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Green Credit Policy and Environmental Outcomes in China: The Critical Role of Local Banks in Pollution Reduction and Innovation

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ABSTRACT

This research assesses the role of local banks in the environmental consequences of the green credit policy (GCP) implementation in China. Utilising a sample of 297 cities from 2010 to 2017 and employing a difference-in-difference model, the study examines whether cities with local banks experience a significant reduction in environmental pollution post-GCP implementation. The 2012 introduction of GCP serves as an exogenous shock, revealing that cities with local banks show a substantial decrease in pollution levels, thereby supporting Porter's hypothesis and relationship banking theory. Mechanism analysis indicates that local banks contribute to pollution mitigation by promoting innovation. Besides, the role of local banks in pollution reduction is more pronounced in cities with higher levels of foreign direct investment and economic development. Overall, our findings underscore the importance of supporting local banks in their green credit initiatives to achieve significant environmental benefits.

JEL Classification: G21, G28, Q5, R11

1 | Introduction

The rapid expansion of China's economy has led to significant environmental challenges, such as widespread water and air pollution, placing vast stress on the nation's resources and ecosystems. In response to the severe environmental degradation, the Chinese government has prioritised advancing green finance through a series of policies and regulations (Campiglio 2016; Larcker and Watts 2020; Flammer 2021; Huang et al. 2021; Ehlers et al. 2022). Among these, the green credit policy (GCP) represents a pivotal initiative in advancing the transition to a green economy. This transformative effort is closely linked to the growth of local financial systems, with city commercial banks (CCBs) playing a key role in fostering regional financial development. The interplay between green finance and localised implementation underscores a compelling narrative: China's push for a green economy is not solely a top-down mandate but a regionally driven effort leveraging the local banking sector to achieve sustainability. Understanding the effectiveness of local banks in implementing the GCP is, therefore, essential for assessing their role in environmental protection.

According to the Porter Hypothesis (Porter and Linde 1995), well-designed environmental regulations encourage firms to engage in green innovation, which in turn can save energy and reduce pollution (e.g., Yang et al. 2012; Li and Wu 2017; Zhang and Vigne 2021). The GCP aims to achieve environmental conservation by leveraging the banking sector, mandating that financial institutions incorporate pollution prevention and environmental protection into their lending criteria. Despite its potential, the GCP faces persistent policy-level challenges. According to the 2023 report by the International Institute of Green Finance (2024), local banks in China grapple with a conflict between supporting green credit and meeting local economic growth objectives. These banks often rely on short-term profits from high-polluting industries, as loans to these sectors typically offer higher interest rates and faster repayment periods. This financial reliance creates a significant obstacle to fully implementing the GCP, as financial returns often take precedence over environmental goals. Additionally, discrepancies between corporate-reported environmental performance and actual impact undermine the policy. Many firms exaggerate their green credentials to access favourable loans, and weak verification processes by banks further exacerbate this issue, reducing the GCP's effectiveness in curbing pollution (Li et al. 2022). To address these challenges, this study explores the role of CCBs in implementing the GCP and their impact on environmental pollution, focusing on the challenges faced by local banks in balancing economic development with environmental conservation. Unlike national banks, CCBs are uniquely positioned to support local economies and foster close relationships with regional firms due to their one-city-one-bank structure, which brings them into more direct conflict between promoting regional economic growth and ensuring environmental conservation. Through heterogeneity tests, the research further identifies the conditions under which local banks prioritise one objective over the other, offering a nuanced understanding of CCBs' role in GCP execution. These insights can guide policymakers in China and other developing countries to adopt more tailored approaches for effective GCP implementation.

Relationship banking theory posits that local banks, acting as relationship lenders, are in a unique position to allocate capital effectively to local firms due to their extensive client knowledge from longstanding relationships (Zhang et al. 2016; Barboni and Rossi 2019; Hasan et al. 2021). In China, CCBs, which emerged in the mid-1990s to support local economies and small and medium-sized enterprises (SMEs), are key players in the GCP framework. Since SMEs are major pollution contributors and constitute 90% of all enterprises in China (Deng et al. 2022), reducing their environmental impact is crucial. Through green lending, CCBs can significantly influence local pollution levels, thereby contributing to sustainable development (Chen et al. 2021). This study investigates the role of CCBs in the environmental outcomes of GCP implementation in China.

Under GCP, CCBs must impose credit restrictions on new projects in high-polluting and high-energy-consuming industries and are even required to retract loans from ongoing projects in these sectors. While green lending has been shown to reduce credit risk and enhance profitability for Chinese commercial banks (Zhou, Caldecott, et al. 2022; Lian et al. 2022), the benefits for CCBs remain debated (Luo et al. 2021; Zhou, Caldecott, et al. 2022; Yin et al. 2021). Loans to polluting companies often offer higher interest rates and shorter repayment terms, which could be more profitable for banks. This raises questions about whether GCP aids CCBs in fulfilling their primary role of local economic development (Yin et al. 2021), which is crucial for local political advancement. Thus, this research seeks to answer: ‘Do CCBs contribute to emissions reduction through GCP implementation?’ and ‘What mechanism do they use to reduce emissions?’ This study focuses on the intermediary role of CCBs in implementing GCP and its environmental impacts.

The primary focus of green credit regulations is pollution reduction due to its significant externalities. China has seen a significant increase in sulphur dioxide (SO_2) emissions, particularly from its industrial sectors, outpacing many other nations. Recognising the severity of pollution, Chinese authorities have emphasised high-quality economic development to address this issue. SO_2 has been a primary target of environmental regulations in China for many years due to its role in acid rain formation and respiratory health impacts. As a result, there is a significant focus on reducing SO_2 emissions in national policies like the 11th (2006–2010) and 12th (2011–2015) Five-Year Plans. From 2013 to 2018, China made significant progress in improving air quality, including a 26% reduction in SO_2 emissions. This progress prompts the question of whether CCBs have contributed to better environmental conditions by adhering to GCP requirements. Therefore, this research aims to examine the role of CCBs in local environmental pollution prevention, particularly regarding industrial pollution (Chen et al. 2018, 2021; Zhang et al. 2019).

China offers an ideal research setting for this study. First, the ‘2012 Guidelines on Performance Evaluation of Banking Sectors’ incorporate socially responsible lending as a key assessment criterion for banks. The Guidelines of the GCP (GCGs) provide detailed implementation guidelines and regulatory pressure, creating a conducive environment to isolate the effects of local banks on GCP implementation and environmental pollution. Second, with the one-city-one-CCB rule and their localised operations within specific provinces or cities, our sample offers a unique context to examine how local banks navigate the tension between profit motives and environmental responsibilities (Sun et al. 2013; Chen et al. 2021). This localised focus enables the study to directly explore whether and under what conditions these banks can reduce city-level pollution by assessing firms' environmental impacts.

We conducted our analysis on a sample of 297 cities in China from 2010 to 2017. Given that the policy aims to control pollution and protect the environment using banks as intermediaries, cities with established local banks are expected to have a more significant impact on implementing GCP than cities without such banks. Therefore, we divided our sample into two groups: cities with local banks before GCP implementation (the treatment group) and cities without local banks before GCP implementation (the control group).

Using the 2012 introduction of GCP as a quasi-natural experiment, this research employs a difference-in-difference (DID) model to assess the impact of local banks on environmental pollution between the treatment and control groups. Our findings reveal that cities with local banks experienced a greater reduction in environmental pollution post-GCP implementation compared to cities without local banks. This result remains robust after conducting parallel trend and dynamic analysis, propensity score matching analysis (PSM-DID), placebo tests, using alternative pollution measures, and excluding special values. Additionally, we explore the mechanism behind this effect, discovering that local banks contribute positively by fostering innovation. Our analysis also indicates that the role of local banks in pollution reduction is more pronounced in cities with higher levels of foreign direct investment (FDI) and economic development.

