led to an increase in carbon emissions, the progress of energy technology has slowed the growth rate of carbon emissions to a certain extent. Subsequently, the research

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

on carbon emissions has been widely questioned by the academic community because of ignoring the impact of rapid changes in production and international trade patterns.Li Wei (2024) used the MRIO method to calculate the embodied carbon emissions, constructed a prediction system of embodied carbon emission intensity based on the AO-ELM method, and simulated the carbon emission prospects of the industry under different policy scenarios. It is believed that CBAM has a promoting effect on carbon emission reduction in this industry, but the effect is limited. It is a more effective way to improve the implementation speed of China 's domestic policies.

The index decomposition method (IDA) is an analysis method based on the overall industrial data and using the index theory to decompose the target factors, which is especially suitable for the research and analysis of the time series data model. Zhang (2022) believed that the current mainstream method for calculating carbon dioxide emissions is the exponential decomposition method. This method is based on the consumption of different types of fossil energy. By multiplying these consumptions by the corresponding carbon emission factors and accumulating the results, the total carbon dioxide emissions of a certain region or industry can be obtained. Yang Junqi (2023) used the exponential decomposition method to decompose the factors affecting the change of carbon emissions, and used the particle swarm inverse neural network model to simulate and predict the carbon emissions in Shanxi Province, which realized the prediction of the trend of carbon emissions, but could not accurately estimate the value of carbon emissions.

Input-output analysis, as a methodology to study the correlation between input and output among departments in the economic system, its core lies in the simplified application of general equilibrium theory. This method is homologous to the general equilibrium model and relies on the input-output table for data analysis and future trend prediction. Yi Jun et al. (2024) believe that the input-output method is mainly applied to the study of carbon emissions from macro perspectives such as economy and policy. Yang Bo (2024) pointed out that the input-output method is a widely used method for measuring embodied carbon at home and abroad. The vast majority of measurement results show that this method of measuring carbon emissions puts developing countries at a disadvantage.

4. Overview of the Impact of Green Finance on Carbon Emissions

In recent years, scholars at home and abroad have carried out a lot of research on the interaction between green finance and carbon emissions. Among them, domestic scholars and foreign scholars have different research focuses. Foreign scholars take the global perspective as the starting point and take the country and region as the sample basis to examine the impact of green finance on carbon emissions. Domestic scholars are more focused on China 's territory, based on provincial and municipal samples. Therefore, this paper will be divided into two parts : foreign research and domestic research, in order to explore the interaction between green finance and carbon emissions.

Some scholars have used the green financial practice of various countries around the world as a sample to prove the impact of green finance on carbon emission reduction. Iqbal et al. (2021) used a data envelopment analysis (DEA) comprehensive evaluation method with consistent weights to construct a green finance index for several countries and regions. This study provides an important quantitative indicator support for exploring the effectiveness of green finance in alleviating environmental pollution worldwide. By studying the relationship between green finance and carbon emissions in the top ten economies that support green finance, scholars such as Meo, Abd (2022) have proved that green finance can curb carbon emissions and that green finance is the best financial strategy for carbon emission reduction. Some scholars have focused on the impact of China 's green finance practice on carbon emissions.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

Muganyi (2022) and other scholars have found that China 's green finance development has significantly reduced industrial gas emissions by analyzing the impact of China 's green finance-related policies.

Based on the panel data of 30 provinces from 2010 to 2020, Wang Yanlin et al. (2024) empirically explored the effect and internal mechanism of green finance on regional carbon emissions, and found that China 's green finance has a significant inhibitory effect on regional carbon emissions. According to the heterogeneity analysis of the region, it is found that this effect has a strong impact on the eastern region, followed by the central region. He Wujie and Chen Hanhua (2019) found that green finance development and renewable energy utilization can effectively curb carbon emissions, and the effect can be optimal when lagging behind 2-3 periods. Zhou Wenhai (2023) divided the green finance index into three dimensions : green credit, green securities and green investment, and empirically tested the carbon emission reduction effect of green finance. The results show that green finance has a significant carbon emission reduction effect both in the total dimension and the sub-dimension. Among them, the carbon emission reduction effect of green investment is the largest, followed by green securities, and green credit is the smallest. The research of Li Zengfu, Feng Liuhua et al. (2022) shows that the increase in the scale of green credit can effectively curb carbon emissions, mainly through two paths of green technology innovation and industrial structure optimization, and this inhibition is heterogeneous, especially in the eastern region.

