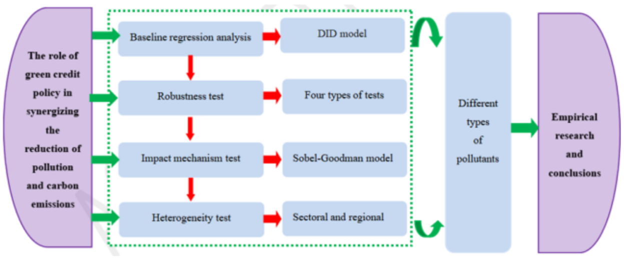
Global NEST Journal, Vol 26, No X, pp 1-11

Can the green credit policy achieve synergizing the reduction of pollution and carbon emissions? Evidence from China

Xiaorui Liu[a], Wen Guo[b]* and Yuyu Chen[a]
[a]Business School, Changshu Institute of Technology, Changshu 215500, China
[b]College of Accounting, Nanjing University of Finance and Economics, Nanjing 210023, China
Received: 13/04/2024, Accepted: 28/06/2024, Available online: 25/11/2024
*to whom all correspondence should be addressed: e-mail: xsyjst@126.com
https://doi.org/10.30955/gnj.006057

Graphical abstract



Abstract

Numerous discussions have taken place regarding the influence of the green credit policy (GCP) on carbon and pollution reduction. However, there is a dearth of research on synergizing the reduction of pollution and carbon emissions (SRPC). This paper aims to investigate the potential of GCP to achieve SRPC by analyzing *the Green Credit Guidelines* implemented in China. Firstly, the findings reveal that GCP significantly contributes to SRPC by upgrading the industrial structure and optimizing energy consumption. However, the promotion of SRPC through technological innovation is deemed ineffective. Additionally, the impact of GCP on SRPC is more prominent in the industrial sector, while it bears no significant influence on the household sector. Lastly, GCP demonstrates success in achieving SRPC in terms of waste gas and common industrial solid waste, but falls short when it comes to wastewater and hazardous waste. This research paper provides a theoretical foundation for GCP to effectively realize SRPC and offers insights to further enhance the policy framework of green finance in China.

Keywords: Green credit policy, Synergizing reduction, Carbon reduction, Pollution reduction

1. Introduction

In pursuit of sustainable economic development, China has implemented a series of green financial policies to guide the allocation of financial resources. The future of China's financial industry lies in the realm of green finance, with green credit at the forefront. In fact, as early as 2007, China introduced credit policies to incentivize banks to provide credit to projects that promote resource conservation. Furthermore, these policies aimed to restrict and eliminate credit extension for projects that disregard the environment (Lee *et al.* 2022).To establish a standardized framework for green credit policy (GCP), China issued *the Green Credit Guidelines* (GCG) in 2012. The purpose of implementing these guidelines is twofold: first, to encourage banks to prioritize green credit, and second, to actively adjust their credit structures in order to effectively mitigate environmental and social risks. By doing so, banks can better serve the real economy (Li *et al.* 2022).The adoption of GCP has proven to be an instrumental tool for promoting green development in China due to its three primary functions (Zhang *et al.* 2021a). Firstly, it optimizes resource allocation, ensuring that financial resources are channeled towards environmentally-friendly initiatives. Secondly, it actively mitigates and manages environmental risks, safeguarding against potential harm. Lastly, it serves as a guiding force for corporate conduct, encouraging environmentally responsible business practices (Lai *et al.* 2024).

The research on the impact of GCP is highly comprehensive. GCP aims to advance environmental conservation by guiding commercial banks in their credit allocation strategies (Zhao *et al.* 2023). With regards to businesses, GCP exerts a significant influence on the penalties and restrictions faced by companies engaged in heavy pollution. This influence encourages the channeling of financial resources towards industries that prioritize environmental protection and resource conservation (Lin and Pan, 2023). Additionally, GCP results in limitations on the cash flow of heavily polluting enterprises, compelling them to decrease their dividend payments (Li *et al.* 2023). From a banking perspective, these policies contribute to improving the interest-bearing asset return rates of banks, while also enhancing their core competitiveness (Lian *et al.* 2022). From an environmental standpoint, GCP facilitates the reduction of local environmental pollution by promoting upgrades in industrial structures, fostering technological innovation among businesses, and enhancing overall enterprise performance (Zhang *et al.* 2022a).

The management of carbon dioxide and pollutants in a synergistic manner is scientifically justified. On one hand, there exists a positive synergy between carbon reduction and pollution reduction (CRPR), which is influenced by China's high-carbon energy structure. On the other hand, carbon dioxide and pollutant emissions stem from the same source and undergo similar processes, underscoring the importance of coordinated governance and emission reduction. The significance of promoting the synergistic reduction of pollution and carbon emissions (SRPC) is emphasized in *the 2023 Government Work Report*. Therefore, investigating the impact of GCP on SRPC holds substantial theoretical and practical value. However, there is a scarcity of research focusing on the specific impact of GCP on SRPC.

Compared to other green credit policies, GCG is widely believed to have a substantial impact on CRPR (Gao and Liu, 2023). Firstly, this paper employs GCG as an example to examine the direct and indirect ways in which GCP can promote SRPC, and tests the direct influence of GCP on SRPC. Secondly, utilizing the Sobel-Goodman model, this paper investigates the impact of GCP on SRPC from three dimensions, exploring its effects on the sectoral heterogeneity of SRPC. Finally, this paper conducts an analysis of the influence of GCP on SRPC with regards to different types of pollutants. The research framework is depicted in **Figure 1**.

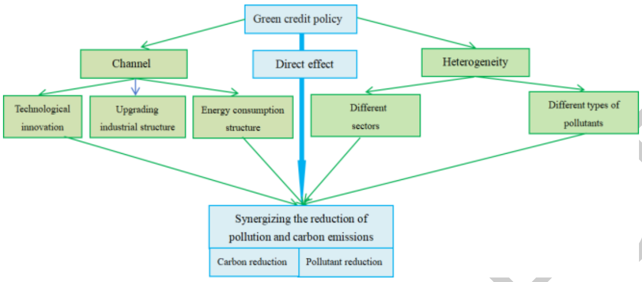


Figure 1. Research framework.