Our study offers significant contributions to various branches of literature. First, it enhances the understanding of the role of local financial institutions in local pollution control, offering nuanced insights into the impact of national environmental regulations. While numerous studies have highlighted the banking sector's role in addressing environmental concerns (Javadi and Masum 2021; Mueller and Sfrappini 2022; Friedrich et al. 2023; Lundgren and Catasús 2000; La Torre et al. 2024), none of them specifically examines the effect of local banks in the context of GCP. Our study provides evidence regarding local banks' role in the GCP implementation to mitigate local pollution. Our findings are applicable to other developing countries where localised financial institutions play a key role in regional development. In countries like India, Bangladesh and Nigeria, such institutions often provide loans to SMEs, which are significant contributors to environmental pollution. The insights from our study on the effectiveness of local banks in facilitating the implementation of the GCP can guide similar initiatives in these regions, where local banks are pivotal in financing the operations of local industries. Second, this study extends the findings of Zhang, Li, et al. (2021) and Zhang, Wang, et al. (2021), which demonstrate the GCP's positive environmental effects at the firm and provincial levels, by providing city-level evidence of local banks' effectiveness in GCP implementation. Third, this study is pioneering in examining the role of local banks in national GCP implementation, unlike previous research focused on major commercial banks (Zhou et al. 2021). Fourth, it contributes to the Corporate Social Responsibility (CSR) literature by demonstrating how local banks fulfil their CSR through GCP implementation, addressing a gap identified by Wu and Shen (2013) and Zhou et al. (2021).

Theoretically, this study supports the Porter Hypothesis from the perspective of local banks. Instead of focusing solely on environmental regulation, it provides new insights by analysing how local banks enhance innovation through GCP implementation and contribute to pollution reduction in the region. It also contributes to relationship banking theory by showing that local banks, as relationship lenders, can better evaluate local customers' green projects due to the detailed information obtained from long-term relationships with local SMEs. This ability to assess the quality of green projects ultimately benefits the environment.

The rest of the paper is structured as follows: Section 2 provides a literature review and formulates two hypotheses. Section 3 describes our sample construction, data sources, measures, empirical models and summary statistics. Section 4 presents the main empirical results with potential interpretations and the moderating effect. Sections 5 and 6 offer mechanism analysis and heterogeneous analysis, respectively. Section 7 concludes with the contributions and implications of the study.

2 | Literature Review and Hypothesis Development

2.1 | Literature Gap

Although the GCP has been extensively studied in the context of environmental governance, existing literature places little emphasis on the role of local banks in its implementation, despite the fact that SMEs are the predominant sources of pollution in many cities. SMEs account for a significant share of economic activity but often lack the resources to independently adopt green practices. Local banks, particularly CCBs, are positioned to influence these enterprises through green financing. However, the mechanisms through which local banks contribute to pollution reduction in GCP implementation remain unclear at the city level. This research addresses this gap by investigating how local banks help mitigate pollution through mechanisms like innovation and relationship banking. By addressing this gap, the study provides crucial insights into the localised implementation of green finance policies.

2.2 | GCP, Local Banks and Environmental Pollution

The GCP, formalised through the GCGs in 2012, is considered a well-structured and comprehensive approach to environmental regulation. This policy distinguishes itself from the initial green credit concept introduced in 2007 through two key enhancements. First, the 2012 Guidelines are prescriptive, providing detailed processes, policy terms, controls and supervision for green lending activities. The introduction of numerous supplementary rules and regulations further strengthens the policy. Second, the GCGs impose a stringent regulatory framework for banks' undesirable behaviours. They specify that a bank's performance in green credit significantly influences its government regulatory ratings, market access and the performance evaluations of its managers. These factors substantially increase the costs of noncompliance with GCP, thereby motivating local banks to prioritise environmental protection in their lending decisions.

A considerable body of research has examined the relationship between financial institutions and environmental outcomes within the framework of green finance (An et al. 2021; Batrancea et al. 2020; Wang et al. 2021; Obiora et al. 2020; Ye and Fang 2021). Green credit, one of the most prominent green financial instruments in China, has been found to contribute significantly to environmental protection (Zhou et al. 2020). For instance, Zhang, Li, et al. (2021) used panel data from 30 provinces from 2007 to 2016 to analyse the impact of green lending on environmental quality, finding substantial improvements. Similarly, Zhang, Wu, et al. (2021) employed a quasi-natural experiment with panel data from 945 A-share listed companies across 30 provincial regions from 2004 to 2017, demonstrating that GCP implementation changes the behaviours of high-polluting firms, leading to reduced environmental pollution.

While the environmental benefits of GCP have been documented, the intermediary role of banks in this process has not been extensively explored. Banks, as primary intermediaries in GCP implementation, significantly influence the utilisation of firms' funds and their activities, indirectly affecting environmental outcomes. Previous studies have predominantly focused on major banks with nationwide operations (Zhou et al. 2021; Zhou et al. 2022), analysing the moderating effects of green credit and the mediating role of green finance. However, there is a scarcity of research focusing on the role of local banks, which operate within specific regions, in GCP implementation. Our study fills this gap by exploring the role of local banks in GCP implementation in terms of environmental pollution.

Recent studies emphasise the broader connections between financial systems, economic complexity and environmental outcomes (e.g., Balsalobre-Lorente, dos Santos Parente, et al. 2023; Balsalobre-Lorente et al. 2024b; Esmaeili et al. 2023; Rafei et al. 2022). For instance, Yousaf et al. (2023) explore the dynamic relationship between decentralised finance and traditional financial sectors, illustrating how economic and financial complexity can contribute to systemic environmental risks. Additionally, other research has highlighted the role of regional factors in shaping the relationship between economic complexity and environmental consequences (Balsalobre-Lorente, Mohammed, et al. 2023; Balsalobre-Lorente et al. 2024a; Jahanger et al. 2022). A separate stream of research has extensively examined the impact of financial development on environmental pollution (e.g., Ibrahim and Vo 2021; Lv et al. 2021; Magazzino et al. 2021). In China, regional banks were notably established to foster the financial development of specific regions. Given the significant transformation driven by the establishment and rapid growth of CCBs in China over the past decade, understanding their role in implementing the GCP is crucial to achieving a green economy.

Evidence suggests that GCP implementation benefits banks by enhancing their core competencies and reducing risks (i.e., Zhou et al. 2021; Lian et al. 2022; Luo et al. 2021). However, whether these benefits extend to local banks remains debated (Luo et al. 2021; Zhou et al. 2021; Yin et al. 2021). Some studies argue that GCP implementation can disadvantage local banks by increasing credit risks (Zhou, Caldecott, et al. 2022).