When discussing the impact at the enterprise level, Li Shaozhe (2023) used the difference-in-differences method to empirically test the impact of green finance pilot policies on carbon emissions of such enterprises and its mechanism of action based on the data of 420 listed companies in Shanghai and Shenzhen A-share markets from 2012 to 2021. The results show that the green finance pilot policy can significantly reduce the carbon emissions of heavily polluting enterprises. This effect is particularly significant in non-state-owned heavily polluting enterprises, heavily polluting enterprises that rely more on external financing, and provinces with a greater degree of industrial structure distortion. Based on the micro-data of listed companies from 2010 to 2019, Zhang (2024) discussed the impact of green financial development on corporate carbon emission intensity. The research results show that the development level of green finance has a significant role in promoting enterprises to reduce carbon emission intensity.

5. Literature Review and Prospect

5.1. Literature Review

In summary, green finance, as an important tool to promote the green transformation of the economy, has a profound impact on carbon emissions through the dual path of green policy incentives and green financial support. However, it is worth noting that the current specific measurement standards of green finance have not yet formed a unified consensus in the academic community, and the comprehensive disclosure of carbon emission data is also insufficient, which requires us to further explore and improve the relevant research system.

In particular, from the perspective of enterprises, the measurement and management mechanism of carbon emissions is not perfect, and the multiple incentives of green finance play a significant role in promoting the emission reduction of enterprises. As a key force to achieve carbon emission reduction targets, the role of enterprises has become increasingly prominent. At present, some listed companies have actively disclosed environmental information such as carbon emissions in ESG (Environmental, Social and Governance) reports, which not only highlights the importance of enterprises to sustainable development, but also reflects their pursuit of economic benefits. At the same time, the determination to live in harmony with nature.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

Therefore, in-depth study of the specific impact of green finance on corporate carbon emission intensity will not only help optimize corporate emission reduction strategies, improve carbon management, but also provide solid theoretical and practical support for the achievement of the ' double carbon ' goal, and promote the comprehensive green transformation and sustainable development of the economy and society.

5.2. The Shortcomings and Prospects of the Research on Green Finance and Carbon Emissions:

First of all, in terms of data acquisition and measurement : there are difficulties in obtaining data related to green finance and carbon emissions, especially long-term sequence data across regions and industries. Incompleteness and inconsistency of data may affect the accuracy and reliability of the results.

Secondly, about the depth of mechanism analysis : the current research focuses on the direct impact of green finance on carbon emissions, and the analysis of its internal mechanism is not deep enough. For example, how green finance indirectly affects carbon emissions by affecting industrial structure and technological innovation still needs to be further explored.

Thirdly, from the evaluation level of policy effect : when evaluating the implementation effect of green financial policy, it often faces challenges such as lag and complexity. The evaluation method of policy effect needs to be more scientific and systematic to accurately reflect the actual impact of policies on carbon emissions.

Finally, international cooperation and comparison : the research on green finance and carbon emissions mostly focuses on the domestic level, and there are relatively few international comparisons and cooperation. Different countries and regions have differences in green financial policies and carbon emissions. Strengthening international cooperation will help promote global green and low-carbon development.

Therefore, in the future research, we should focus on improving the data system, establish and improve the data system of green finance and carbon emissions, and improve the integrity and consistency of the data ; expand the research perspective of green finance and carbon emissions, and pay attention to its interaction with other economic, social and environmental factors ; promote international cooperation, strengthen international cooperation and exchanges in the field of green finance and carbon emissions, and jointly cope with the challenges of global climate change. Promote global green and low-carbon development through sharing experience, exchanging technology, and cooperative research.

Acknowledgments

Fund project : * This paper is one of the outcomes of the Shaanxi Provincial Social Science Fund project "Evaluation and Enhancement Strategies for Scientific and Technological Innovation Capability of Shaanxi Colleges and Universities" (2020R023), the Xi'an Science and Technology Plan Soft Science Research Project "Research on the Operation Mode, Effectiveness Evaluation, and Promotion Path of Xi'an Science and Technology Think Tanks" (23RKYJ0003), and the Xi'an Social Science Planning Fund "Research on the Current Status, Dilemmas, and Promotion Path of the Development of Xi'an Geographical Indication Agricultural Product Brands under the Background of Rural Revitalization" (24JX16).

References

[1] Cowan E. Topical issues in environmental finance [J].EEPSEA Special and Technical Paper, 1999 (1) : 1-20.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

[2] Chen Yeting, Huang Zengyuan, He Siyuan, et al. How does green finance empower common prosperity : mechanism and empirical test [J / OL]. JOURNAL OF AGRICULTURAL AND FORESTRY ECONOMIC MANAGEMENT, 1-12 [2024-08-14].

[3] Qiao Qin, Fan Jie, Sun Yong, et al. Study on the measurement and influencing factors of green finance in provinces along the ' Belt and Road ' [J].Industrial technology and economy, 2021,40 (07) : 120-126.

[4] Li Yunyan, Zhang Shuo. Spatial-temporal pattern changes and associated network evolution of green finance development in China [J].Contemporary economic management, 2023,45 (11) : 76-87.

