OLS-Based Research on the Impact of Green Finance on Green Development——Taking Beijing as an Example

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Abstract. The Green Credit Policy (GCP) and the Green Finance have brought tremendous influence to the promotion of industry. Green development is an approach to economic growth that considers both economic benefits and environmental protection, but because it requires significant investment to build a green industry, the recovery process is time-consuming and fraught with risk, so there is insufficient incentive for urban green development. Through specialized financing services for environmental protection firms and high-polluting companies, green finance may support the green transformation of high-polluting enterprises. This paper uses OLS estimation to evaluate the Green Development effect of GCP. Green development is significantly impacted by GCP. And Green Financial Level(gfl)'s index has a strong positive covariance with Green Development Level(gdl). Based on these results, we suggest that: The Chinese Government should promote GCP and make further efforts to perfect our industrial structure. Nations, including China, are actively promoting green finance to foster sustainable economic growth and protect the environment. China's efforts in developing green finance are crucial for realizing its ecological civilization. Green finance is a key aspect of promoting sustainable development. It is hoped that the Chinese government will offer stronger support in this field by establishing effective systems and regulations. Encouraging more financial institutions to participate in green finance will ultimately lead to sustainable economic and environmental progress.

Keywords: Green credit policy, Environmental regulation, green development, Green Finance.

1. Introduction

1.1. Research background

Thanks to the rapid pace of industrialization and modernization, the rapid growth of the Chinese economy at 9.7 percent a year, China has become the world's second-largest economy [1,2]. In China, however, the expansion of the economy on a scale has led to a high degree of environmental degradation and unsustainable energy consumption [3,4]. The issue of sustainable energy development in China has been studied in many academic publications [5-7]. This research aims at exploring Chinese renewable energy industry from the angle of green financial. The GCP is proposed for the purpose of dealing with the environmental contamination and unreasonable waste of energy produced by government-funded companies. Green credit is one of the most important environmental finance tools by encouraging financial institutions to divert their resources to clean production locations [8,9]. In 2002, International Finance Corporation (IFC) suggested "Green Credit" as Equator Principle, which is a code of conduct for commercial loans aimed at detecting, assessing, and managing the societal and ecological risks associated with financing projects [10,11]. Economic growth will improve the situation of people, but at the expense of putting more pressure on the economy and the environment, which will eventually change their status. The financial institutions shall adopt measures to address these changes while preserving the sustainability of the economy and the environment by considering the potential impact on the environment in their investment and funding decisions.

The remainder of the paper consists of four sections. In the second section, methods, descriptions, and parameters are discussed. The evidence and statistics are presented in Chapter 3. The limitations of this essay are discussed in section four. In the end, the findings and policy implications of those outcomes are presented.

1.2. Research Objectives

China's sustainable energy development has drawn global attention amid the growing concern over climate change. Renewable energy research and development have become a priority for countries worldwide. China, being one of the most populous nations, faces significant energy consumption and environmental impacts. Therefore, it is essential to examine how China's renewable energy sector is expanding if we are to safeguard the environment globally and achieve sustainable economic growth.

In this study, the renewable energy sector in China is examined from the angle of green financing, which utilizes financial mechanisms and products to support sustainable development and environmental protection. The aim is to provide financial support and policy guidance, reducing dependence on traditional energy sources and mitigating environmental pollution and carbon emissions. The study intends to explore the application and development of green finance in China's renewable energy sector and propose policy recommendations to foster sustainable growth.

The specific objectives are as the following three:

(1) Analyze the current situation and future trends of China's renewable energy industry, identifying its challenges and opportunities;

(2) Investigate the application and effectiveness of green finance in China's energy sector, evaluating its impact on industrial development;

(3) Analyze international experiences and case studies, drawing insights from other countries' green finance practices in the energy industry to provide guidance for China's development.

1.3. Research significance

The research holds significant value in the following aspects:

(1) The study provides vital theoretical and practical insights into China's renewable energy industry. By examining green finance's application in this sector, it establishes a foundation and practical knowledge to foster sustainable development and growth.

(2) The research bears immense practical importance for China's overall economic sustainability. Given the environmental degradation and unsustainable energy consumption resulting from rapid economic growth, exploring green finance's role in the renewable energy industry can support sustainable economic development.

