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Passive Allocation of Bank Credit Asset Structure Under the Background of Environmental Governance

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Abstract

The COVID-19 epidemic not only poses challenges to natural ecology, people's health and economic development, but also affects the financial sector through the real economy and poses risks to the banking system. China's indirect financing system, which is dominated by commercial banks, has caused banks to face major challenges in the structural allocation of credit assets. This study is based on the background of epidemic and green transition, in the face of the epidemic risk problem, the Chinese government attaches great importance to environmental governance and has introduced corresponding credit support policies, this study continues to examine how commercial banks passively adjust their credit asset structure allocation under the constraints of the green transition policy of environmental governance through the double-difference method. The research finds that the Chinese government promotes green transformation, and national and local commercial banks passively respond to and implement the green credit policy by shifting their credit resources from highly polluting industries to green projects. Compared with local commercial banks, national commercial banks will be more inclined to respond to the green credit policy. Exploring the impact of the epidemic on the structural allocation of bank credit assets not only enriches the theoretical study of the economic consequences of the epidemic, but also has important practical significance for preventing financial risks, serving the real economy and promoting high-quality economic development.

Keywords: Commercial Banks, Green Credit, Credit Asset Structure

Introduction

In recent years, with the continuous promotion of China's green credit policy, the green credit business of commercial banks has developed rapidly (Luo et al., 2021; Mengze & Wei, 2015). According to data released by the China Banking and Insurance Regulatory Commission

(Figure 1), as of the end of 2020, the green credit balance of 21 major banks reached 11.5 trillion yuan.

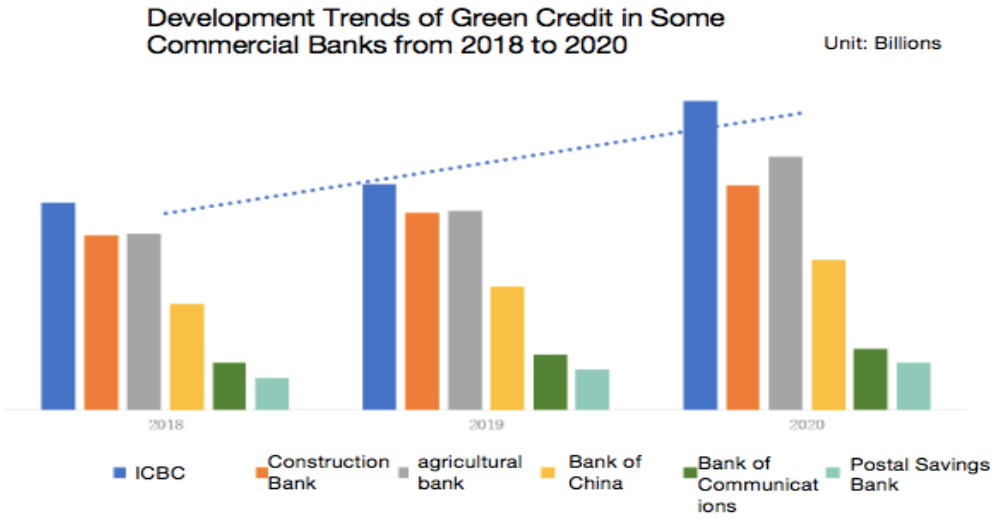

Figure 1 Development trends of green credit in some commercial banks from 2018 to 2020
Data Source: China Banking and Insurance Regulatory Commission

Furthermore, figure 1 above illustrates a consistent growth in the magnitude of green credit within commercial banks over the years. The credit balance has continuously risen, mostly allocated towards two key sectors: energy conservation and environmental protection initiatives, as well as supporting developing companies. Nevertheless, the overall green credit balance remains relatively modest and the percentage is not substantial, leaving ample space for enhancement.

The continued development of green credit business has provided important support for the realization of the dual-carbon goal and high-quality development, and has promoted the transition of the real economy in a low-carbon direction (Du et al., 2023; Zeng et al., 2023). Enterprises and banks continue to attach greater importance to green credit, especially the balance and proportion of green credit of China's four largest state-owned commercial banks, which have been growing year by year (Bao & He, 2022; Xing et al., 2021). Figure 2 above shows the balance and share of green credit of the four state-owned commercial banks. As of 2022, the proportion of green credit of the four major state-owned commercial banks has exceeded 10%, and the scale of investment has shown accelerated growth.