Related studies have extensively discussed the impact of financial advancement on environmental pollution (i.e., Ibrahim and Vo 2021; Lv et al. 2021; Magazzino et al. 2021). According to relationship banking theory, local banks have an advantage in capital allocation due to their ability to collect detailed client information and reduce information asymmetries (Barboni and Rossi 2019; Hasan et al. 2021). This advantage is particularly relevant for evaluating green projects, as local banks can leverage their deep knowledge of local customers to assess the environmental aspects of their businesses (Zhang et al. 2016; Barboni and Rossi 2019; Hasan et al. 2021). Given CCBs' function as relationship lenders extending credit to SMEs, it is anticipated that the GCP directive to issue loans exclusively to environmentally friendly firms will incentivise CCBs to fund local SMEs, thus contributing to pollution reduction. Hence, we posit our first hypothesis:

H1. *Cities that have established their own local banks (CCBs) will experience a greater reduction in local pollution than cities without local banks after the implementation of GCP.*

2.3 | Local Banks, Innovation and Environmental Pollution

We further explore the mechanism behind the role of local banks in environmental pollution at the city level after GCP. Evidence shows that efficient technologies can reduce pollution emissions (i.e., Dinda 2004; Chu et al. 2021; Wang et al. 2020). In particular, enhancing technological innovation is a key factor in improving environmental performance (Acemoglu et al. 2012; Balsalobre-Lorente, dos Santos Parente, et al. 2023; Zeqiraj et al. 2020). Under GCP, financing activities support technological innovation by encouraging these funded entities to heighten their ecological awareness. Seeking to secure additional funds from GCP, local firms may enhance their technological innovation and engage in product innovation. In this process, local banks play a crucial role in fostering the rapid advancement of affiliated firms' technological innovation in China.

On the one hand, as an important intermediary of GCP, local banks can encourage local businesses' innovation activities by alleviating financing constraints. Existing studies show that technological innovation and productivity can be enhanced through green financial policies (Su and Lee 2025; Yu et al. 2021). As relationship lenders, local banks offer significant financial support to local firms in implementing green financial policies, reducing the financing challenges of local firms (Beck and Demirguc-Kunt 2006). Specifically, GCP allows local banks to implement preferential strategies, such as lowering interest rates on loans and easing loan requirements for target clients.

On the other hand, local banks can offer firms additional funds for their high-risk innovations. Corporate innovation activities are frequently associated with high risks and uncertainty (da Silva Etges and Cortimiglia 2019), limiting funding opportunities. However, these innovation-related risks can be transferred by local banks to shareholders with a higher tolerance for risk (Saeed and Izzeldin 2016). Consequently, this risk transfer and the alleviation of loan restrictions can enhance firms' willingness and capacity to pursue innovation. Based on the above discussions, we propose our second hypothesis:

H2. *Local banks facilitate environmental pollution reduction at the city level by promoting innovation after the implementation of GCP.*

3 | Research Design and Data

3.1 | Research Design

Our study's empirical model is to estimate the critical role of local banks, particularly CCBs, in executing the GCP and influencing environmental outcomes at the city level. By aligning financial incentives with environmental goals, local banks are better equipped to identify environmentally compliant firms and offer them preferential financing, leading to significant reductions in industrial emissions, such as SO_2, in cities with CCBs. In contrast, cities without CCBs may face less stringent enforcement of the GCP and smaller pollution reductions. To test this, we employed a DID model. The DID method enables causal inference by comparing pollution levels in cities with and without CCBs before and after the GCP's implementation, accounting for time-invariant city differences and broader trends. By controlling for confounding factors like macroeconomic shocks or nationwide policies, the DID model provides an estimation of how CCBs promote the GCP's environmental benefits. Therefore, our benchmark regression model is formulated as follows:

$$\ln SO_{2\,(i,t+1)} = \alpha_0 + \alpha_1 \text{post}_t \times \text{CCB}_i + \sum_{j=1}^{n} \beta_j \text{Controls}_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $\ln SO_2$ is the natural logarithm of industrial SO_2 emissions for the city i in year $t+1$; post is a binary variable equal to 1 for the period after the GCP implementation in 2012, and 0 otherwise; CCB is a binary variable equal to 1 if a city has an established CCB, and 0 otherwise; η_i represents city-fixed effects to control for time-invariant city-specific characteristics; λ_t represents year-fixed effects to control for factors that vary over time but are constant across cities. post and CCB, standing alone, are absorbed by year- and city-fixed effects, respectively. Controls denotes a vector of control variables, and $\varepsilon_{i,t}$ is the random error term.

The interaction term post×CCB is our primary variable of interest, with α_1 indicating the difference in environmental pollution between cities with and without local banks post-GCP implementation. If the coefficient of α_1 is significantly negative, it indicates that regional banks play a positive role in the implementation of GCP on reducing environmental pollution. By contrast, if the coefficient of α_1 is significantly positive, it indicates that regional banks play a negative role in the implementation of GCP on reducing environmental pollution.

3.2 | Mechanism Analysis

The theoretical foundation for using innovation as a mediating mechanism between CCBs and pollution reduction lies in the GCP's goal to align financial flows with environmental objectives. The GCP incentivises banks to prioritise financing environmentally sustainable projects, such as promoting environmental innovations. CCBs, due to their deep-rooted relationships with regional firms and detailed knowledge of local industries, are uniquely positioned to identify and support businesses with high potential for green technology development. By reducing financial barriers and offering targeted green loans, local banks encourage firms to adopt innovative processes and technologies, leading to more efficient resource use and lower pollution levels. This mediation framework highlights the role of innovation in transforming financial support into measurable environmental benefits, emphasising how local banks act as critical agents within the GCP framework.

To test this, we use a two-step regression methodology to conduct the mechanism analysis following Baron and Kenny (1986). First, we test the role of local banks in the relationship between GCP and the mediating variable of innovation. In the second step, we test the relationship between the mediating variable and environmental pollution. In order to examine how local banks play their part in putting GCP into action to reduce local pollution, the following mediation models are constructed:

$$\text{Inno}_{i,t} = \alpha_0 + \alpha_1 \text{post}_t \times \text{CCB}_i + \sum_{j=1}^{n} \beta_j \text{Control}_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

$$\ln SO_{2\,(i,t+1)} = \alpha_0 + \alpha_1 \text{post}_t \times \text{CCB}_i + \alpha_2 \text{Inno}_{i,t} + \sum_{j=1}^{n} \beta_j \text{Control}_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3)$$

where $\text{Inno}_{i,t}$ represents the mediating variables: innovation. For the mediation effect to be established, it must satisfy the following criteria (Baron and Kenny 1986): (1) the coefficient α_1 of Equation (1) is statistically significant; (2) the coefficient of α_1 in Equation (2) is statistically significant; (3) the coefficient of α_2 in Equation (3) is significant. This would fully support our H2. Given them, if α_1 in Equation (3) is insignificant, the effects of Post×CCB are fully mediated via innovation. However, if α_1 in Equation (3) remains significant, the effects of Post×CCB are partially mediated. The framework of the empirical part is given in Figure 1.

3.3 | Variables Measurements

3.3.1 | Explained Variables

SO_2 is widely recognised as a primary air pollutant, making it a key indicator in environmental pollution studies (Cole et al. 2011). We use the natural logarithm of SO_2 emissions in the city, $\ln SO_2$, as the main explained variable. An alternative measure, $\ln(SO_2\text{intensity})$, represents the natural logarithm of the ratio of SO_2 emissions to the population in the city.

3.3.2 | Explanatory Variables

Following Luo et al. (2021), we categorise cities into treatment and control groups based on the presence of CCBs before the GCP implementation. The variable CCB is a dummy variable equal to 1 for cities with CCBs before 2012, and 0 otherwise. The variable post indicates the post-GCP period, equal to 1 from 2013 to 2017, and 0 from 2010 to 2012.

Figure 2 presents the distribution of CCB before the GCP implementation (left) and industrial SO_2 emissions in 2011 (right). The results indicate that no evident overlap exists between cities that established their own local banks and cities with higher industrial SO_2 emissions (top 25% SO_2 emission levels) before the formal implementation of GCP.

3.3.3 | Innovation

The innovation index (*inno*) used in this study is derived from Fudan University's 'China City Innovation Index Report', which includes patents and other technology-related metrics to gauge the innovation capacity of a city (Chen et al. 2021).