(3) The study holds international significance for global environmental protection. China's renewable energy industry profoundly impacts global environmental well-being. The research on the use of green financing in this sector can be used as a model by other nations aiming to advance renewable energy sources and safeguard the environment.

In summary, this study seeks to further the renewable energy sector's sustainable growth in China by examining green finance's application and growth within the sector. The ultimate goal is to achieve sustainability in China's economy while contributing to global environmental protection.

2. Study design and variables

2.1. Mechanism and research presupposition

Firstly, Green finance channels funds from high-energy-consuming and highly-polluting industries towards industries that promote energy efficiency, environmental protection, and resource utilization. On one hand, it makes it more difficult to raise funds and makes it more difficult for high-energy and pollution projects to develop. On the other hand, green finance utilizes methods like interest subsidies to enhance the return on investment for green projects, thereby promoting the growth of low-pollution, low-energy-consuming industries.

Furthermore, green finance compels enterprises to undergo the green transformation and provides financial support for their technological innovation. Green finance restricts the loan quotas for high-pollution enterprises and imposes punitive high-interest rates, forcing them to undertake green transformation [12]. For most enterprises entity, during the initial stages of technological innovation,

it is not only challenging to ensure economic benefits but also entails the risk of innovation failure. These factors discourage traditional financial institutions from participating in the financing. The intervention of green finance can provide funding for enterprise research and development teams, support green innovation actions, and address the technological challenges faced in green development.

Research Presupposition H1: Green Finance is facilitating the development of green development.

The cause and effect of more advanced economic development may be more open and transparent financing mechanisms, fairer competition, more transparent information, etc. Therefore, the degree of economic development is likely to act as an instrumental variable influencing green development indicators.

Research Presupposition H2: Economy Development would affect green finance and thus affect green development.

2.2. Description of Data

The data source of this thesis is from several cities' websites, NBS, MSTC, PBOC, PBOC, etc., as well as all kinds of authoritative statistics yearbooks, such as National, Provincial and Municipal Statistics Yearbook, Environmental Status Bulletin, China Science & Technology Statistical Yearbook, China Energy Statistical Yearbook, China Financial Yearbook, China Agricultural Statistical Yearbook, China Industrial Statistical Yearbook, China Energy Statistical Yearbook, China Tertiary Statistics Yearbook, China Tertiary Statistics Yearbook. Agricultural Statistics, China Yearbook of Industrial Statistics, China Yearbook of Tertiary Industry Statistics

The green development level(gdl) is determined by the provincial Green Index.

Based on Liu and others (2021) (1), the measurement of GDP growth rate by means of green loans (gc) is computed as follows: The ratio of interest expenditure of industrial firms above scale to interest expenditure of industrial enterprises above the scale of the six largest high energy-consuming industries shows the level of financial development in the green sector.

2.3. Settings of variable

2.3.1 predicted variable

The Green Growth Rate (GDL) is a prediction variable where the weights are determined by means of the entropy method, then by calculating a composite index based on the weights.

2.3.2 Explanatory variable

Green financial development (gfl) and Economic Development(ED) are explanatory variable.

2.4. Setting of regression model

2.4.1 Standard level-level model

$$\mathrm{gdl}_t = b_0 + b_1 gfl_t + b_2 ED_t + e \tag{1}$$

And gdl represents Beijing's green development level which varies by time, b0 is the intercept, gfl,t is the green finance level by time and ED is the economic development index by time, e is the error term.

2.4.2 Log-log model

$$\mathrm{Log}(\mathrm{gdl}_t) = b_0 + b_1 \log(gfl_t) + b_2 \log(ED_t) + e \tag{2}$$

2.4.3 Model with Instrument variable.

$$\mathrm{gfl}_i = \gamma_0 + ED_i \gamma_1 + u_i \tag{3}$$

$$\widehat{\mathrm{gfl}_1} = \hat{\gamma}_{\mathrm{ols}_{n0}} + \mathrm{ED}_i \hat{\gamma}_{\mathrm{OLS}_{n1}} \tag{4}$$

$$\mathrm{gdli} = \beta 0 + \widehat{\mathrm{gfl}_1} \beta 1 + \mathrm{ei} \tag{5}$$