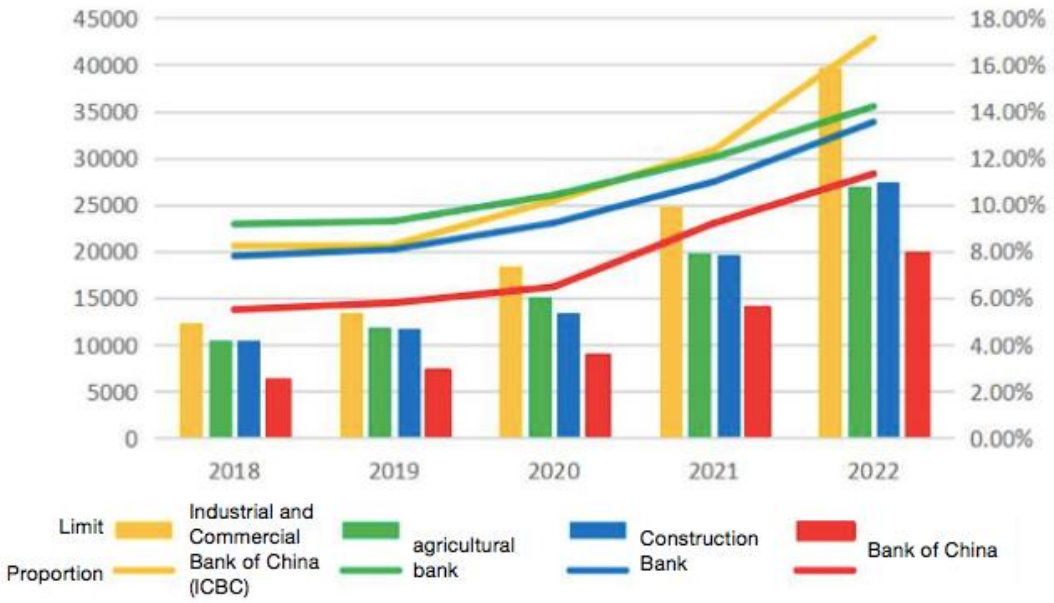

Figure 2 Green credit balance and proportion of four state-owned commercial banks from 2018 to 2022

Data source: Company annual report and social responsibility report

According to statistics, by 2022, China's green credit balance reached RMB 22.03 trillion, up 38.5% year-on-year. The growth is mainly concentrated in the fields of environmental protection, clean energy, low-carbon transportation and green upgrading of infrastructure. Green credit in the energy-saving and environmental protection industry grew by 59.1% year-on-year, the transportation industry by 10.8%, the power industry by 27.4%, the green upgrading of infrastructure by 32.8%, and the clean energy industry by 34.9%. The growth rate of green credit in these areas is clearly ahead of the curve, promoting sustainable development.

In response to sudden public health crises, commercial banks will adjust their loan asset allocation to reduce risk (Cebenoyan & Strahan, 2004; Korzeb & Niedziółka, 2020). The Chinese government promotes the development of green finance to address environmental issues and promote the green and low-carbon transformation of the economy (Hu et al., 2023; Kong, 2022). Therefore, regulators have introduced green credit policies, such as the relevant opinions jointly issued by the Environmental Protection Bureau, the Central Bank and the CBRC in 2007, and the Green Credit Guidelines in 2012, which require financial institutions to support energy conservation and emission reduction, and to promote green and low-carbon transformation.

Against this background, this study explores whether commercial banks will passively respond and adjust their credit asset allocation toward green projects under the guidance of the government's green credit policy. The nature and characteristics of commercial banks will affect their credit asset allocation behavior, which may differ. This issue is related to the realization of the goals of green transformation and high-quality development of the economy. According to this background, this article propose: will the allocation of bank credit asset structure under the background of environmental governance be passively affected?

Existing research on bank credit asset structure under environmental governance is insufficient, there are fewer direct studies on green credit abroad, and most of them focus on green finance and low carbon economy and other related fields, and the main body is mostly enterprises and governments, and there are relatively few studies on banks; most of the domestic literature analyses from the theoretical level, which involves the impact path of green credit and the role of the government and other aspects, but it lacks adequate quantitative analysis.

The research contribution of this study lies in: firstly, breaking through the limitation of traditional green finance research with enterprises or governments as the main body, focusing on the core role of commercial banks in policy transmission, revealing the passive adjustment mechanism of their credit asset allocation behaviour, and filling the theoretical gap of the interaction mechanism between environmental regulation and banks' micro-behaviour. Secondly, based on the perspective of commercial bank heterogeneity, we systematically examine the differentiated impact of different types of banks on the degree of policy response to deepen the understanding of the green credit transmission mechanism. Quantitative analysis methods such as double-difference models are used, combined with empirical tests on Chinese banking panel data, breaking through the limitations of existing studies that favour theoretical deduction, providing reliable evidence for the assessment of the micro effects of green credit policies, and having practical reference value for optimizing the policy tool mix and guiding the precise allocation of financial resources. It is of practical significance for accelerating the green and low-carbon transformation of the economy and restoring the goal of economic development in the post-epidemic era.

Literature Review and Hypotheses Development

Literature Review

Green credit, as an emerging financial concept, has not yet been widely used abroad, but its core content involves corporate social responsibility, green finance and low-carbon economy, etc (Lian et al., 2022; Ozili, 2022). Campiglio (2016) suggests that banks may refuse to provide loans to low-carbon businesses and enterprises due to risk considerations, and thus the government should intervene through monetary policy, such as lowering the reserve ratios of loans for low-carbon enterprises, in order to promote the green credit development.

Domestic studies have focused on the role of the government in promoting green credit, the implementation of green credit business and its impact on the environment. Studies have pointed out that green credit policies may lead to a reduction in the scale of existing credit and increase the cost of credit for highly polluting enterprises, thus negatively affecting their green innovation (Zhang et al., 2021; Zhang et al., 2022). In addition, some studies have shown that green credit policies help optimize bank credit structure, reduce non-performing loans, and improve bank performance in the long run (Luo et al., 2021). However, the government needs to formulate relevant complementary policies and provide economic support in order to incentivize commercial banks to actively implement green credit policies (Chai et al., 2022; Chen et al., 2022). Meanwhile, regulators should increase fiscal and legal incentives for green credit (Chen et al., 2022; Raberto et al., 2019).