This paper makes several academic contributions. Different from most existing studies, this study not only evaluates the influence of GCP on CRPR, but also assesses the direct and indirect impacts of GCP on SRPC. Furthermore, acknowledging the importance of both the industrial sector and the household sector in SRPC and recognizing the potential diverse effects of GCP on SRPC across various sectors in China, this investigation additionally explores the variability in the impact of GCP on SRPC from a sectoral perspective. Additionally, considering that carbon emissions do not have the same root and origin as all pollutants, this paper also examines the heterogeneity of GCP on SRPC under different types of pollutants.

2. Literature and hypotheses

SRPC encompasses the cooperative mitigation of carbon dioxide emissions (CO2) in conjunction with the reduction of pollutants. Alternatively, it involves the joint reduction of pollutants while simultaneously managing CO2. Several scholars have investigated the driving forces behind SRPC due to the harmful impacts of climate anomalies and environmental pollution on human life, as well as the interconnectedness between pollutants and greenhouse gases (Chen *et al.* 2023). These factors include the using of autonomous electric vehicles (Ercan *et al.* 2022), carbon emission trading policies (Dong *et al.* 2022), agricultural practices (Bhattacharyya *et al.* 2022), urbanization and technological innovation (Yi *et al.* 2022), the reuse of fly ash in thermal power plants (Hou *et al.* 2023), energy efficiency, industrial structure (Zeng and He, 2023), environmental tournament (Xiao *et al.* 2024), and park industrial policy (Chen *et al.* 2024). However, not every measure can achieve a positive synergy between CRPR. For instance, in the industrial sector, if cleaner production and pollutant emissions are controlled by consuming more non-renewable energy, it can result in a negative synergy between the two (Liu *et al.* 2018).

The evaluation of green finance policies mainly focuses on the impacts of green credit policy (GCP) on both the economic and environmental aspects of real enterprises. GCP plays a crucial role in the implementation of green finance policy. From an economic perspective, GCP influences customer preferences and capital allocation direction, thereby creating a financing incentive and constraint mechanism for borrowing enterprises (Andersen, 2017; Mateut, 2018). The effects of GCP on enterprises in eastern China have been found to enhance the quality of green innovation, as evidenced by the research of Wang *et al.* (2022). However, for enterprises with low stock prices and high pollution levels, implementing GCP can significantly increase the risk of stock price collapse (Shao *et al.* 2022). Furthermore, GCP reduces the financing available to enterprises classified as "two high" (high pollution and high consumption), and may even lead to a decrease in dividend payments to increase cash holdings (Yuan and Gao, 2022; Li *et al.* 2023). Under GCP, high-polluting enterprises face environmental regulatory pressures and financial constraints, which drive them to make social donations (Wang *et al.* 2023a). Moreover, the implementation of GCP enhances the performance and core competitiveness of banks, resulting in improved cost efficiency and risk management (An *et al.* 2023). However, it is crucial to recognize that the economic effects of green credit policies are not universally positive, as excessive financing for green enterprises may occur (He *et al.* 2019). Additionally, GCP may hinder research and development investments in "two high" enterprises, albeit influenced by economic uncertainty (Zhang and Kong, 2022). In response to GCP, non-green firms prioritize increasing green innovation activities rather than inputs (Hu *et al.* 2023).

There is also a discussion on the environmental consequences of GCP. GCP can achieve PM2.5 emission reduction through industrial structure, technological progress, and corporate performance, with varying environmental consequences across regions (Zhang *et al.* 2021b). Among all green financial products, green credit has been found to have the best carbon emission reduction effect (Wang *et al.* 2023). By increasing financing costs, GCP can reduce carbon emissions from high-polluting enterprises (Sun and Zeng, 2023). Additionally, GCP can optimize energy consumption structure, increase technological innovation, and enhance innovation input to inhibit carbon emission (Wang, 2023). Furthermore, these policies can promote low-carbon technological innovation activities, enhance green production efficiency, and improve enterprises' ESG performance (Chen *et al.* 2022; Lv *et al.* 2023). GCP also facilitate the development and application of carbon-neutral technologies by renewable energy companies (Su *et al.* 2023). However, the environmental effects of GCP are not uniformly positive. In the early stages of implementation, difficulties in full implementation resulted in insignificant carbon reduction (Zhang *et al.* 2011). Moreover, the effects of GCP can vary due to the heterogeneity of enterprises, particularly those with a state-owned background in central China, where the effects may be relatively weak or even insignificant (Wang, 2023).

As a crucial component of China's economic functioning, the significance of GCP extends across diverse sectors, contributing to the enhancement of enterprises' environmental consciousness and thus facilitating the advancement of SRPC for "two high" enterprises. Viewing GCP through the lens of signal transmission, enterprises are obligated to divulge their ecological data as a criterion for evaluating financial support. This compels enterprises to prioritize investments in eco-friendly initiatives and simultaneously curtail investments in projects that contribute to pollution and high carbon emissions (Chai *et al.* 2022). Additionally, with regards to credit selection, GCP necessitates financial institutions to limit or even reject loans for "two high" enterprises. This financing penalty motivates such enterprises to downsize their production scale, leading to the achievement of SRPC (Liu *et al.* 2019).

Hypothesis 1: GCP directly facilitates the promotion of SRPC.

The concept of GCP is closely associated with policies on environmental regulation. According to the Porter hypothesis, the implementation of reasonable regulations addressing environmental concerns can foster innovation and spur technological advancements within businesses (Zhang *et al.* 2023). To maintain a competitive edge concerning green credit policies, certain enterprises must actively pursue technological innovation. Moreover, the marketization of GCP acts as a catalyst for heavily-polluting and energy-intensive enterprises to invest in technological innovation. These innovative endeavors ultimately enhance the clean production capabilities of enterprises, thus contributing to SRPC (Gan *et al.* 2024)

Hypothesis 2: GCP can indirectly stimulate SRPC through technological innovation.

The application of GCP has a significant role in channeling funds towards specific sectors, facilitating their eco-friendly advancement, and ultimately influencing the overall enhancement of the industrial framework. This approach has a twofold impact. Firstly, it leads to the gradual removal of outdated sectors characterized by "two high." These sectors encounter substantial challenges in terms of their own technological innovation (Shao *et al.* 2022). Secondly, GCP fosters the growth of technology-driven industries that possess distinctive benefits like increased value addition, minimal environmental harm, and reduced carbon emissions. Consequently, these high-tech sectors propel the progression of the advanced industrial structure. Additionally, the process of industrial upgrade entails the elimination of heavily pollutant and energy-intensive capacities, thereby realizing SRPC.

Hypothesis 3: GCP can indirectly promote SRPC through upgrading industrial structure.