3. Regression results analysis

3.1. Standard regression

As the Table1 and Table2 shows, If the gfl index is raised by 0.01, then the gdl index will rise by 0.014, which is significant at the 5 percent level. One percent of the increase in the index of gfl causes the index of gdl to increase by 0.8 percent, and it is significant at the 10% level. It means that green financial development increased levels can improve green development levels. Also, the index of ED increases by 0.01 will cause the index of gdl to increase by 0.086, and it is significant at the 10% level. One percent of the increase in the index of ED causes the index of gdl to increase by 0.6 percent, and it is significant at the 10% level. So Economic Development also has an influence that may cause the alteration of the green index. Due to the steady and significant contribution from the level of environmental financial development, the general level of environmental development has a significant influence on the overall environmental performance, thus the H1 assumption is validated. It can be explained as follows: on the supply side, green finance restricts the resources of highly polluting and consuming companies, which makes firms more competitive. Secondly, it gives financial aid to developing low-polluting and low-consuming businesses, which helps to promote green growth.

Table 1. Standard regression results

	level-level	log-log
(Intercept)	-27.405+	0.275
	-12.174	-0.896
gfl	1.392*	
	-0.526	
ED	8.585+	
	-3.684	
Log(gfl)		0.812+
		-0.337
Log(ED)		0.619+
		-0.288
Num.Obs.	9	9
R2	0.913	0.911
R2 Adj.	0.884	0.882

3.2. Regression with instrumental variable

Table 2. Regression with IV results

	OLS			Instrumental Variable
	-1	-2	-3	-4
gfl	2.376***		1.392**	2.920***
ED		16.406***	8.585*	
Constant	-0.249	-0.106	-0.274*	-0.459*
Observations	9	9	9	9

Note: *p<0.1; **p<0.05; ***p<0.01

The 2SLS results for the green development level show it is 0.029. It is similar to the OLS result, which is 0.024. The endogeneity bias may not be severe in this case.

4. Conclusion

The increase of Green Finance Index can cause an increase of the index of Green Development Level. A strong positive correlation can be observed. And the Instrumental Variable's endogeneity

bias's effect is not strong, so the level of Economy Development is not an omitted bias of the regression.

First and foremost, the promotion of green development benefits greatly from green money. The green financial system can direct the fund movement, push the company to carry out the green conversion, and make the eco-resources valuable.

Second, Green Finance is a way to improve the environment by means of the greening of industry. The greening of industry structure has some intermediate role in the green financial promotion of green development. Green Finance directs the funds from energy-consuming companies to green companies, enhances the greenness of the industry structure, and accelerates green development.

As a result, it would be beneficiary for the government to further implement green finance policies with facilitating methods, such as deeper investigations and surveys.

The GCP is a strategy that supports environmentally friendly enterprises by providing increased loan support. In Beijing, this policy has been widely implemented and has positively impacted green development in several ways.

First off, the green credit program encourages businesses to make technical and environmental changes. Offering low-interest loans or preferential rates, it motivates businesses to invest in eco-friendly technologies and equipment, leading to reduced environmental pollution and improved resource utilization efficiency. This, in turn, fosters the growth of industries with more focus on the environment.

Secondly, green credit policies promote the advancement of renewable and clean energy projects. Through financial support for such projects, green finance institutions help address financing challenges, resulting in wider adoption of renewable and clean energy sources. This contributes to a reduction in dependence on traditional energy and leads to lower carbon emissions and improved air quality.

The GCP also significantly contributes to the competitiveness of businesses and their sustainable growth. Access to green credit support enables businesses to meet environmental protection requirements, elevate product quality, and enhance market competitiveness. This support acts as a driving force for companies to transition towards green development, providing them with a competitive edge in the market.

Green finance must be harmonized with other economic, fiscal, and environmental policies to foster holistic green development. Combining green finance with industrial policies directs funding towards green industry segments and facilitates the transformation of the entire industrial structure. Moreover, aligning green finance with employment policies fosters the creation of green jobs, enhancing the quality of life.

Regarding environmental aspects, green finance should work in tandem with environmental regulations, facilitating robust environmental information disclosure and assessments to raise environmental risk awareness and management capabilities for enterprises. Moreover, integrating green finance with carbon market policies promotes carbon emission trading and carbon pricing mechanisms, providing further financial support for enterprises.

Regarding the limitation of this paper, the observations were too small, I could only find data from 2011 to 2019. And the method I used was not advanced enough, more methods such as RDD, DiD, and LATE should be implemented to see the regional difference of Green finance Policy among different regions.

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