In terms of academic research, the existing literature mostly analyzes the impact of green credit policy from the perspective of enterprises, mainly focusing on the relationship between

green credit and enterprises' green innovation, investment efficiency, economic performance and financing behavior (Wang et al., 2022; Wu et al., 2023). In contrast, the literature with banks as the main body of research is less, mainly focusing on the impact of green credit on bank performance and operational efficiency (Aslam & Jawaid, 2023; Luo et al., 2017). Research on how green credit affects the credit asset allocation of commercial banks is still relatively limited.

In summary, green credit research has made initial progress at home and abroad, especially the theoretical analysis of policy effects, but there are still more shortcomings, such as fewer studies on banks in foreign countries and a lack of quantitative analysis in China.

Theoretical Analysis and Research Hypotheses

(1) Bank Credit Asset Structure Allocation Behavior Supported by Green Credit

As epidemics ebb and flow, and small-scale outbreaks can occur at any time due to inputs from outside the country as well as seasonal influences, the government recognizes the importance of environmental protection, and the allocation of banks' credit structure continues to change (Campiglio et al., 2018; Saif-Alyousfi & Alshammari, 2025). Green credit has become an important policy tool for responding to environmental change and environmental governance. According to Zheng et al. (2022), commercial banks should adjust their business model, optimize the structure of credit assets, support the green and low-carbon economy, reduce credit support for high-emission industries, and increase credit investment in green projects. Gu et al. (2023) point out that, after the implementation of the Clean Air Initiative in China, green banks have charged higher lending rates to high-polluting firms. The green credit policy clearly specifies the direction, objectives and management measures of banks' green credit, aiming to promote the transition of credit structure from brown to green. Based on the above analysis, this study proposes empirical hypothesis 1.

Hypothesis 1: Under the background of public health emergencies, commercial banks will respond to and implement the green credit policy, adjust credit asset allocation, and reduce credit allocation to high-emission industries.

(2) Heterogeneity analysis of the impact of bank credit asset allocation under the background of environmental governance

National commercial banks (e.g., state-owned banks and joint-stock banks) and local commercial banks have significant differences in green credit policy response and implementation. Local banks may not actively engage in green credit due to the long return cycle, low returns and high risk of green projects (Taghizadeh-Hesary & Yoshino, 2020). In contrast, state-owned banks, with strong financial strength, strong risk resistance, and a well-developed green credit evaluation system and government policy support, are able to invest more resources in promoting green credit (Zhang and Lian, 2022). In addition, the leaders of commercial banks have the dual characteristics of “economic man” and “political man”, and when faced with the pressure of promotion, the banks' lending behaviors often reflect the stronger will of the government (Qian et al., 2011). Therefore, compared with local banks, national banks are more active in implementing green credit policies, supporting green projects and reducing credit investment in highly polluting industries (Shao and Yan, 2020). Local banks, on the other hand, are more interfered by local governments, focus more on short-term favorable projects, and have weaker green credit implementation. Based on this,

national banks are more responsive to green credit policies. This study proposes hypothesis 2.

Hypothesis 2: Relative to local commercial banks, national commercial banks will be more responsive to green credit policies.

Research Methodology

Benchmark Regression Model

This study categorizes bank samples into two groups: the processing group consists of banks impacted by green credit policies, while the control group comprises banks unaffected by green credit regulations. The fundamental concept involves initially computing the variations in credit asset allocation variables within the treatment group prior to and following the implementation of the policy. Subsequently, the changes in credit allocation variables within the control group before and after policy implementation are calculated. Finally, the disparity between the two is determined to assess the impact of green credit policies on bank credit allocation.

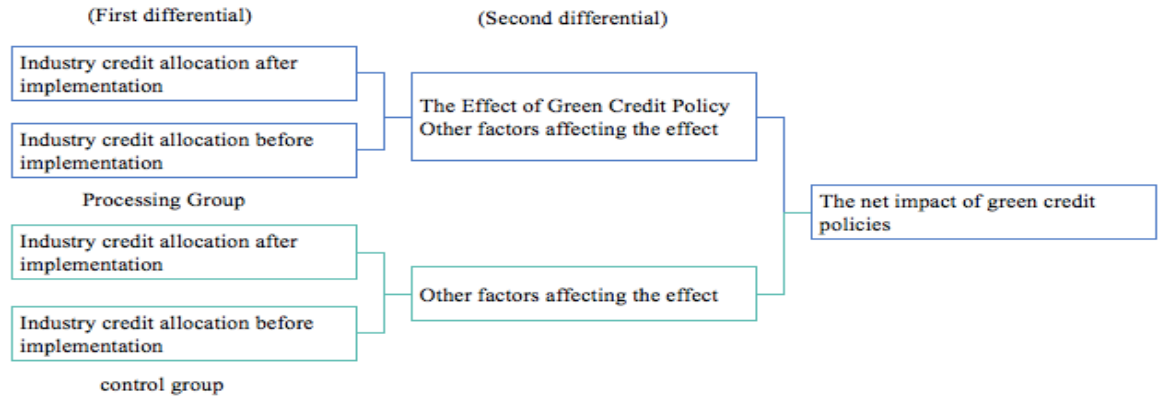

Figure 3 Implementation process of double difference

$$Loan\_atio_{b,t} = \alpha_0 + \alpha_1 \ Treat_b \times Post_t + \alpha_2 \ Treat_b + \alpha_3 \ Post_t + \alpha_4 X_{b,t-1} + u_b + \lambda_t + \varepsilon_{b,t} \quad (1)$$