According to Lu *et al.* (2022), the introduction of GCP poses challenges for coal-dependent companies in obtaining adequate financial assistance. Nevertheless, it also acts as a catalyst for the advancement of the emerging energy industry and the shift towards more sustainable energy utilization by businesses (Fang *et al.* 2023). One of the primary advantages of GCP lies in its ability to encourage financial institutions to enhance their funding for the clean energy sector. This, in turn, fosters the development of clean energy technologies and lowers the overall cost of adopting alternative energy sources, thereby enabling companies to embrace and maintain the use of renewable energy. Additionally, as part of their eco-friendly initiatives, enterprises may choose to substitute high-emission conventional energy sources with low-pollution alternative energy options. This transition towards cleaner energy consumption not only contributes to the transformation of the company's energy usage structure but also aligns with the concept of SRPC.

Hypothesis 4: GCP can indirectly promote SRPC through optimizing energy consumption structure.

3. Methodology and data

3.1. Variables

This paper measures CO2 by calculating the sum of the product of different types of energy consumption and their corresponding carbon emission coefficients. Additionally, environmental pollution is characterized by sulfur dioxide emissions (SO2). The level of SRPC (CO2SO2) is determined by the product of CO2 and SO2, which serves as a measure of the overall emission reduction of both CO2 and SO2. This product acts as an inverse index, reflecting the homologous characteristics of the emissions.

This paper examines the impact of *GCG* on SRPC. To analyze this, we use the guidelines as an exogenous shock policy. *GCG* issued by China in 2012 put forward specific requirements for the green credit work of financial institutions, and is considered to be the first normative document on green credit in China (Li *et al.* 2024). Therefore, the academic community regards 2012 as the time point for China to introduce GCP. We introduce a time dummy variable (post), where post=1 represents the years in 2012 and onwards, and post=0 represents the years before 2012. Additionally, we introduce a processing group dummy variable (treat), where treat=1 indicates that the per capita CO2SO2 in a province exceeds the median of all provinces, and treat=0 indicates otherwise. When the per capita CO2SO2 in a province exceeds that of all provinces in 2012 and onwards, post×treat=1; otherwise, it is 0.

The basic factors influencing environmental pollution and carbon emissions are population size (pop), economic growth (gdp), and technological innovation (ti) (Dietz and Rosa, 1994). These factors are measured by the total resident population, per capita gross domestic product (GDP), and the number of patents granted, respectively. Additionally, industrial structure upgrading (isu), energy consumption structure (ecs), urbanization level (url), opening-up level (opl), and environmental regulation (er) are also factors that affect environmental pollution and carbon emissions (Zeng and He, 2023; Liu *et al.* 2024). These factors arerespectively expressed by GDP of tertiary industries /GDP of secondary industries, the proportion of coal consumption, the proportion of permanent urban population, the total amount of imports and exports / GDP, and the investment amount of industrial pollution control / GDP, respectively.

Table 1. Descriptive results.

Varible	Mean	SD	Min	Median	Max
lnCO2	8.1527	0.7274	5.2038	8.2079	9.5638
lnSO2	3.5136	1.2628	-1.9505	3.8546	5.2998
lnCO2SO2	11.6664	1.7372	5.3512	11.9116	14.7279
post×treat	0.2632	0.4407	0.0000	0.0000	1.0000
lnpop	8.1785	0.7513	6.2804	8.2558	9.4481
lngdp	9.3358	1.0836	5.9532	9.4279	11.7338
lnti	9.3825	1.7483	4.2485	9.4399	13.6788
lnisu	0.0931	0.3854	-0.6405	0.0513	1.6571
lnecs	-0.9491	0.5580	-5.2708	-0.8113	-0.1406
lnur	-0.6441	0.2698	-1.3955	-0.6309	-0.1100
lnopl	-1.6739	2.1872	-7.9216	-1.7715	3.8133
lner	-6.9061	0.9790	-11.6694	-6.8016	-4.5068

Table 2. Results of baseline regression.

	lnCO2		lnSO2		lnCO2SO2	
	(1)	(2)	(3)	(4)	(5)	(6)
post×treat	-0.0768***	-0.1151***	-0.1277*	-0.3338***	-0.1281*	-0.3464***
	(-3.04)	(-5.20)	(-1.94)	(-7.67)	(-1.74)	(-6.88)
lnpop		0.2397		-0.9741***		-0.4052
		(1.54)		(-3.29)		(-1.23)
lngdp		0.1809*		-0.0136		-0.0693
		(-2.05)		(-0.07)		(-0.32)
lnti		0.0487		-0.0914		0.0487
		(1.58)		(-1.58)		(0.76)
lnisu		-0.0990*		-0.3673***		-0.4933***
		(-1.76)		(-3.03)		(-3.27)
lnecs		0.2137***		0.6438***		0.8140***
		(5.18)		(7.77)		(9.23)
lnur		0.2832**		1.2623***		1.6667***
		(2.06)		(3.40)		(3.87)
lnopl		-0.0018		-0.0024		0.0046
		(-0.38)		(-0.17)		(0.35)
lner		0.0297**		0.0184		0.0945***
		(2.35)		(0.56)		(2.77)
constant	6.9477***	4.0961***	1.8958***	12.4780***	8.7563***	15.6908***
	(77.49)	(3.52)	(7.94)	(-7.67)	(27.27)	(6.59)
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9619	0.9726	0.9266	0.9586	0.9405	0.9770
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*Note: *, **, ***is significant at the 10%, 5% and 1% levels, respectively. The same is true below.*

3.2. Methodology

The impact of GCP implementation on SRPC in particular provinces is explored in this research paper. To evaluate this, the study establishes both an experimental group and a control group to assess the consequences of policy implementation. To conduct the analysis, the DID model is utilized, integrating a time dummy variable and a province dummy variable.

$$\ln \mathrm{CO2SO2}_{it} = \alpha_0 + \alpha_1 \mathrm{post}_t \times \mathrm{treat}_i + \delta \mathrm{Control}_{it} + \mathrm{yearFE} + \mathrm{provinceFE} + \varepsilon_{it} \quad (1)$$