3.3.4 | Control Variables

In line with prior research (Zhang et al. 2019; Chen et al. 2021), we control for various city-level variables to account for confounding effects. These control variables include the natural logarithm of GDP per capita (*lngdpp*) and its square term (*lngdpp2*) (Grossman and Krueger 1991; Holtz-Eakin and Selden 1995).

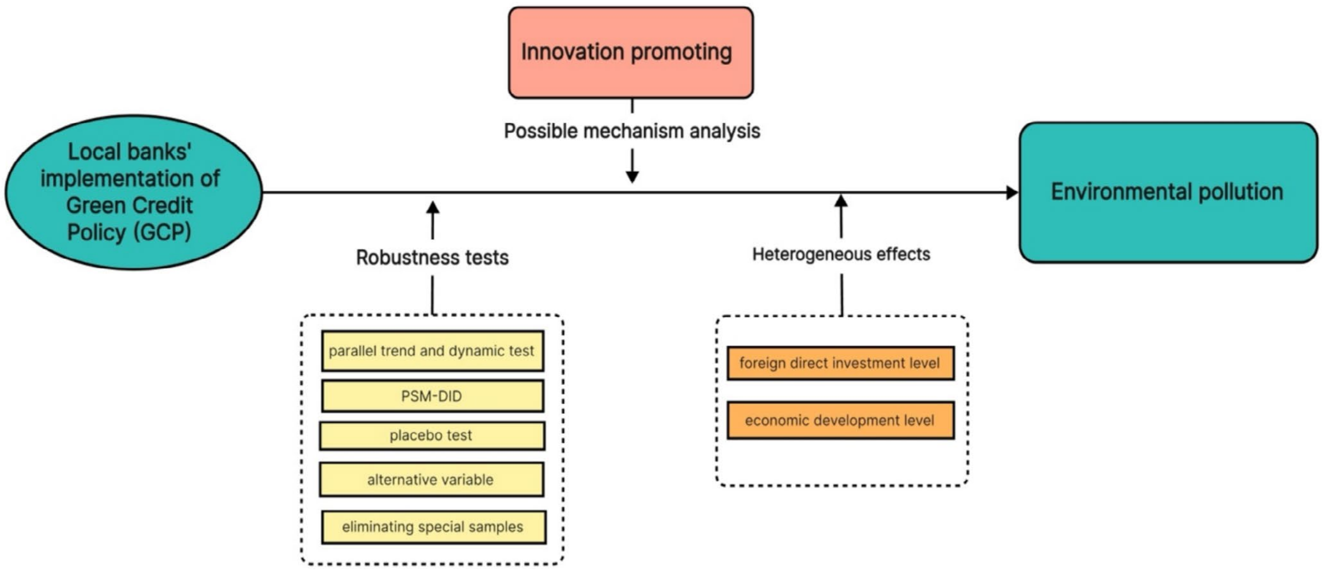

FIGURE 1 | The framework of empirical design. [Colour figure can be viewed at wileyonlinelibrary.com]

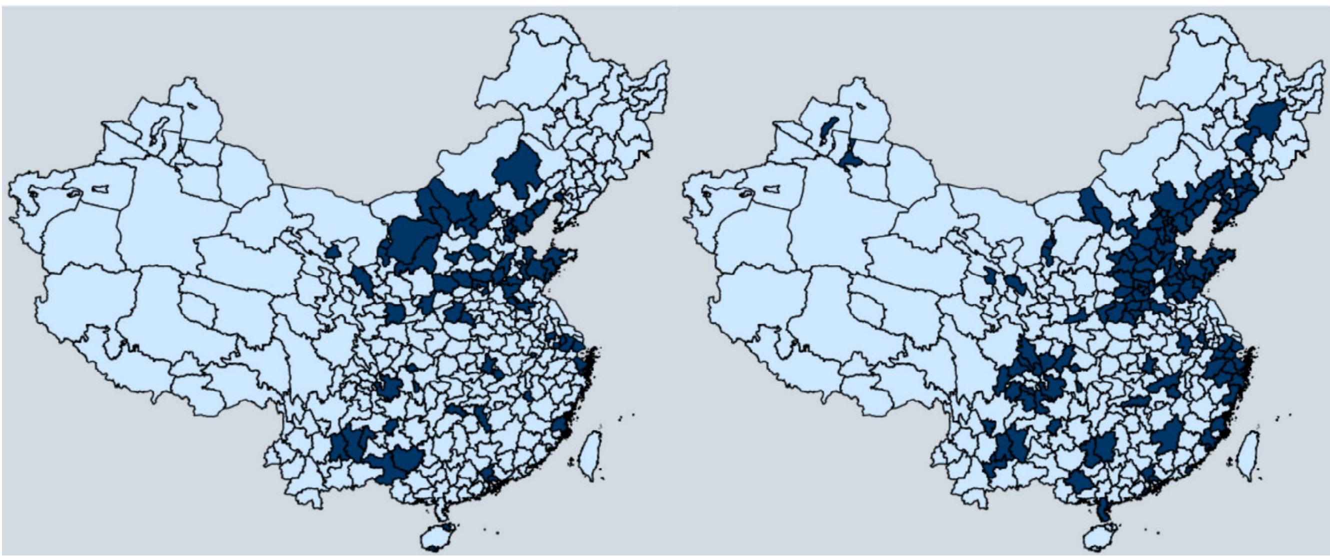

FIGURE 2 | The distribution of CCB before GCP implementation (left) and industrial SO_2 in 2011 (right). Note: Deep blue blocks represent the cities that established their own CCB before GCP implementation (left) and cities with the top 25% emissions of industrial SO_2 in 2011 (right). [Colour figure can be viewed at wileyonlinelibrary.com]

Additionally, we account for the natural logarithm of total retail sales of consumer goods (*lnconsu*) and the ratio of green coverage area to built-up area (*Greencoverage*). Furthermore, we include the natural logarithm of population density (*lnpopden*). These variables help control economic development, consumption levels, environmental initiatives and population characteristics, providing a comprehensive understanding of the factors influencing environmental pollution in Chinese cities. Table 1 shows the detailed definitions of variables.

3.4 | Data

This research utilises a sample of 297 cities in China, covering the period from 2010 to 2017. The GCP was formally implemented in 2012, when the China Banking Regulatory Commission launched the GCP Guidelines. We use 2012 as the dividing point to reflect the policy implementation, following the methodology of Luo et al. (2021). The chosen period of 2010–2017 allows for an analysis, capturing 3 years before and 5 years after the policy implementation. Data for the dependent and control variables were manually collected from the 'China City Statistical Yearbook'. The listing of CCBs was derived from the 'China Financial Statistical Yearbook'. Additionally, data regarding CCBs and listed SMEs were obtained from the CSMAR database. We winsorised all continuous variables at the 1% and 99% levels to reduce the impact of outliers. The final data set comprises 2152 city-year observations across 297 cities.

3.5 | Summary Statistics

Table 2 provides the descriptive statistics of the variables used in our study. The mean of the natural logarithm of SO_2 emissions ($lnSO_2$) is 10.265. The range of $lnSO_2$ values indicates substantial variability in environmental pollution across cities. The mean for the CCB variable is 0.383, indicating that 38.3% of the sampled cities had established commercial banks before the implementation of GCP. The statistics for our control variables align with prior literature (Zhang et al. 2019, 2022).

The correlations between variables are presented in Table 3. SO_2 emissions are generally lower in the post-GCP period but higher in cities with established CCBs, possibly because these cities are larger and more industrialised. SO_2 levels also show a positive relationship with GDP per capita and sales of consumer goods, which are indicators of economic development. The partial impacts of CCBs and GCP, after controlling for these confounding factors, are examined in the subsequent section using multivariate regressions.