In model (1), the subscript b represents the individual bank and t represents the year, $Loan\_atio_{b,t}$ represents the credit industry allocation of bank b during period t; $Treat_b$ is a grouping variable used to measure whether banks are implementing green credit policies. If it is implemented, the value of this variable is 1 for the treatment group, otherwise it is 0 for the control group; $Post_t$ is a time variable set according to the implementation time of the Green Credit Guidelines. When the observed values of the bank sample are in 2012 or later, the value of this variable is 1, otherwise it is 0; $X_{b,t-1}$ are control variables at the bank level. In order to reduce the endogeneity issues that may exist in indicators such as bank credit asset structure allocation and bank level control variables, this study takes a lag of one period for all control variables; u_b represents the individual effect of banks, λ_t represents the fixed effect of years that only changes with years and does not change with individual banks, $\varepsilon_{b,t}$ represents the residual term, representing unobservable factors that affect the structural allocation behavior of credit assets. It should be pointed out that in order to reduce the impact of individual and time effects on the identification effect of banks, this study uses a bidirectional fixed effects model of individual and year effects of banks in empirical hypothesis testing. In equations 3-1, the individual effects of banks and the fixed effects of years absorb the coefficients of $Treat_b$ and $Post_t$, respectively. Therefore, this study mainly examines the interaction term $Treat_b$ in the model × $Post_t$ coefficient α1. This coefficient measures the

causal effect of the impact of green credit guidance policies on the structural allocation of bank credit assets.

Variable Definition

Dependent Variable

$Loan\_ation_{b,t}$ is a variable of credit asset allocation in commercial banks. According to the Guidelines, banks are required to reduce their credit allocation to industries with high energy consumption, high pollution, and overcapacity. Based on 20 international industry categories, this study mainly categorizes the industries affected by policies into three major industries: manufacturing, electricity, gas and water production and supply, and construction. The explained variable in this study is the ratio of the sum of the three types of industry loans mentioned above to the total amount of commercial bank loans.

Core Explanatory Variables

The explanatory variable of this article is the policy of the former China Banking Regulatory Commission's "Green Credit Guidelines". The "Guidelines" policy issued by the former China Banking Regulatory Commission in 2012 brought a large exogenous impact on banks' asset allocation in the credit industry. This study adheres to the specifications of the double difference model by using two dummy variables, namely Treat and Post. The Treatment variable is utilized as a means to differentiate between the experimental group and the control group. Referring to existing research (Ding Ning et al., 2020), this study will take 1 for banks affected by policies, otherwise take 0; Post represents a time variable, representing the period before and after the promulgation of the Guidelines, i.e. with a value of 1 after 2012, with a value of 0 before 2012.

Control Variables

To effectively identify the impact of green credit policies on the credit asset allocation behavior of commercial banks, this study controls for a series of variables that may have an impact on the credit asset allocation behavior of commercial banks. The control variables selected in this study mainly include: Bank asset size (Size), Capital adequacy ratio (Car), Return on Assets (Roa), Non-performing loan ratio (NPL), Liquidity level (Liq).

In this study, 62 Chinese commercial banks (including national, joint-stock and local banks) are selected as the research sample during 2010-2023. Based on the policy time point of Green Credit Guidelines in 2012, DID analysis is used to distinguish between the treatment group and the control group by combining factors such as green credit statistics from the CBD, disclosure of social responsibility reports and the timing of green credit disclosure. The data for both the explanatory and control variables were obtained from the China Banking Database (CBD). Taking the 2012 Green Credit Guidelines as the policy time point, commercial banks are categorized according to the treatment variables and time variables, in which banks disclosing green credit balances and related indexes are treated as the treatment group, and banks without green credit disclosure are the control group. Among them, green credit related information and data disclosure mainly come from the annual reports and social responsibility reports of major commercial banks. In order to eliminate the influence of extreme values on the study, this study applies Winsorize shrinkage at the 1%-99% level for continuous variables.

Results and Discussion

Descriptive Statistics of Variables

Table 1 gives the descriptive statistics of the main variables. The descriptive statistics show that the mean value of banks' credit share in the traditional two high and one residual industry is 29.1487, the standard deviation is 9.8498, the minimum value is 10.5481, and the maximum value reaches 58.4021, which indicates that there is a wide range of variability in banks' loan share in the traditional two high and one residual industries during the sample period. All other control variables also fluctuate within a wide range, but the statistical results are basically consistent with the existing studies and in line with the current situation of commercial banks' operation. In addition, considering the problem of multicollinearity, this study carries out the variance inflation factor (VIF) test on the explanatory variables. The results show that the VIF of the dependent variables are all less than 5, indicating that the problem of covariance is not prominent.