In Formula (1), i, t, δ, and ε denote the province, year, coefficient of the control variable, and residual term, respectively. The control variables comprise of lnpop, lngdp, lnti, lnisu, lnecs, lnur, lnopl, and lner. The terms yearFE and provinceFE indicate fixed effects for time and region, respectively. α_0 and α_1 represent the constant term and the coefficient of post×treat, respectively. In this empirical research, we aim to investigate the underlying mechanism by employing a Sobel-Goodman model. This model is used to explore whether the impact of an independent variable on the dependent variable is realized through the mediating variable. The advantage of this model is that the direct and indirect effects of independent variables on dependent variables can be considered at the same time, so that the total effects of independent variables on dependent variables can be evaluated more accurately. The primary objective is to assess whether ti, isu, and ecs function as pathways through which GCP can achieve CRPR. The specific model utilized for this purpose is depicted below.

$$\ln CO2SO2_{it} = \beta_0 + \beta_1 \text{post}_t \times \text{treat}_i + \text{yearFE} + \text{provinceFE} + \varepsilon_{it} \quad (2)$$

$$\ln ti_{it} = \beta_{10} + \beta_{11} \text{post}_t \times \text{treat}_i + \delta_1 \text{Control}_{1it} + \text{yearFE} + \text{provinceFE} + \varepsilon_{it} \quad (3)$$

$$\ln isu_{it} = \beta_{20} + \beta_{21} \text{post}_t \times \text{treat}_i + \delta_2 \text{Control}_{2it} + \text{yearFE} + \text{provinceFE} + \varepsilon_{it} \quad (4)$$

$$\ln ecs_{it} = \beta_{30} + \beta_{31} \text{post}_t \times \text{treat}_i + \delta_3 \text{Control}_{3it} + \text{yearFE} + \text{provinceFE} + \varepsilon_{it} \quad (5)$$

In Formula (3) - (5), Control_1, Control_2 and Control_3 refer to refer to control variables other than lnti, lnisu and lnecs, respectively. Taking the calculation of the indirect effect of lnti and its proportion to the total effect as an example, we list the specific calculation formula as follows.

$$\text{Indirect effect} = \beta_{11} \times \delta_{\text{lnti}} \quad (6)$$

$$\text{Proportion of indirect effect} = (\beta_{11} \times \delta_{\text{lnti}})/\beta_1 \quad (7)$$

3.3. Data sources

The main objective of this study is to examine the 30 provinces in the Chinese mainland, excluding Tibet, and investigate the period from 2003 to 2021. The data utilized in this scientific investigation were obtained from reliable sources, including *the China Environmental Statistical Yearbook*, *China Energy Statistical Yearbook*, *China Statistical Yearbook*, as well as *provincial Statistical Yearbook*. To tackle the issue of non-stationarity of the variables, all the variables underwent logarithmic transformation in the empirical analysis, except for the post×treat variable. The **Table 1** presents the descriptive findings derived from the data analysis.

4. Results and discussion

4.1. Baseline regression analysis

The baseline regression results are presented in **Table 2**. Models 1, 3, and 5 included lnCO2, lnSO2, and lnCO2SO2 as the dependent variables, with post×treat as the independent variable. Year fixed effects and province fixed effects were also included. The results indicate that the coefficient of the impact of GCP on lnCO2, lnSO2, and lnCO2SO2 is significantly -0.0768, -0.1277, and -0.1281, respectively. This suggests that GCP can reduce carbon dioxide and sulfur dioxide emissions, and promotes SRPC. Furthermore, control variables were added respectively. The outcomes demonstrate that the coefficient for post×treat can consistently stay significantly negative, providing further evidence that the policy contributes to CRPR, as well as SRPC. Thus, Hypothesis 1 is confirmed.

At present, GCP implemented in China has achieved certain results. Data released by the People's Bank of China show that by the end of 2022, the balance of green loans in Chinese and foreign currencies was 22.03 trillion yuan, up 38.5% year on year. Among them, the loans invested in projects with CRPR benefits were 14.70 trillion yuan, accounting for 66.7% of green loans. By use, the balance of loans in the green upgrading industry of infrastructure, the clean energy industry and the energy conservation and environmental protection industry were 9.82 trillion yuan, 5.68 trillion yuan and 3.08 trillion yuan respectively, up 32.8%, 34.9% and 59.1% year on year respectively. GCP plays a certain regulatory role on commercial banks and increases the operation difficulty of commercial banks. However, commercial banks can not only obtain certain economic benefits, but also better fulfill their social responsibilities, thus realizing the unity of social and economic benefits. Therefore, green credit policy can continue to play a role in CRPR.

4.2. Robustness test

4.2.1. Parallel trend test

Figure 2 illustrates the parallel trend test. It can be observed that in the DID model with dependent variables lnCO2, lnSO2, and lnCO2SO2, the post×treat coefficient is not statistically significant prior to the implementation of GCP, specifically before 2012, and is very close to 0. This indicates that there are no significant differences between the experimental group and the control group in terms of CO2, SO2, and CO2SO2 before the implementation of GCP, thus satisfying the parallel trend hypothesis. After the implementation of GCP, the post×treat coefficient becomes significantly negative, confirming the substantial positive impact of GCP on CRPR and SRPC.

4.2.2. Placebo test

In order to minimize the impact of random factors on the policy, this study investigates the effectiveness of the policy by dividing the participants into an experimental group and a control group, while maintaining the same implementation time for the policy. Specifically, 15 provinces were randomly selected as the experimental group, while the remaining provinces served as the control group for the baseline regression. This process was repeated 400 times. The kernel density distribution of the coefficients of the explanatory variables is shown in **Figure 3**. The majority of coefficient values fall within the range of 2, and the p-values are greater than 0.1. Based on the 400 random samplings conducted, it can be observed that GCP did not have a significant effect. This indicates that the baseline regression successfully passed the placebo test.

4.2.3. Counterfactual analysis

This paper revised the policy implementation time to 2008 in order to determine whether the responses of provinces to CRPR and SRPC were intentional or accidental. The regression coefficient of the counterfactual shock variable (post×treat) was examined to assess if it was statistically significant. If it is not significant, it suggests that the behavior of SRPC in each province began in 2012 rather than as an early response. The empirical results of the DID model with the policy implementation time set in 2008 are shown in **Table 3**. The findings reveal that, irrespective of including control variables, the significance of the coefficient for post×treat is non-existent when lnCO2, lnSO2, and lnCO2SO2 are utilized as the explained variables. This implies that the results demonstrated in **Table 2** maintain a reasonable level of robustness.