4 | Empirical Results

4.1 | Main Results

Table 4 presents the results of our baseline regression analysis using Equation (1), which examines the role of local banks in the relationship between the implementation of the GCP and environmental pollution. Column (1) shows that the coefficient of the interaction term α_1 is significantly negative (−0.352) at the 1% level. This indicates that cities with local banks experienced a significant reduction in pollution levels following the implementation of the GCP. Column (2) provides similar estimates after including control variables, reinforcing the finding that cities with local banks are associated with lower pollution in the years following GCP implementation. These results support H1, suggesting that local banks effectively implement GCP to reduce environmental pollution. This finding is consistent with previous studies by Chen et al. (2021) and Zhang, Li, et al. (2021), which highlight the positive environmental contributions of local banks in China.

TABLE 1 | Variable measurements.

	Variable	Measurements
Explained variable	$lnSO_2$	Natural logarithm of total industrial SO_2 emissions
Explanatory variable	Post	Post is a time dummy variable that equals 1 if the time is within the range of 2013–2015 (impacted period) and 0 from 2010 to 2012 otherwise (pre-impact period)
	CCB	CCB equals 1 if the city had its own city commercial bank before and in 2012, and otherwise 0
	Post × CCB	Difference-in-Difference
Control variable	lngdpp	Natural logarithm of gross domestic product per capita
	lngdpp2	lngdpp × lngdpp
	Greencoverage	Green coverage area/built-up area (%)
	lnconsu	Natural logarithm of total retail sales of consumer goods
	lnpopden	Natural logarithm of population per land area
Mechanism analysis	inno	Innovation index/100

TABLE 2 | Descriptive statistics.

	Variable	*N*	Mean	SD	Min	Max
Explained variable	$lnSO_2$	2152	10.265	1.220	6.828	13.291
Explanatory variable	Post	2152	0.606	0.489	0.000	1.000
	CCB	2152	0.383	0.486	0.000	1.000
Control variables	lngdpp	2152	10.46	0.759	8.457	12.282
	lngdpp2	2152	109.982	15.956	71.515	150.844
	GreCovRatio	2152	38.993	7.296	7.93	60.58
	lnpopden	2152	1.410	0.802	−0.571	3.125
	lnconsu	2152	15.372	1.035	12.575	17.843
Mediating variable	Inno	1915	0.111	0.489	0.000	10.614

Note: The table reports summary statistics for all observations in our sample from 2010 to 2017. For each variable, we show the pooled average, standard deviation, minimum and maximum values from left to right.

TABLE 3 | Correlations.

	$\ln SO_2$	Post	CCB	lngdpp	lnconsu	Greencoverage	lnpopden
$\ln SO_2$	1.000						
Post	−0.352	1.000					
CCB	0.301	−0.012	1.000				
lngdpp	0.215	0.120	0.344	1.000			
lnconsu	0.148	0.218	0.441	0.475	1.000		
Greencoverage	0.069	0.058	0.196	0.324	0.283	1.000	
lnpopden	−0.082	−0.111	−0.331	−0.748	−0.250	−0.214	1.000

Note: The table reports the Pearson correlation coefficients between the variables. See Table 1 for variable definitions.

TABLE 4 | Local banks' role in GCP implementation and environmental pollution.

	(1)	(2)
	$\ln SO_{2\,(i,t+1)}$	$\ln SO_{2(i,t+1)}$
Post × CCB	−0.352***	−0.325***
	(0.055)	(0.055)
lngdpp		1.909***
		(0.563)
lngdpp2		−0.095***
		(0.028)
Greencoverage		−0.000
		(0.003)
lnpopden		−0.104
		(0.066)
lnconsu		0.138*
		(0.071)
_cons	11.396***	0.023
	(0.034)	(3.139)
N	2152	2152
R^2	0.684	0.687
City FE	Yes	Yes
Year FE	Yes	Yes

Note: The table reports the role of local banks in GCP implementation on environmental pollution. City-fixed effects and year-fixed effects are included. R^2 reflect within bank variations. Standard errors clustered at the city level are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

Regarding the control variables, the coefficient for *lngdpp* is significantly positive, while the coefficient for *lngdpp2* is significantly negative, indicating an inverted U-shaped relationship with environmental pollution (Fosten et al. 2012; Sinha and Bhattacharya 2017). Additionally, the coefficients of other control variables align with prior studies (Zhang et al. 2019; Chen et al. 2021).

The findings highlight the crucial role of CCBs in implementing GCP. Leveraging close relationships with regional firms and in-depth knowledge of local industries, CCBs are well-equipped to monitor and influence firms' environmental practices. By aligning financing with environmental compliance, these banks drive firms toward greener practices. The observed pollution reductions in cities with CCBs support the hypothesis that local banks, through their proximity to firms and relationship banking practices, effectively enforce GCP standards. These results align with prior studies (e.g., Chen et al. 2021; Zhang, Li, et al. 2021) and suggest that involving local banks in environmental governance can serve as an effective model for pollution reduction. Policymakers in other developing economies can also adapt the GCP framework to leverage local banks' unique ties to industries to achieve broader environmental improvements.

The findings highlight critical implications for cities with and without local banks in the context of the GCP. Cities without local banks often face significant challenges in securing diverse and flexible local financing options. Their reliance on external funding sources, such as national banks, international organisations or government grants, limits their ability to address localised environmental issues. This reliance particularly hinders smaller-scale, community-driven pollution-reduction initiatives, which require agile and tailored financing solutions. To overcome these challenges, policymakers in such cities must actively foster relationships with national banks and specialised green finance institutions. Furthermore, the adoption of innovative financing mechanisms, including green bonds, impact investing and crowdfunding, can play a transformative role in engaging local stakeholders and addressing funding gaps for environmental initiatives.

Conversely, cities with local banks demonstrate a more pronounced reduction in pollution levels, underscoring the pivotal role of proximity and tailored financial support in advancing green projects. Local banks are uniquely positioned to cater to the specific needs of their regions, as emphasised by relationship banking theory, which highlights their ability to build trust and address localised challenges. However, to maximise their effectiveness, local banks should adapt their lending programmes to better align with the unique characteristics of green projects. These projects often feature long payback periods, dispersed locations and immature business models, which can deter conventional investors. By providing transparent and comprehensive information about green projects, local banks can attract a broader pool of investors, thereby enhancing the financing ecosystem for sustainable development.

To ensure the success of green financing efforts, robust monitoring and accountability systems are required. Both local and national banks should implement mechanisms to track the environmental outcomes of their funded projects. This could include mandatory environmental impact assessments and detailed reporting on the contributions of financed projects to pollution reduction and other sustainability goals. Such measures not only foster accountability but also provide critical data to evaluate the effectiveness of green financing strategies, ultimately supporting the overarching goals of the GCP.

4.2 | Robustness Tests

To mitigate potential biases, including endogeneity, omitted variables and identification biases, this study employs several robustness tests. First, to address omitted variables and endogeneity biases, the choice of explanatory variables—a time dummy and a CCB dummy—minimises these risks. These macro-level dummy variables are unlikely to be influenced by missing micro-level variables, as the dependent variable, representing aggregated micro-level emissions, does not directly interact with the explanatory variables. Furthermore, the CCB dummy is defined based on the presence of CCBs before GCP implementation, further reducing potential bias. Second, PSM is employed to account for unobservable factors, matching cities based on regional economic, environmental and population characteristics to ensure comparability. Finally, identification bias is addressed through placebo tests, alternative pollution measures and the exclusion of special values, ensuring the robustness of the findings across different model specifications.