[5] Wang Yafei, Shi Ming, Roman, etc. Green Finance and Enterprise Total Factor Energy Efficiency : Impact Mechanism and Empirical Test [J].Contemporary Economic Research, 2024, (08) : 114-128.

[6] Liu Chuanjiang, Zhang Shaohui, Li Xue. Has the green credit policy improved the green total factor productivity of China 's heavily polluting industries ? [J].International Finance Research, 2022, (04) : 3-11.

[7] You Zhiting, Peng Zhihao, Li Peng. Research on the impact of green finance development on regional carbon emissions-Taking green credit, green industry investment and green bonds as examples [J].Financial theory and practice, 2022, (02) : 69-77.

[8] Xin Yao Yao, Tang Jue Lan. China 's green finance under the goal of carbon neutrality : policies, practices and challenges [J].Contemporary economic management, 2021,43 (10) : 91-97.

[9] Shi Jianwen, Yang Xiuyun. The spatial effect of agricultural emission reduction and carbon sequestration on the high-quality development of agricultural economy in the Yellow River Basin [J / OL].Journal of Northwest A & F University (Social Science Edition), 1-12 [2024-08-13].

[10] Grossman G. M., Krueger A. B., Economic Growth and the Environment[J], Quarterly Journal of Economics, 1995, 110(2):353-377.

[11] Okushima S., Tamura M., Multiple Calibration Decomposition Analysis: Energy Use and Carbon Dioxide Emissions in the Japanese economy, 1970-1995[J], Energy Policy, 2007, 35(10):5156-5170.

[12] Baiocchi G., Minx J.C., Understanding Changes in the UK's CO2 Emissions: A Global Perspective[J], Environmental Science Technology, 2010, 44(4):1177-1184.

[13] Li Wei, Liu Xing. Carbon emission reduction prospect analysis of China 's foreign trade steel considering CBAM-based on implied carbon intensity prediction [J].Industrial technology and economy, 2024,43 (08) : 118-128.

[14] Zhang, Zhang, Feng.Research on regional differences, dynamic evolution and convergence of carbon emission intensity in China [J / OL].Quantitative economic and technical economic research, 2022,39 (4) : 67-87.

[15] Yang Junqi, Fan Xiaojun, Zhao Yuehua, et al. Prediction of carbon emissions in Shanxi Province based on PSO-BP neural network [J]. Journal of Environmental Engineering Technology, 2023,13 (6) : 2016-2024.

[16] Yi Jun, Sun Haoran, Lin Weifang, et al. Comparative Analysis of Carbon Emission Accounting Standards for Power Systems [J / OL].Grid Technology, 1-14 [2024-08-14].

[17] Yang Bo, Wang Yong. Research on the Impact of EU Carbon Border Regulation Mechanism on China 's Export Trade - A Case Study of Manufacturing Exports to the EU [J / OL].Financial Economy, 1-11 [2024-08-14].

[18] Iqbal S, Taghizadeh-Hesary F, Mohsin M, et al. Assessing the role of the green finance index in environmental pollution reduction[J]. Studies of Applied Economics, 2021, 39(3).

[19] Meo M S, Abd Karim M Z. The role of green finance in reducing CO2 emissions: An empirical analysis[J]. Borsa Istanbul Review, 2022, 2 2(1): 169-178.

[20] Muganyi T, Yan L, Sun H. Green finance, fintech and environmental protection: Evidence from China[J]. Environmental Science and Eco technology, 2021, 7: 100107.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0007

[21] Wang Yanlin, Zhang Zixuan, Liu Yanhua. Research on the impact and mechanism of green finance on regional carbon emission reduction [J].Friends of Accounting, 2024 (5) : 79-86.

[22] He Wujie, Chen Hanhua, Wang Zhuo. An empirical study on the dynamic relationship between green finance development and carbon emissions-test based on VAR model [J].Journal of Guizhou Normal University (Social Science Edition), 2019, (01) : 99-108.

[23] Zhou Wenhai, Wu Xiaomin, Zhao Guiling. An empirical study on the carbon emission reduction effect of green finance under the dual carbon target [J / OL].Journal of Hebei University of Economics and Business, 2024,45 (1) : 47-58.

[24] Li Zengfu, Feng Liuhua, Mai Shiqi, Li Anyao. Does green credit curb carbon emissions ? - Research based on China 's provincial panel data [J]. Shanghai Finance, 2022, (01) : 2-12.

[25] Li Shaozhe, Li Mianxiao, Lin Liqiong. Does the pilot policy of green finance restrain the carbon emissions of heavy polluting enterprises ? Evidence from the Green Finance Reform and Innovation Pilot Area [J / OL].Financial Development Research, 2023 (11) : 46-54.