Table 1
Descriptive statistics for key variables

Variable	Observed value	Mean	Std. Dev.	Min	Max
Loan_ratio	322	29.1487	9.8498	10.5481	58.4021
Treat	351	0.4159	0.4936	0.0000	1.0000
Post	351	0.6809	0.4668	0.0000	1.0000
Size	351	12.7694	1.7344	9.8960	16.5856
Car	350	12.5920	1.9438	8.1100	27.0700
Roa	351	0.9852	0.2774	0.0721	2.0560
NPL	351	1.0315	0.6519	0.0200	5.6700
Liq	343	48.4590	12.5474	28.3600	104.0300

Source: China Banking Database (CBD)

Benchmark Regression Results

In order to more clearly identify the causal effects of green credit policy shocks affecting the passive allocation of banks' credit assets, this study analyzes them by adopting a two-way fixed-effects model covering bank individual effects and year fixed effects, and gradually introducing characteristic variables such as banks. The regression results are shown in Table 3. The results in column (1) of Table 2 show that the Treat×Post coefficient is significantly negative at the 1% level when controlling only for bank fixed effects but no control variables are included in the regression; column (2) is the result of adding bank characteristic control variables and controlling for individual bank fixed effects, and the Treat×Post coefficient is also significantly negative; column (3) shows that the Treat×Post coefficient is significantly negative when introducing bank characteristics control variables as well as controlling for two-way fixed effects, the Treat × Post coefficient remains significantly negative. Taken together, the results show that the allocation to the two-high and one-remaining credit sectors significantly decreases in the experimental group compared to the control group, and thus, the green credit policy shock significantly reduces banks' credit allocation to the traditional two-high and one-remaining sectors. This is basically consistent with the findings of empirical studies by Reghezza et al. (2022), Kacperczyk and Peydró (2021) and others. Hypothesis 1 is verified.

Table 2
Benchmark Regression Results on the Impact of Green Credit Policy on Banks' Credit Asset Structure Allocation

Variable	Loan ratio	Loan ratio	Loan ratio
	(1)	(2)	(3)
TreatxPost	-3.7653***	-1.4281*	-2.7111***
	(0.6809)	(0.8260)	(0.9492)
L.Size		-5.9638***	-3.9942**
		(0.7716)	(1.8380)
L.Car		0.1565	0.1470
		(0.1474)	(0.1485)
L.Roa		-0.8136	-2.7451*
		(1.4222)	(1.4477)
L.NPL		-0.5233	-0.1674
		(0.4402)	(0.4287)
L.Liq		-0.0463	-0.0398
		(0.0289)	(0.0274)
Bankeffects	YES	YES	YES
Yeareffects	NO	NO	YES
N	322	263	263
R^2	0.1045	0.3915	0.4661

Note: Bankeffects denote individual bank effects and Yeareffects denote year fixed effects; numbers in parentheses under the coefficients of each variable are standard errors.N denotes sample size. *, ** and *** denote significant at the 10%, 5% and 1% levels, respectively, as below.

Robustness Testing

Parallel Trend Test

The effect of commercial banks' response to and implementation of green credit policy is generally tested in this study using a double-difference model, but the prerequisite for the use of such a model is to comply with the parallel trend assumption. For the study of this study, before the green credit policy shock, the double-difference method requires that the credit sector allocation of banks in the experimental group and the control group maintain basically parallel time trends, while in the year of the policy promulgation and afterward, there should be significant differences in the change trend. As shown in figure 4, the sample period of this study is 2010-2023, and 2012 is the policy point of the “Green Credit Guidelines” policy, before 2012, the trend of change in the credit industry allocation of banks in the treatment and control groups is basically the same, and after that point of time the two begin to show a significant difference, i.e., the share of commercial banks affected by the green credit policy's credits to high-pollution and high-emission industries, etc. declines more significantly. In order to further verify the parallel trend test, this study further adopts the dynamic effect plot of 95% confidence interval for testing, as shown in figure 5, similarly, before 2012, the 95% confidence interval passes through 0 or near 0, and gradually declines after 2012. The results of the parallel trend test of the two plots are basically the same. Therefore, the results indicate that the study in this study satisfies the prerequisites of the double difference model and can reduce the endogeneity problem caused by bias.