4.2.1 | Parallel Trend and Dynamic Effects

A key assumption of the DID method is the presence of parallel trends, meaning that the treatment and control groups exhibit similar patterns before policy implementation. To test this assumption, we included interaction terms for the years before GCP implementation: pre2 × CCB and pre1 × CCB in Equation (1). Table 5 shows that the coefficients of these interaction terms are insignificant, supporting the parallel trend assumption. Additionally, we added interaction terms for the years immediately following the GCP implementation, denoted as post1 × CCB, post2 × CCB, post3 × CCB and post4 × CCB. The coefficients for these terms are significantly negative, indicating that the positive impact of local banks on pollution reduction persists post-GCP implementation.

TABLE 5 | Parallel trend analysis.

	(1)
	$\ln SO_{2(i,t+1)}$
Pre2 × CCB	−0.109
	(0.069)
Pre1 × CCB	0.092
	(0.106)
Current × CCB	−0.217***
	(0.074)
Post1 × CCB	−0.254***
	(0.073)
Post2 × CCB	−0.331***
	(0.091)
Post3 × CCB	−0.429***
	(0.108)
Post4 × CCB	−0.468***
	(0.110)
lngdpp	2.056***
	(0.579)
lngdpp2	−0.102***
	(0.028)
Greencoverage	−0.000
	(0.003)
lnpopden	−0.098
	(0.066)
lnconsu	0.120*
	(0.068)
_cons	−0.530
	(3.205)
N	2152
R^2	0.690
City FE	Yes
Year FE	Yes

Note: The table presents the parallel trend and dynamic effect of the local banks' role in GCP implementation on environmental pollution. City-fixed effects and year-fixed effects are included. R^2 reflect within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

4.2.2 | PSM-DID

To address potential differences in city characteristics between the treatment and control groups before GCP implementation, we employed the PSM technique. This tool involves constructing a new data set where the cities in the control group are paired with cities in the treatment group across various aspects. When implementing PSM, our initial step is to estimate a logit model using pre-event samples. In this model, the dependent variable is a binary dummy variable set to 1 if the city has its own CCBs and 0 otherwise. We use control variables as independent variables. The logit model's estimated probabilities were subsequently utilised for nearest-neighbour PSM, without replacement. As demonstrated in Panel A of Table 6, following PSM, no statistically significant distinctions have been found between the treated and control groups for any of the control variables. Then, Equation (1) is re-estimated based on the matched sample, and its results are given in Table 6, Panel B. It can be observed from Panel B Columns (1) and (2) that the coefficients for post × CCB remain significantly negative, confirming our main findings.

TABLE 6 | PSM-DID.

Panel A: Balancing test				
		Mean of control group	**Mean of treated group**	**Diff**
Variables		**(1)**	**(2)**	**(1)–(2)**
lngdpp	Unmatched	10.254	10.791	−0.537***
lngdpp2	Unmatched	105.649	116.953	−11.304***
Greencoverage	Unmatched	37.865	40.807	−2.942***
lnpopden	Unmatched	1.619	1.073	0.546***
lnconsu	Unmatched	15.012	15.951	−0.939***
lngdpp	Matched	10.586	10.538	0.048
lngdpp2	Matched	112.546	111.489	1.057
Greencoverage	Matched	40.332	39.811	0.522
lnpopden	Matched	1.320	1.361	−0.041
lnconsu	Matched	15.488	15.479	0.009

Panel B: DID estimates using matched sample		
	(1)	**(2)**
	$\mathbf{lnSO_{2(i,t+1)}}$	$\mathbf{lnSO_{2(i,t+1)}}$
Post*CCB	−0.392***	−0.403***
	(0.105)	(0.106)
lngdpp		0.424
		(0.783)
lngdpp2		−0.019
		(0.040)
Greencoverage		−0.008
		(0.006)
lnpopden		−0.068
		(0.125)
lnconsu		0.184
		(0.158)
_cons	11.531***	6.793
	(0.055)	(4.148)
N	818	818
R^2	0.678	0.681
City FE	Yes	Yes
Year FE	Yes	Yes

Note: The table shows the role of local banks in implementing GCP on environmental pollution using PSM-DID. Panel A presents the balancing test before and after marching. Panel B shows the results for the matched sample. City-fixed effects and year-fixed effects are included. R^2 reflect within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

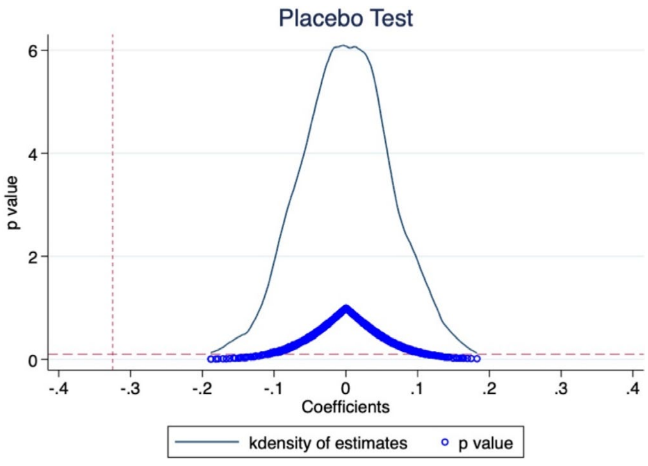

FIGURE 3 | Placebo test. This figure plots the kernel density and *p* value of 1000 estimates about the pseudo coefficients of CCB × Post constructed by random assignment of the treatment variables across firms. We observe that the distribution of the false estimate concentrates around zero, and the true estimate of −0.352 (see Column 2 in Table 3) falls outside the 95% distribution interval in the placebo test. [Colour figure can be viewed at wileyonlinelibrary.com]

4.2.3 | Placebo Test

To mitigate initial differences between the treatment and control groups before the GCP implementation and to lessen the influence of unobservable and uncontrollable variables, a placebo test was carried out in this study. From all cities, we randomly selected 111 cities with local banks to serve as treatment groups, and the remaining cities were assigned to the control groups. We then randomly selected a year as the event year. Following that, we repeat the baseline regression and implement this random process 1000 times. If the mean of the coefficients of the pseudo-interaction term significantly deviates from 0, it could indicate omitted variable issues in our benchmark model. Figure 3 illustrates the distribution of these 1000 coefficients and the associated *p* values. It can be observed that the mean value of the coefficient distribution is approximately 0. Considering that the true estimated coefficient of CCB × Post in Column 2 of Table 4 is −0.352, it suggests that any potentially omitted variables are unlikely to significantly alter our main result.

4.2.4 | Alternative Variables of Environmental Pollution

We employed two alternative variables for environmental pollution. First, we measured environmental pollution using the emission intensity of SO_2(lnSO_2Intensity), defined as the natural logarithm of the ratio of total industrial SO_2 emissions to the population. Second, we used nitrogen oxides (lnNO_x), calculated as the natural logarithm of total industrial NO_x emissions at the city level. Table 7, Columns (1) and (2), report the results, showing that the coefficient for post × CCB remains significantly negative, supporting our main findings.

4.2.5 | Eliminating Special Values

Some cities in China, such as Beijing, Shanghai, Tianjin and Chongqing, have unique administrative statuses and greater resources, which could bias the results. After removing these municipalities, we still find that the coefficient for post × CCB in Table 8, Column (1), remains significantly negative. Additionally, we excluded cities with CCBs operating in multiple provinces (i.e., Beijing Bank, Shanghai Bank, Ningbo Bank, Hangzhou Bank and Tianjin Bank), which could have different impacts due to their larger scale.[1] The results in Table 8, Column (2), remain consistent. Finally, we excluded cities with banks related to the Equator Principles, which pursue green financing due to the principle rather than the GCP.[2] Our results in Table 8, Column (3), still remain consistent.