Table 3. Results of the counterfactual analysis.

	lnCO2		lnSO2		lnCO2SO2	
	(1)	(2)	(3)	(4)	(5)	(6)
post×treat	-0.0505	-0.0089	-0.0870	-0.1436	-0.1375	-0.1351
	(-1.42)	(-0.26)	(-1.28)	(1.55)	(-1.54)	(-1.60)
constant	6.9494***	2.9075***	1.7900***	10.6598***	8.7298***	8.7438***
	(76.29)	(12.80)	(7.06)	(5.02)	(26.11)	(26.88)
Control	N	Y	N	Y	N	Y
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9614	0.9723	0.9261	0.9558	0.9404	0.9683
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4. Empirical results after excluding other policy interference.

	lnCO2		lnSO2		lnCO2SO2	
	(1)	(2)	(3)	(4)	(5)	(6)
post×treat	-0.0807***	-0.0916***	-0.0296*	-0.1258***	-0.1103*	-0.2174***
	(-3.78)	(-4.91)	(-1.68)	(-2.86)	(-1.67)	(-4.27)
constant	7.3909***	4.0782**	2.1240***	5.1145	9.5149***	9.1927*
	(124.84)	(2.25)	(13.00)	(1.18)	(45.50)	(1.93)
Control	N	Y	N	Y	N	Y
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9920	0.9920	0.9519	0.9654	0.9713	0.9828
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

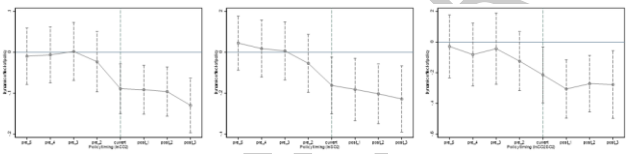


Figure 2. Test of parallel trend.

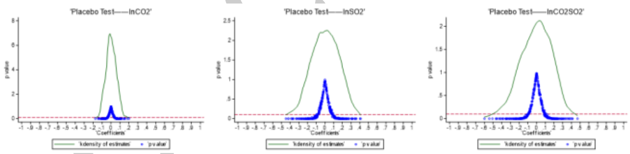


Figure 3. Placebo test.

4.2.4. Excluding other policy interference

Due to the large time span of the data selected in this paper, during this period, in addition to *GCG* issued in 2012, the Chinese government also introduced GCP in 2007 and 2018. For the purpose of eliminating the influence caused by policies apart from GCG on the empirical findings, this study exclusively preserves the data spanning from 2008 to 2017. Subsequently, the regression analysis is performed once more in accordance with Formulas (1) and (2). The findings are displayed in Table 4. It is evident that, irrespective of the inclusion of the control variable, the post×treat coefficient exhibits a significant negative association, thereby reinforcing the robustness of the regression outcomes presented in **Table 2**.

4.3. Impact mechanism test

The Sobel-Goodman model is designed to examine the policy mechanism from three perspectives: ti, isu, and esc. **Table 5** presents the empirical results. By incorporating the empirical results from **Table 2** and applying Formulas (6) and (7), we can derive **Table 6**.

The findings from **Table 2** (columns 2, 4, and 6) and **Table 5** (column 1) demonstrate that the effectiveness of GCP in stimulating technological advancement and reducing emissions of carbon dioxide, sulfur dioxide, and SRPC is questionable. While GCP may foster innovation in green technologies, its impact on non-green technological advancements is negligible (Zhang *et al.* 2022b). Between 2016 and 2022, China approved a total of 21.193 million patent applications, with only 0.178 million attributed to green and low-carbon patents. This represents less than 1% of the total approved patents. The meager proportion of green technology innovation within the broader scope of technological advancements underscores the limited influence of GCP in promoting innovation. Furthermore, non-technological innovation is primarily driven by considerations of product scale and production efficiency, paying little attention to energy consumption and environmental pollution. Consequently, technological advancements cannot play a pivotal role in CRPR. Thus, Hypothesis 2 lacks support.

Table 2 (columns 2, 4, and 6) and **Table 5** (column 2) present findings indicating that GCP has the potential to facilitate the enhancement of the industrial structure. Moreover, the industrial structure upgrade has the ability to accomplish SRPC. GCP serves as a means of providing financial support and policy guidance to support the improvement of the industrial structure (Ge *et al.* 2022). Local governments also have a significant role by taking appropriate measures and influencing investors towards favoring green industries with minimized pollution and energy usage. This is based on the integration of new information and green policy guidelines. As the optimization of the industrial structure continues, the efficiency of resource utilization enhances, ultimately leading to the attainment of SRPC. The intermediary effect of the industrial structure upgrade, portrayed in **Table 6** (columns 2, 5, and 8), has a substantial adverse impact, accounting for 5.62%, 12.54%, and 16.79% of the total influence of GCP on carbon reduction, pollution reduction, and SRPC, respectively. Thus, Hypothesis 3 finds support.

The optimization of energy consumption structure by GCP can be observed in the results of **Table 2** (columns 2, 4, and 6) and **Table 5** (column 3), ultimately leading to the achievement of SRPC. This highlights the significant role of energy consumption structure upgrading in attaining SRPC. This policy not only facilitates the transformation of energy development enterprises but also encourages industrial enterprises and residents to consume more new energy (Alharbi *et al.* 2023). As the energy consumption structure is upgraded, the entire society will naturally reduce its reliance on non-clean energy, thereby achieving SRPC. The intermediary effect of the energy consumption structure is further supported by the significant positive impact shown in columns (3), (6), and (9) of **Table 6**. These columns explain 3.34%, 6.05%, and 7.63% of the total impact of GCP on carbon reduction, pollution reduction, and SRPC, respectively. Therefore, Hypothesis 3 is supported.

Table 5. Results of Sobel-Goodman test.

	lnti (1)	lnisu (2)	lnecs (3)
post×treat	-0.0587	0.0436*	-0.0120***
	(-1.42)	(1.82)	(-2.82)
constant	1.3851	0.5860***	9.8498***
	(0.80)	(4.42)	(4.50)
Control	Y	Y	Y
year FE	Y	Y	Y
province FE	Y	Y	Y
R-squared	0.9845	0.5625	0.8444
Prob > F	0.0000	0.0000	0.0000

Table 6. Indirect effect results.

	lnCO2			lnSO2			lnCO2SO2		
	lnti (1)	lnisu (2)	lnecs (3)	lnti (4)	lnisu (5)	lnecs (6)	lnti (7)	lnisu (8)	lnecs (9)
Indirect effect	-0.0029	-0.0043▲	-0.0026▲	0.0054	-0.0160▲	-0.0077▲	-0.0029	-0.0215▲	-0.0098▲
Proportion of indirect effect	0.0372	0.0562▲	0.0334▲	-0.0420	0.1254▲	0.0605▲	0.0223	0.1679▲	0.0763▲

Note: ▲ indicates a significant indirect effect.