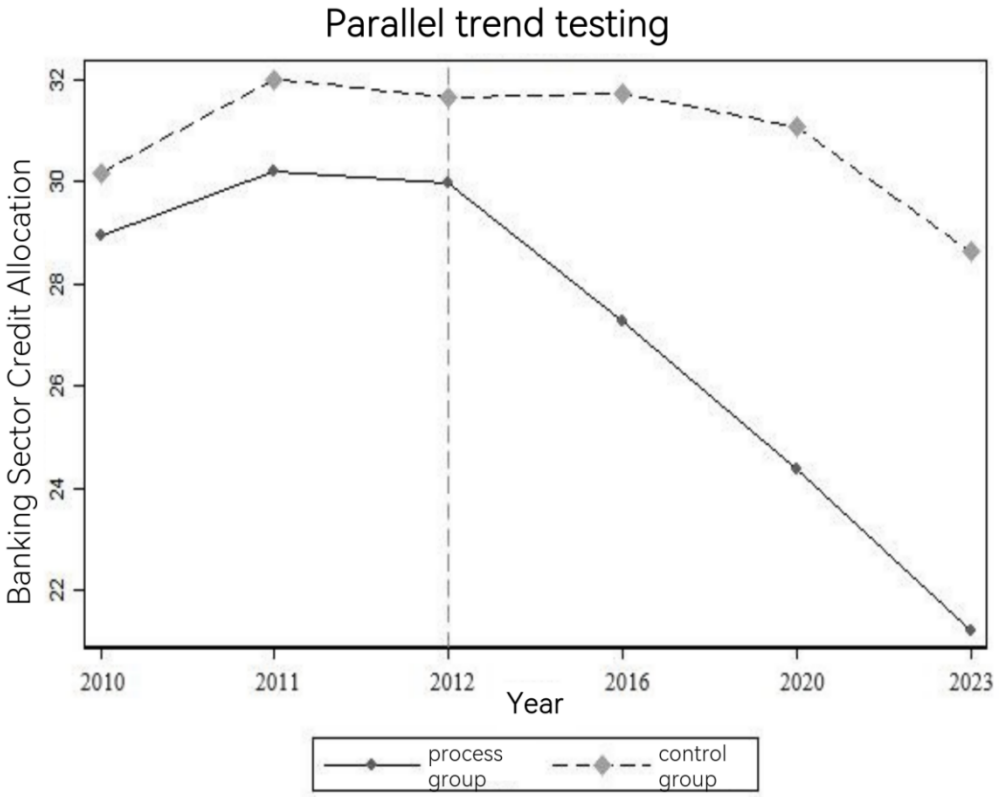

Figure 4 Trends in bank credit sector allocations before and after the Guidelines

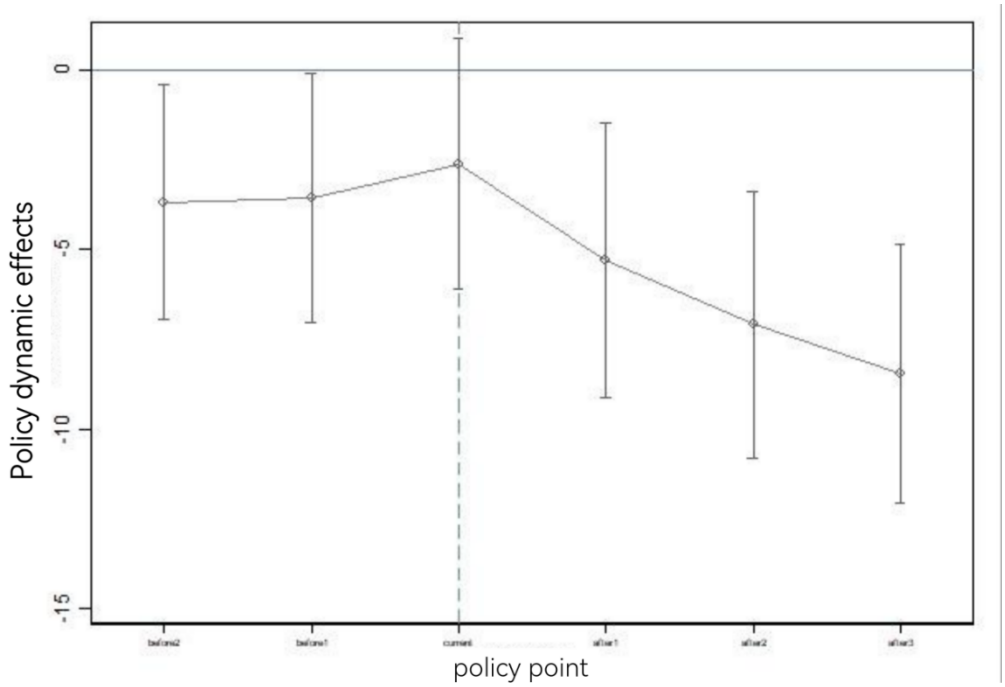

Figure 5 Dynamic Trend Plot of Parallel Trend Test Results

Placebo Test

In order to exclude the interference of pre-green credit policy factors on the empirical results and enhance the robustness of the policy effect, this study adopts the replacement of the policy time point. Referring to Lin et al. (2020), the year of implementing green credit policy by each commercial bank is front-loaded by one period in the empirical analysis. If the coefficient of the interaction term of the double difference is significantly negative, it means

that the decline of commercial banks' credit share for traditional high-carbon industries is due to other stochastic factors, and the impact of green credit policy on the structural allocation of commercial banks' credit industry, i.e., the hypothesis, is likely to be untenable; if the coefficient of the interaction term is not significantly negative, it suggests that the decline of the credit share of the high-carbon industry is affected by the green credit policy. Table 3 is the regression results after commercial banks implement green credit policy one period ahead of time, and it can be seen that the regression coefficients of Treat×Post in the table are significant only when no control variables and year fixed effects are added to column (1) but not significant when control variables and two-way fixed effects are added more strictly to column (2) and column (3), indicating that the regression coefficients of Treat×Post are not significant after grouping. None of them are significant after that, indicating that basically all the negative significance of green credit policy on the structural allocation of commercial banks' credit sector analyzed by the benchmark regression becomes insignificant in the grouping case. Thus, the placebo test proves the robustness of the benchmark regression results.

Table 3
Placebo test: advancing the point of policy implementation

Variable	Loan ratio	Loan_ratio	Loan_ratio
	(1)	(2)	(3)
TreatxPost	-1.839**	0.560	-2.015
	(0.873)	(1.043)	(1.304)
L Size		-4.004***	-3.118
		(0.955)	(1.930)
L.Car		0.141	0.090
		(0.125)	(0.115)
L.Roa		-1.772	-3.515**
		(1.711)	(1.602)
L.NPL		-0.501	0.075
		(0.966)	(1.149)
L.Liq		-0.061**	-0.051**
		(0.025)	(0.024)
Bankeffects	YES	YES	YES
Yeareffects	NO	NO	YES
N	322	263	263
R^2	0.0201	0.2316	0.3750

Note: Bankeffects denote individual bank effects and Yeareffects denote year fixed effects; numbers in parentheses under the coefficients of each variable are standard errors.N denotes sample size. *, ** and *** denote significant at the 10%, 5% and 1% levels, respectively, as below.