5 | Mechanism Analysis of Innovation

Thus far, our analysis has demonstrated that CCBs play a significant role in the effectiveness of the GCP in reducing environmental pollution. This section delves into the potential

TABLE 7 | Alternative explained variable.

	(1)	(2)
	lnSO_2Intensity$_{(i,t+1)}$	**ln$NO_{x(i,t+1)}$**
Post*CCB	−0.315***	−0.136**
	(0.057)	(0.056)
lngdpp	1.881	−1.713**
	(1.152)	(0.667)
lngdpp2	−0.101*	0.086***
	(0.053)	(0.032)
Greencoverage	−0.004	−0.003
	(0.003)	(0.003)
lnpopden	−0.084	−0.011
	(0.101)	(0.075)
lnconsu	0.048	−0.033
	(0.068)	(0.063)
_cons	−3.568	19.170***
	(6.303)	(3.533)
N	1925	1871
R^2	0.592	0.281
City FE	Yes	Yes
Year FE	Yes	Yes

Note: The table shows the effect of local banks' implementation of GCP on environmental pollution using alternative explained variables. City-fixed effects and year-fixed effects are included. R^2 reflect within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

TABLE 8 | Eliminating special values.

	Eliminating municipalities	Eliminating cities operated over five branches in other provinces	Eliminating cities whose CCB belongs to equator banks
	(1)	(2)	(3)
	$lnSO_{2(i,t+1)}$	$lnSO_{2(i,t+1)}$	$lnSO_{2(i,t+1)}$
Post*CCB	−0.318***	−0.314***	−0.332***
	(0.055)	(0.055)	(0.055)
lngdpp	1.674***	1.694***	1.910***
	(0.547)	(0.550)	(0.565)
lngdpp2	−0.083***	−0.083***	−0.096***
	(0.027)	(0.027)	(0.028)
Greencoverage	−0.001	−0.001	−0.000
	(0.003)	(0.003)	(0.003)
lnpopden	−0.076	−0.074	−0.103
	(0.065)	(0.065)	(0.066)
lnconsu	0.078	0.077	0.139*
	(0.054)	(0.054)	(0.071)
_cons	1.925	1.817	−0.005
	(2.881)	(2.894)	(3.150)
N	2125	2116	2130
R^2	0.684	0.682	0.687
City FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: The table shows the effect of local banks' implementation of GCP on environmental pollution after eliminating special values. City-fixed effects and year-fixed effects are included. R^2 reflect within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

mechanism underlying this relationship via innovation (Chen et al. 2021; Zhang, Li, et al. 2021). Using a two-step regression methodology based on Baron and Kenny (1986), we perform the mechanism analysis, and the results are presented in Table 9. Column (1) of Table 9 shows the results of the first-stage analysis for innovation, with the coefficient of post × CCB being significantly positive at the 1% level. This indicates that cities with local banks experienced increased innovation after GCP implementation. Column (2) presents the results of the second-stage analysis, where the coefficient for *inno* is significantly negative at the 1% level, and the coefficient for post × CCB remains significantly negative. These results suggest that local banks promote local pollution reduction partially through facilitating innovation.

The mechanism analysis highlights that CCBs are uniquely equipped to evaluate and finance both environmental projects and green innovations. The results highlight the intricate relationship between finance, innovation and environmental sustainability, reinforcing Porter's hypothesis. The implementation of green finance policies, such as the GCP, emerges as a significant driver of environmentally friendly innovation. By channelling financial resources through local banks, these policies create a foundation for firms to innovate and adopt green technologies. This not only reduces pollution but also initiates a virtuous cycle where environmental improvements enhance a city's appeal for future investment and innovation. As local firms scale their green innovations from the pilot stage to wider markets, the potential for pollution reduction and long-term environmental benefits grows substantially.

The effectiveness of this positive feedback loop can be further enhanced through targeted environmental policies aimed at fostering green innovation. Local governments can play an important role by developing sector-specific policies that incentivise businesses to adopt green technologies. For instance, subsidies, grants and low-interest loans for research and development in sectors such as energy, transportation and manufacturing can drive significant advancements in green innovation. Moreover, integrating environmental innovation into urban planning policies promotes new infrastructure and urban development projects that align with sustainability goals. Prioritising clean technologies, implementing green building standards and promoting sustainable mobility solutions in urban planning can significantly enhance pollution reduction efforts while fostering a culture of environmental responsibility.

TABLE 9 | Mechanism analysis.

	(1)	(2)
	inno	**$lnSO_{2(i,t+1)}$**
Post × CCB	0.089**	−0.273***
	(0.036)	(0.052)
lngdpp	−2.447***	2.225**
	(0.755)	(1.083)
lngdpp2	0.120***	−0.107**
	(0.037)	(0.050)
Greencoverage	−0.000	−0.002
	(0.001)	(0.004)
lnpopden	0.060	−0.039
	(0.040)	(0.090)
lnconsu	−0.189	0.065
	(0.136)	(0.058)
inno		−0.161***
		(0.041)
_cons	15.179***	−0.926
	(5.424)	(5.860)
N	1915	1915
R^2	0.135	0.632
City FE	Yes	Yes
Year FE	Yes	Yes

Note: The table gives the underlying possible mechanisms of local banks' GCP implementation in influencing environmental pollution. City-fixed effects and year-fixed effects are included. R^2 reflects within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

Long-term sustainability strategies are also critical for maximising the impact of green finance and innovation. Providing a stable regulatory environment encourages investors and innovators to commit to long-term projects without fearing sudden policy shifts. By offering predictable and consistent policies, local governments can cultivate an environment of trust and confidence among stakeholders.

6 | Heterogeneous Effects

6.1 | FDI

Previous studies have indicated that the inflow of FDI contributes to pollution reduction (Chen et al. 2021). To explore this further, we divided our sample into cities with low and high FDI based on the bottom and top 25% of FDI levels. FDI level is measured as the ratio of FDI to GDP per city, following Chen et al. (2021). As shown in Table 10, the coefficient is insignificant for cities with low FDI in Column (1) and only significantly negative for cities with high FDI in Column (2). These results support the existing arguments about the benefits of FDI, such as advanced manufacturing and environmentally friendly technologies and more efficient resource allocation (Asturias et al. 2014), which can significantly mitigate environmental pollution.

The findings emphasise the importance for low-FDI cities to attract FDI that focuses on sustainable technologies and environmentally friendly industries as a means to reduce pollution and drive economic growth. By targeting FDI in sectors, such as renewable energy, green manufacturing and sustainable agriculture, these cities can simultaneously address environmental and economic challenges. Clean technologies and advanced manufacturing methods brought by foreign investors can provide the tools needed for low-FDI cities to adopt more sustainable practices and reduce their ecological footprint. However, the transition toward attracting such investments is not without challenges. Low-FDI cities often grapple with structural and policy barriers that hinder their ability to compete for sustainable FDI effectively.

One of the most significant obstacles these cities face is the lack of administrative capacity to design, implement and enforce policies that encourage sustainable development. Issues such as poor governance, corruption and lack of transparency in decision-making processes are key deterrents for foreign investors. When business decisions appear subject to bribery or favouritism, investor confidence wanes, making these cities less attractive. Weak public institutions and inadequate regulatory enforcement further exacerbate the problem, as do inefficiencies in systems for issuing permits and unclear business setup procedures. These structural deficiencies create an environment of uncertainty and risk for foreign investors, limiting the inflow of FDI necessary for advancing sustainability goals.