4.4. Heterogeneity test

To test sectoral heterogeneity, this paper calculated several variables including industrial CO2 (iCO2), industrial SO2 (iSO2), industrial CO2SO2 (iCO2SO2), household CO2 (hCO2), household SO2 (hSO2), and household CO2SO2 (hCO2SO2). These variables were logarithmized and used separately as explained variables. The experimentation is executed by employing Formula (1), and the outcomes can be observed in **Table 7**. The discoveries reveal that GCP exhibits a constructive influence on CRPR and SRPC in the industrial field. However, when it comes to the household sector, the influence of GCP is found to be insignificant. GCP strives to incentivize individuals to obtain energy-efficient household appliances and embrace new energy vehicles, while simultaneously offering financial backing to expand their energy utilization. Although GCP does exhibit a positive effect on CRPR and SRPC within the domestic sector, it is relatively feeble in comparison to the adverse impact.

To further investigate the pollution reduction effects of GCP on different types of pollutants, this study focuses on pollutants in wastewater, waste gas, and solid waste. Empirical analysis is conducted using Formula (1), and the results are presented in **Table 8**. We use chemical oxygen demand emissions (COD) and ammonia nitrogen emissions (AN) to represent wastewater discharge in Models 1 and 2. The empirical results indicate that GCP does not have a significant impact on wastewater discharge. We use SO2 and nitrogen oxide emissions (NO) to represent waste gas emissions in Models 3 and 4. The results demonstrate that GCP can effectively reduce waste gas emissions. We use common industrial solid wastes generated (CIG) and hazardous wastes generated (HWG) to represent solid waste generation in Models 5 and 6. The results show that GCP can significantly reduce the production of CIG, but does not have a significant impact on the production of HWG. These findings suggest that in the past, GCP has primarily focused on addressing waste gas and carbon emissions, while neglecting the treatment of wastewater and HWG. Therefore, it is crucial to develop a comprehensive GCP that encompasses all aspects of environmental governance in a timely manner.

Table 7. Results of sectoral heterogeneity test.

	lniCO2 (1)	lniSO2 (2)	lniCO2SO2 (3)	lnhCO2 (4)	lnhSO2 (5)	lnhCO2SO2 (6)
post×treat	-0.1661***	-0.2120***	-0.3781***	0.2289	0.0231	0.2520
	(-5.65)	(-3.18)	(-5.05)	(0.78)	(0.15)	(1.34)
constant	4.7672***	22.3567***	27.1240***	-0.6536*	-0.4057	-1.0594
	(2.80)	(3.76)	(4.51)	(-1.68)	(-0.42)	(-0.85)
Control	Y	Y	Y	Y	Y	Y
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9668	0.9222	0.9520	0.6353	0.4502	0.5014
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 8. Pollution reduction effects of GCP on different types of pollutants.

	Waste water		Waste Gas		Solid Wastes	
	lnCOD (1)	lnAN (2)	lnSO2 (3)	lnNO (4)	lnCIG (5)	lnHWG (6)
post×treat	0.0341	-0.0347	-0.3338***	-0.2221***	-0.1615***	-0.0123
	(0.83)	(-0.84)	(-7.67)	(-4.91)	(-3.36)	(-0.11)
constant	-2.1843	-15.0967***	12.4780***	-0.7516	4.4860**	2.7448
	(-0.98)	(-7.28)	(5.38)	(-0.31)	(2.47)	(0.60)
Control	Y	Y	Y	Y	Y	Y
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9383	0.9429	0.9586	0.9487	0.9466	0.8436
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.6035

Table 9. SRPC of GCP under different types of pollutants.

	lnCO2COD (1)	lnCO2AN (2)	lnCO2SO2 (3)	lnCO2NO (4)	lnCO2CIG (5)	lnCO2HWG (6)
post×treat	0.0841	-0.4385	-0.3464***	-2.2810***	-0.6109*	0.9739
	(0.24)	(-1.28)	(-6.88)	(-5.96)	(-1.66)	(1.09)
constant	-26.9873	-124.2874***	15.6908***	-16.1238	41.2873***	32.3717
	(-1.49)	(-7.21)	(6.59)	(-0.79)	(2.69)	(0.91)
Control	Y	Y	Y	Y	Y	Y
year FE	Y	Y	Y	Y	Y	Y
province FE	Y	Y	Y	Y	Y	Y
R-squared	0.9522	0.9464	0.9770	0.9603	0.9684	0.8769
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

In order to further study the SRPC of GCP under different pollutants, we considered various explained variables. These explained variables include the logarithm of the product of CO2 and COD (lnCO2COD), the logarithm of the product of CO2 and AN (lnCO2AN), lnCO2SO2, the logarithm of the product of CO2 and NO (lnCO2NO), the logarithm of the product of CO2 and CIG (lnCO2CIG), and the logarithm of the product of CO2 and HWG (lnCO2HWG). In order to conduct an empirical analysis, we employed Formula (1) and the outcomes are outlined in **Table 9**. The empirical findings reveal that the SRPC of GCP is only observed between CO2 and waste gas emissions, as well as between CO2 and CIG. However, GCP does not exert a significant impact on the simultaneous reduction of CO2 and wastewater discharge, and the simultaneous reduction of CO2 and HWG is also insignificant.

Based on previous studies, it is evident that carbon dioxide and air pollutants share similar characteristics and origins, making them suitable for synergistic reduction (Tolga *et al.* 2022). However, water pollutants, which are primarily produced through chemical reactions, have a minimal correlation with carbon dioxide (Liu and Guo, 2023; Vuckovic *et al.* 2023). Non-hazardous waste includes solid waste generated in various industries such as mining and transportation, while hazardous waste refers to waste with hazardous characteristics like toxicity and flammability, including medical waste and pesticide waste. The production of non-hazardous solid waste is associated with fossil energy or electricity consumption, making it possible to achieve synergistic reduction of carbon dioxide and non-hazardous solid waste through the implementation of GCP. However, the correlation between hazardous solid waste and carbon dioxide is insignificant, and the quantity of hazardous waste is relatively small compared to carbon dioxide and non-hazardous solid waste. Therefore, it is impractical to reduce hazardous waste by solely focusing on reducing carbon dioxide through GCP.