Propensity Score Matching

In order to solve the sample selection bias problem and ensure a more accurate assessment of the effects of green credit policy implementation, with reference to Chen Qiang's (2022) study, this study adopts the propensity score matching (PSM) method to re-match similar observations for the treatment group as a new control group, in order to eliminate the possible ex-ante differences between the treatment and control groups. To this end, the study uses several representative indicators such as bank capital adequacy ratio,

relative size of loans, non-performing loan ratio, profitability level, and balance sheet ratio as matching criteria to select comparable commercial banks that have not implemented green credit for each bank that has implemented green credit on the basis of PSM treatment. In this study, the samples of the processing group are matched by using three matching methods, namely 1:1 nearest neighbor matching, radius matching and kernel matching, respectively, and the amount of sample loss after pairing is around 20 samples, with the absolute value of the standard deviation (%bias) being less than 20%, less than 4%, and less than 10%, respectively. According to the existing studies, the absolute value of standard deviation is within a reasonable range. Meanwhile, the t-tests all pass the test and the P-values are significant, indicating that the variable characteristics of the two groups of samples after PSM treatment are relatively close to each other, and the impact of the sample selection error on the net effect of the policy during the double difference test can be reduced by the balancing assumption. Table 4 shows the results of re-running the double difference test regression on the matched samples. As can be seen from the results in Table 5, the regression coefficients of Treat × Post remain consistent with the benchmark regression results, further illustrating the robustness of the benchmark results.

Table 4
Robustness test regression results for propensity score matching

Variable	nearest neighbor	radius match	kernel matching
	Loan ratio	Loan ratio	Loan ratio
TreatxPost	-2.814***	-2.854***	-2.737***
	(1.004)	(1.029)	(1.014)
L.Size	-5.763***	-5.609***	-5.624***
	(1.965)	(2.019)	(2.011)
L.Car	-0.018	-0.014	-0.019
	(0.213)	(0.214)	(0.213)
L.Roa	-3.306**	-3.453**	-3.418**
	(1.643)	(1.631)	(1.624)
L.NPL	-0.328	-0.333	-0.337
	(0.454)	(0.454)	(0.452)
L.Liq	-0.021	-0.026	-0.024
	(0.032)	(0.032)	(0.031)
Bankeffects	YES	YES	YES
Yeareffects	NO	NO	YES
N	246	245	247
R^2	0.4778	0.4700	0.4716

Note: Bankeffects denote individual bank effects and Yeareffects denote year fixed effects; numbers in parentheses under the coefficients of each variable are standard errors.N denotes sample size. *, ** and *** denote significant at the 10%, 5% and 1% levels, respectively, as below.

Exclusion of Other Events

In order to exclude, as much as possible, the possibility of the introduction of other policies triggering the results of this study, the sample period of this study is set as 2010-2023. However, considering that during that study period, in addition to the green credit policy, it also includes the supply-side structural reform announced in 2015, in which the task of removing production capacity may directly affect the structural allocation of commercial

banks' credit resources industry. Therefore, the overcapacity industry is not only affected by the green credit policy, but also by the supply-side structural reform policy. Based on this, in order to avoid the interference of this policy on the empirical results of this study, this study excludes the sample of 2015 within the sample period and retests it. As shown in Table 5, the direction and significance of the regression coefficients of the cross terms are unchanged, and the results are basically consistent with the previous study.

Table 5
Regression results excluding other policy effects

Variable	Loan ratio	Loan ratio	Loan ratio
	(1)	(2)	(3)
Treat×Post	-2.3751***	-1.5056**	-1.8861**
	(0.6424)	(0.7584)	(0.9262)
L.Size		-4.2305***	-2.5674
		(0.8765)	(2.1594)
L.Car		0.3432**	0.2609
		(0.1515)	(0.1592)
L.Roa		0.8281	0.1954
		(1.5344)	(1.7414)
L.NPL		-0.2653	-0.3631
		(0.4925)	(0.5109)
L.Liq		-0.0569*	-0.0522*
		(0.0310)	(0.0307)
Bankeffects	YES	YES	YES
Yeareffects	NO	NO	YES
N	265	208	208
R^2	0.0619	0.3112	0.3430

Note: Bankeffects denote individual bank effects and Yeareffects denote year fixed effects; numbers in parentheses under the coefficients of each variable are standard errors.N denotes sample size. *, ** and *** denote significant at the 10%, 5% and 1% levels, respectively, as below.

A Test of Heterogeneity Across Bank Types

To further examine the impact of green credit policy on banks' credit allocation, this study conducts a heterogeneity analysis based on bank nature to explore the differences in the response to and implementation of green credit policy among different types and characteristics of commercial banks.