Addressing these challenges requires a comprehensive approach spanning governance reform, capacity building and strategic incentives. Strengthening governance through robust anti-corruption measures and ensuring transparency in public administration is essential. The adoption of e-governance platforms can enhance transparency and streamline processes for procurement, business registration and permit issuance. These digital tools not only increase investor confidence but also improve overall administrative efficiency. Additionally, training programmes for local government officials in managing foreign investments, understanding legal frameworks and implementing sustainable projects are critical.

6.2 | Local Economic Development

Significant disparities exist in the levels of economic development and institutional frameworks among different regions in China. Given that CCBs are responsible for local economic development, banks in economically underdeveloped regions may face higher pressure and thus might prioritise economic growth over environmental protection, potentially neglecting GCP requirements and their corporate social responsibilities. To investigate this, we divided our sample into economically underdeveloped and developed cities based on the bottom and top 25% of GDP per capita. Table 10 shows that the coefficient of post × CCB is insignificant

TABLE 10 | Heterogeneous effect.

	Low FDI	High FDI	Economically under-developed areas	Economically developed areas
	(1)	(2)	(3)	(4)
	$lnSO_{2(i,t+1)}$	$lnSO_{2(i,t+1)}$	$lnSO_{2(i,t+1)}$	$lnSO_{2(i,t+1)}$
Post × CCB	−0.190	−0.426***	−0.067	−0.325**
	(0.131)	(0.119)	(0.146)	(0.136)
lngdpp	0.204	1.592*	3.574	7.774**
	(1.210)	(0.845)	(3.018)	(3.629)
lngdpp2	−0.019	−0.075*	−0.178	−0.350**
	(0.062)	(0.043)	(0.163)	(0.159)
Greencoverage	−0.003	−0.003	−0.001	0.005
	(0.005)	(0.006)	(0.007)	(0.005)
lnpopden	−0.039	−0.056	0.072	−0.009
	(0.162)	(0.200)	(0.152)	(0.163)
lnconsu	0.030	0.247	0.086	0.686
	(0.111)	(0.218)	(0.074)	(0.498)
_cons	10.897	−0.387	−8.513	−42.186**
	(6.621)	(5.768)	(13.809)	(20.820)
N	497	644	533	538
R^2	0.601	0.627	0.588	0.734
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: The table presents the effect of local banks' implementation of GCP on environmental pollution, considering cities' foreign direct investment and economic development levels. City-fixed effects and year-fixed effects are included. R^2 reflects within bank variations. Standard errors are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

in economically undeveloped regions (Column 3) but significantly negative in economically developed regions (Column 4). This indicates that CCBs positively contribute to GCP implementation and pollution reduction only in economically developed areas, whereas in less developed regions, CCBs prioritise local economic development over environmental compliance.

The findings suggest the importance of transferring successful practices from developed regions to less developed areas to enhance the role of CCBs in implementing the GCP and achieving pollution reduction goals. Developed regions often prioritise long-term sustainable development, creating an environment where CCBs can effectively balance economic growth with environmental compliance. Less developed regions can adopt similar frameworks to align local government incentives with environmental objectives, encouraging businesses and officials to embrace environmentally conscious practices. However, the successful replication of these strategies faces significant challenges due to institutional, economic and governance-related disparities.

A critical obstacle for less developed regions is the lack of institutional capacity and resources to implement complex environmental policies effectively. Unlike their developed counterparts, these regions often lack trained professionals, advanced monitoring systems and strong enforcement mechanisms essential for GCP execution. Additionally, the economic structure of less developed regions frequently relies on polluting industries, creating a conflict between economic growth and environmental priorities. This dependency makes it challenging for CCBs to focus on green initiatives. Furthermore, weak governance and corruption can exacerbate the situation by allowing firms to bypass environmental regulations. Policy misalignment also plays a significant role; national GCP frameworks often fail to account for the unique needs and constraints of less developed areas, further complicating their implementation.

To overcome these challenges, a multi-faceted approach is necessary. First, less developed regions should invest in training programmes for local government officials and financial institution staff to build expertise in green finance and environmental policy enforcement. These programmes can equip stakeholders with the knowledge and skills needed to implement GCP effectively. Complementing this effort with advanced monitoring and reporting systems can enhance transparency and accountability, ensuring that green initiatives are properly executed and evaluated. Second, aligning local officials' performance evaluations with environmental outcomes can incentivise a greater focus on GCP implementation. For example, incorporating metrics such as green credit lending and pollution reduction achievements into official assessments can motivate local governments to prioritise sustainable development. Finally, tailoring GCP guidelines to the specific challenges faced by less developed regions is advisable. Flexible frameworks that allow for gradual implementation and consider local economic and institutional contexts can significantly improve policy effectiveness. By adopting these measures, less developed regions can strengthen the role of CCBs in pollution reduction and bridge the gap between economic and environmental objectives.

7 | Conclusion and Implications

This paper investigates the role of local banks in implementing the GCP and its impact on reducing local pollution, using a sample of 297 Chinese cities from 2010 to 2017. The study finds that local banks positively influence the implementation of GCP in curbing environmental pollution by promoting innovations. However, the pollution reduction effort is more pronounced in cities with higher levels of FDI and economic development.

Our findings have significant implications for implementing the GCP in China. The GCP relies on banks to drive environmental protection, but these institutions often face a conflict between pursuing profitability and supporting environmental goals. CCBs, under the one-city-one-CCB rule, encounter heightened challenges as they balance responsibilities for local economic growth with GCP-driven environmental objectives. Our analysis reveals that while the GCP generally motivates CCBs to finance environmental projects and reduce pollution, these positive effects are primarily seen in economically developed areas and those with high levels of FDI. In less developed regions and areas with low FDI, CCBs tend to prioritise profitability and local economic development over environmental objectives. This finding highlights limitations in the current GCP design and suggests room for improvement in aligning the interests of CCBs with broader environmental and economic goals.

This research offers valuable insights for policymakers and financial institutions aiming to improve environmental outcomes through financial mechanisms. The findings suggest that local banks play a crucial role in effectively implementing GCP by significantly reducing local pollution levels. These insights can guide local governments in providing targeted support for local banks, such as training programmes for green lending experts and the creation of specialised departments to manage green loans. Such measures can lower the initial costs and barriers for CCBs in adopting green credit practices, facilitating more widespread and effective environmental financing. Additionally, by highlighting the potential for CCBs to foster innovation among SMEs, this research underscores the importance of local banks in promoting sustainable economic development. The findings offer an outline for other regions and countries seeking to leverage local financial institutions to achieve environmental objectives.

However, this paper has some limitations. First, it focuses mainly on SO_2 emissions as a pollutant, while the emissions levels of other pollutants and other environmental outcomes, such as energy savings, are also crucial for evaluating the environmental impact of local banks' compliance with GCP. Future research could extend this study by examining different environmental outcomes. Second, this study is conducted at the city level, whereas future research could analyse firm-level or project-level data if available. This would allow for more direct results on the environmental consequences of local banks' compliance with GCP and provide a stricter assessment of green credit issuance by local banks.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] China Trade Finance Network, '*Establishment and integrated operation of inter-provincial branches of 35 local banks*', http://m.sinotf.com/News.html?id=315556.

[2] This principle was first introduced in 2003 by 10 banks, with the incorporation of policies and guidelines announced by the International Finance Corporation and the World Bank. It is of vital importance for this principle to address global environmental and social risks in project finance by making an effort to persuade worldwide banks to allocate lending to projects that have satisfied social and environmental assessments.

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