5. Conclusion

The significance of GCP in CRPR, as a crucial element of green financial policy, should play an important role. This study aims to demonstrate this significance by analyzing inter-provincial data from China and utilizing the DID model to assess the effects of GCP on the decrease of CO2 and pollutant emissions, as well as SRPC. The results of this analysis provide several important revelations. Firstly, the overall implementation of GCP plays a significant role in reducing CO2 and pollutant emissions, while also addressing SRPC. Secondly, GCP influences CO2 reduction, pollutant emissions reduction, and SRPC by promoting the upgrading of industrial structure and optimizing energy consumption patterns, although technological innovation does not appear to serve as an effective mediator. Thirdly, GCP fosters CO2 reduction, pollutant emissions reduction, and SRPC within the industrial sector, but its impact on the household sector is not substantial. Lastly, GCP can promote the synergistic reduction of CO2 and waste gas, and the synergistic reduction of CO2 and CIG. However, it is worth noting that GCP cannot only fails to inhibit the discharge of wastewater pollutants and the production of HWG, but also fails to promote the synergistic reduction of CO2 and wastewater discharge, and the synergistic reduction of CO2 and HWG. We offer the following advices.

Firstly, there is a pressing need to enhance the support provided by GCP in fostering innovation in green technology. While China's efforts in green technology innovation are currently thriving, the financial backing for this sector falls short in comparison to non-green technology innovation. To address this issue, it is important to fortify the establishment of mechanisms that promote green incentives and environmental regulations. Additionally, government departments should focus on the consumption side and realize SRPC in the household sector by changing the public behavior. Efforts must be made on both the supply side and the demand side to promote SRPC. Emissions caused by residents' lives are the key areas of CRPR. Residents can carry out low-carbon activities from clothing, food, housing, transportation, use, office and other aspects. Moreover, we should quickly build a collaborative mechanism for CRPR on policies to maximize the role of policies. GCP is a beneficial supplement to local environmental protection policy. How to improve the adaptation of GCP with environmental regulation, fiscal and tax policies is related to the synergistic effect between different policies. Therefore, it is necessary to formulate various policies as a whole to achieve coordinated efforts. Finally, expediting the establishment of an effective collaborative system linking green finance and transition finance is crucial. The focus of the green finance system lies in extending financial aid to "green" projects, inadvertently neglecting the green conversion of carbon-intensive and heavily polluting industries. Transition finance can offer financial assistance in transforming "brown" industries. It plays a crucial role in guiding and supervising the conversion of such industries, joining forces with green finance, and facilitating the high-quality advancement of the economy.

Acknowledgements

This work was supported by the project of national social science foundation of China (Grant numbers: 19BJL035).

References

Alharbi S.S., Mamun M.A., Boubaker S. and Rizvi S.K.A. (2023). Green finance and renewable energy: A worldwide evidence. *Energy Economics*, **118**, 106499.

An X., Ding Y. and Wang Y. (2023). Green credit and bank risk: Does corporate social responsibility matter?. *Finance Research Letters*, **58**, 104349.

Andersen D.C. (2017). Do credit constraints favor dirty production? Theory and plant-level evidence. *Journal of Environmental Economics and Management*, **84**, 189–208.

Bhattacharyya S.S., Leite F.F.G.D., France C.L., Adekoya A.O., Ros G.H., de Vries W., Melchor-Martínez E.M., Iqbal H.M.N. and Parra-Saldívar R. (2022). Soil carbon sequestration, greenhouse gas emissions, and water pollution under different tillage practices. *Science of the Total Environment*, **826**, 154161.

Chai S., Zhang K.,Wei W., Ma W. and Abedin M.Z. (2022). The impact of green credit policy on enterprises' financing behavior: Evidence from Chinese heavily-polluting listed companies. *Journal of Cleaner Production*, **363**, 132458.

Chen S., Tan T., Wang J., Zhang L., He X. and Mu S. (2023). Spatial and temporal evolution of synergizing the reduction of pollution and carbon emissions and examination on comprehensive pilot effects–evidence from the national eco-industrial demonstration parks in China. *Environmental Impact Assessment Review*, **101**, 107147.

Chen Z., Zhang Y., Wang H., Ouyang X. and Xie Y. (2022). Can green credit policy promote low-carbon technology innovation?. *Journal of Cleaner Production*, **359**, 132061.

Dietz T. and Rosa E.A. (1994). Rethinking the environmental impacts of population, affluence and technology. *Human Ecology Review*, **12**, 277–300.

Dong Z., Xia C., Fang K. and Zhang W. (2022). Effect of the carbon emissions trading policy on the co-benefits of carbon emissions reduction and air pollution control. *Energy Policy*, **165**, 112998.

Ercan T., Onat N.C., Keya N., Tatari O., Eluru N. and Kucukvar M. (2022). Autonomous electric vehicles can reduce carbon emissions and air pollution in cities. *Transportation Research Part D: Transport and Environment*, **112**, 103472.

Fang G., Chen G., Yang K., Yin W. and Tian L. (2023). Can green tax policy promote China's energy transformation?— A nonlinear analysis from production and consumption perspectives. *Energy*, **269**, 126818.

Gan T., Zhou Z., Li S. and Tu Z. (2024). Carbon emission trading, technological progress, synergetic control of environmental pollution and carbon emissions in China. *Journal of Cleaner Production*, **442**, 141059.

Gao W. and Liu Z. (2023). Green credit and corporate ESG performance: Evidence from China. *Finance Research Letters*, **55**, 103940.

Ge T., Cai X. and Song X. (2022). How does renewable energy technology innovation affect the upgrading of industrial structure? The moderating effect of green finance. *Renewable Energy*, **197**, 1106–1114.

He L., Zhang L., Zhong Z., Wang D. and Wang F. (2019). Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production*, **208**, 363–372.

Hou H., Su L., Guo D. and Xu H. (2023). Resource utilization of solid waste for the collaborative reduction of pollution and carbon emissions: Case study of fly ash. *Journal of Cleaner Production*, **383**, 135449.

Hu Y., Jin S., Ni J., Peng K. and Zhang L. (2023). Strategic or substantive green innovation: How do non-green firms respond to green credit policy?. *Economic Modelling*, **126**, 106451.

Lai J., Liu X. and Yuan L. (2024). Can green credit policy increase corporate pollution abatement efforts?. Evidence from China. *International Review of Economics & Finance*, **93,** 797–813.

Lee C.-C., Chang Y.-F. and Wang E.-Z. (2022). Crossing the rivers by feeling the stones: The effect of China's green credit policy on manufacturing firms' carbon emission intensity. *Energy Economics*, **116**, 106413.