Compared with local commercial banks, large state-owned banks and joint-stock commercial banks are the main implementers of green credit due to the differences in the management level of operation and risk, and the credit allocation for the traditional two high and one leftover industry will also show certain differences. Therefore, this study examines the heterogeneous impact of green credit policy on the allocation of credit industry from the perspective of the nature of the bank. To this end, this study divides the bank sample into state-owned commercial banks, joint-stock commercial banks and local commercial banks, due to the limitations of the number of samples as well as from the point of view of the strength of the implementation of the green credit policy, this study combines state-owned commercial banks and joint-stock commercial banks into a group, divided into national

commercial banks, including state-owned banks and joint-stock commercial banks, and local commercial banks for regression tests. The regression results are shown in Table 7. From Table 6, it can be seen that the regression coefficients of the interaction term Treat×Post are significantly negative at the 5% level for national commercial banks including state-owned banks and joint-stock commercial banks, while the regression coefficients of Treat×Post are significantly negative at the 10% level for local commercial banks; in terms of the magnitude of the coefficients, the effect of policy on the national commercial banks including state-owned banks and joint-stock commercial banks is significant. In terms of the size of the coefficient, the policy has a stronger effect on national commercial banks including state-owned banks and joint-stock commercial banks. This indicates that the green credit policy has a significant impact on the credit allocation of the two groups of banks, but the effect is more significant for national commercial banks including state-owned banks and joint-stock commercial banks. Hypothesis 2 is verified.

Table 6
Heterogeneity regression results for bank nature

Variable	Loan ratio	Loan ratio	Loan_ratio	Loan ratio
	(1)	(2)	(3)	(4)
Treat×Post	0.7735	-5.0126**	-1.5041	-2.4954*
	(1.3352)	(2.0230)	(1.3743)	(1.4234)
L Size	-11.5111***	-9.5994***	-5.0510***	-4.0702*
	(1.8073)	(2.8954)	(0.9378)	(2.4047)
L.Car	0.2587	0.9496**	0.0775	0.0421
	(0.4378)	(0.4620)	(0.1838)	(0.1867)
L.Roa	-1.1964	-5.2868	-0.4478	-2.1397
	(3.7844)	(3.4522)	(1.6105)	(1.6832)
L.NPL	0.8742	3.4809**	-0.4548	-0.1673
	(1.5628)	(1.4769)	(0.4964)	(0.4906)
L.Liq	-0.0560	0.0284	-0.0401	-0.0409
	(0.0537)	(0.0478)	(0.0345)	(0.0333)
Bankeffects	YES	YES	YES	YES
Yeareffects	NO	YES	NO	YES
N	82	82	176	176
R^2	0.6808	0.7952	0.2912	0.3635

Note: Bankeffects denote individual bank effects and Yeareffects denote year fixed effects; numbers in parentheses under the coefficients of each variable are standard errors.N denotes sample size. *, ** and *** denote significant at the 10%, 5% and 1% levels, respectively, as below.

Conclusions and Recommendations

The 2020 outbreak of COVID-19 Pneumonia became a major event in the environmental field. Historically, ecological destruction and water pollution have led to many serious epidemics, such as the plague caused by over-cultivation of grasslands, the spread of leprosy by armadillo trapping, and the cholera in London caused by water pollution. These events show that there is some connection between major epidemics and ecological changes. Therefore, more attention needs to be paid to environmental governance in the post epidemic era. This study explores the passive allocation of bank credit asset structure from the perspective of environmental governance.

On the basis of theoretical analysis, this study combines epidemic risk and environmental governance policies, empirically tests the green credit policy response and implementation effects of commercial banks under environmental governance using double-difference quasi-natural experiments, and examines the heterogeneity of the response effects by the nature of the bank and the level of liquidity. In addition, this study also analyzes the impact of banks' credit asset allocation adjustment on banks' profitability and risk under green credit.

The results of the empirical study show that: First, in order to cope with the risk of epidemic, commercial banks passively respond to the state-led green credit policy in the context of environmental governance, and banks affected by the policy reduce the credit allocation to high-pollution and high-emission industries, optimize the structure of credit assets, and credit resources flow to green projects. The dynamic effect of banks' implementation of green credit policy has been strengthened, and as society's attention to green credit increases, the reputational effect of commercial banks' implementation of green credit has become more and more significant, pushing them to implement green policies more actively. Second, compared with local commercial banks, national commercial banks are more inclined to respond to green credit policies. This may be due to the fact that national banks have more strength, stronger risk resistance, a more complete green credit evaluation system and policy support from government departments.

Based on the above research, this study puts forward the following recommendations:

(1) In order to promote the development of green finance, it is necessary to improve the construction of green financial standards and infrastructure, including carbon emission reduction certification standards, green project certification, carbon emission accounting and information platforms. In addition, it is particularly important to promote the construction of green financial systems in local commercial banks to enhance their incentives to respond to green credit policies.

(2) Incentive and constraint mechanisms should be gradually improved to promote the sustainable development of green credit. Incentive mechanisms for green finance should be strengthened, such as incorporating green credit performance into the central bank's assessment system, optimizing carbon emission reduction support tools, strictly verifying carbon emission reduction reports, and expanding the scope of qualified collateral for green bonds and green loans. In addition, differentiated capital regulatory tools can be adopted to reduce the risk weight of green assets in order to promote green transformation.

(3) Green finance should balance the relationship between emission reduction and growth, avoiding excessive lending restrictions on high-carbon industries while supporting their technological upgrading and low-carbon transformation. To this end, long-term green transition support tools should be innovated and high-carbon transition enterprises should be included in green finance standards to ensure that their carbon reduction plans and transition paths are clear.

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