Li C., Wang Y., Sun W., Yu Y and Ding Y. (2024). Green credit policy and corporate deleveraging: Evidence from China. *Finance Research Letters*, **66**, 105694.

Li Y., Liao M. and Liu Y. (2023). How does green credit policy affect polluting firms' dividend policy? The China experience. *International Review of Financial Analysis*, **88**, 102631.

Lian Y., Gao J. and Ye T. (2022). How does green credit affect the financial performance of commercial banks? ——Evidence from China. *Journal of Cleaner Production*, **344**, 131069.

Lin B.and Pan T. (2023). Financing decision of heavy pollution enterprises under green credit policy: Based on the perspective of signal transmission and supply chain transmission. *Journal of Cleaner Production*, **412**, 137454.

Liu J., Zhang S. and Wagner F. (2018). Exploring the driving forces of energy consumption and environmental pollution in China's cement industry at the provincial level. *Journal of Cleaner Production*, **184**, 274–285.

Liu X. and Guo W. (2023). Dynamic nonlinear effects of urbanization on wastewater discharge based on inertial characteristics of wastewater discharge. *Science of The Total Environment*, **904**, 166514.

Liu X., Wang E. and Cai D. (2019). Green credit policy, property rights and debt financing: Quasi-natural experimental evidence from China. *Finance Research Letters*, **29**, 129–135.

Liu Z., Kong L. and Xu K. (2024). The impact of public environmental preferences and government environmental regulations on corporate pollution emissions. *Journal of Environmental Management*, **351**, 119766.

Lu Y., Gao Y., Zhang Y. and Wang J. (2022). Can the green finance policy force the green transformation of high-polluting enterprises? A quasi-natural experiment based on “Green Credit Guidelines”. *Energy Economics*, **114**, 106265.

Lv C., Fan J. and Lee C-C. (2023). Can green credit policies improve corporate green production efficiency?. *Journal of Cleaner Production*, **397**, 136573.

Mateut S. (2018). Subsidies, financial constraints and firm innovative activities in emerging economies. *Small Business Economics*, **50**, 131–162.

Shao H., Wang Y., Wang Y. and Li Y. (2022). Green credit policy and stock price crash risk of heavily polluting enterprises: Evidence from China. *Economic Analysis and Policy*, **75**, 271–287.

Su T., Meng L., Wang K. and Wu J. (2023). The role of green credit in carbon neutrality: Evidence from the breakthrough technological innovation of renewable energy firms. *Environmental Impact Assessment Review*, **101**, 107135.

Sun C. and Zeng Y. (2023). Does the green credit policy affect the carbon emissions of heavily polluting enterprises?. *Energy Policy*, **180**, 113679.

Vuckovic D., MacDonald J.A., Lin D., Mendez M., Miller E. and Mitch W.A. (2023). Pharmaceuticals, pesticides, and ultraviolet filters in wastewater discharges to San Francisco Bay as drivers of ecotoxicity. *Environmental Pollution*, **336**, 122432.

Wang H., Qi S., Zhou C., Zhou J. and Huang X. (2022). Green credit policy, government behavior and green innovation quality of enterprises. *Journal of Cleaner Production*, **331**, 129834.

Wang J., Tian J., Kang Y. and Guo K. (2023b). Can green finance development abate carbon emissions: Evidence from China. *International Review of Economics & Finance*, **88**, 73–91.

Wang Q., Zhao X. and Liu Y. (2023a). Green credit policy and corporate charitable donations: Evidence from China. *Journal of Cleaner Production*, **415**, 137644.

Wang Y. (2023). Can the green credit policy reduce carbon emission intensity of “high-polluting and high-energy-consuming” enterprises? Insight from a quasi-natural experiment in China. *Global Finance Journal*, **58**, 100885.

Xiao Q., Zhao Y., Shen S., Zheng Z. and Zhao M. (2024). The impact of environmental tournament on CO2 emissions from the perspective of synergizing the reduction of pollution and carbon emissions. *Science of The Total Environment*, **907**, 168181.

Yi H., Zhao L., Qian Y., Zhou L. and Yang P. (2022). How to achieve synergy between carbon dioxide mitigation and air pollution control? Evidence from China. *Sustainable Cities and Society*, **78**, 103609.

Yin W., Zhu Z., Kirkulak-Uludag B. and Zhu Y. (2021). The determinants of green credit and its impact on the performance of Chinese banks. *Journal of Cleaner Production*, **286**, 124991.

Yuan N. and Gao Y. (2022). Does green credit policy impact corporate cash holdings?. *Pacific-Basin Finance Journal*, **75**, 101850.

Zeng Q.-H. and He L.-Y. (2023). Study on the synergistic effect of air pollution prevention and carbon emission reduction in the context of "dual carbon": Evidence from China's transport sector. *Energy Policy*, **173**, 113370.

Zhang A., Deng R. and Wu Y. (2022a). Does the green credit policy reduce the carbon emission intensity of heavily polluting industries? -Evidence from China's industrial sectors. *Journal of Environmental Management*, **311**, 114815.

Zhang B., Yang Y. and Bi J. (2011). Tracking the implementation of green credit policy in China: Top-down perspective and bottom-up reform. *Journal of Environmental Management*, **92**(4), 1321–1327.

Zhang D. and Kong Q. (2022). Credit policy, uncertainty, and firm R&D investment: A quasi-natural experiment based on the Green Credit Guidelines. *Pacific-Basin Finance Journal*, **73**, 101751.

Zhang K., Li, Y., Qi Y. and Shao S. (2021b). Can green credit policy improve environmental quality? Evidence from China. *Journal of Environmental Management*, **298**, 113445.

Zhang M., Yan T., Gao W., Xie W. and Yu Z. (2023). How does environmental regulation affect real green technology innovation and strategic green technology innovation?. *Science of The Total Environment*, **872**,162221.

Zhang S., Wu Z., He Y. and Hao Y. (2022b). How does the green credit policy affect the technological innovation of enterprises? Evidence from China. *Energy Economics*, **113**, 106236.

Zhang S., Wu Z., Wang Y. and Hao Y. (2021a). Fostering green development with green finance: An empirical study on the environmental effect of green credit policy in China. *Journal of Environmental Management*, **296**, 113159.

Zhao J., Huang H. and Liu F. (2023). Green credit policy and investment-cash flow sensitivity: Evidence from a quasi-natural experiment. *Finance Research Letters*, **52**, 103502.