

Article

Does Green Credit Policy Work in China? The Correlation between Green Credit and Corporate Environmental Information Disclosure Quality

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Abstract: Roughly a decade ago, the Chinese government implemented a green credit policy aimed at lowering emissions from highly polluting corporations through improving information disclosure quality during the loan process. According to policy guidelines, banks may provide financial support only for new projects that passed an environmental assessment or were explicitly designed to decrease pollution. This paper used panel data from 320 companies in heavy polluting industries listed on the Shanghai Stock Exchange from 2008 to 2016 and adopted a fixed effects regression model to examine whether collusion between local governments and Chinese listed companies has prevented the green credit policy from achieving its target. The results show that there is no significant positive correlation between CEID and corporate green financing, which means that the environmental information disclosure system does not send valuable signals to the market and has failed to become a decision-making tool for bank-risk management.

Keywords: green credit; corporate environmental information disclosure; collusion; risk management

1. Introduction

Corporate environmental information disclosure (CEID) and green credit policy are environmental and economic means to regulate corporate environmental behavior. Implemented effectively, these regulative policies should support and promote environmentally-friendly corporations through financial disclosure of environmental compliance. Theoretically, rating agencies can get full information under completely free market conditions and avoid known environmental risks due to asymmetric information. Previous studies mainly pay more attention to the role of green credit in emission reduction. For example, in Poland the effects of completing actions co-financed by the Bank for Environmental Protection with the pro-ecological credit only in 2013 were reduction of particulate emissions by 155 tons/year, reduction of SO₂ emissions by 1817 tons/year, reduction of NO_x emissions by 618 tons, and reduction of heat consumption as well [1].

China—one of the world’s largest polluters—has, over the last decade, developed a national green credit system. In 2007, China Environmental Protection Administration, the People’s Bank of China, and China Banking Regulatory Commission (CBRC) collectively published suggestions on the implementation of environmental protection policies and regulations against credit risk. These regulations were to strengthen credit management and support for environmental protection through the cooperation of various environmental protection departments and financial institutions. In 2012, these green credit policy regulations were standardized under the CBRC issued Green Credit Guideline. In 2016, the People’s Bank of China, the Ministry of Finance, the China banking regulatory

commission, and seven other ministries and commissions jointly issued a “guidance on building green financial system” aimed at optimizing the allocation of resources in an ecologically sound system.

Further, the new Environmental Protection Law clarified China’s environmental information disclosure system and strengthened the allowable punishment for polluting. For listed companies, especially in heavy polluting industries, the 2010 Environmental Information Disclosure of Listed Companies and the 2011 Preparation of the Enterprise Environment Report set out the requirements for annual environmental information disclosure.

In general, Chinese researchers suggest that the new credit policy has been effective. Liu et al. (2015) found that the green credit policy can effectively restrain the investment behavior of the energy-intensive industries by increasing the interest rate of bank loans, thus reducing the amount of bank loans and output in paper and chemical industries in the short and medium term [2]. Lian (2015) concluded that after 2008, the debt financing cost of environmental corporations has been effectively reduced, while the debt financing cost of high pollution and high energy consumption corporations has risen, so that green credit policy effectively promotes the development of environmental corporations and curbs the development of high pollution and high energy consumption corporations [3]. Other scholars have found that green credit can improve the performance of banks and credit structure of banks and reduce credit risk [4–7]. Aizawa and Yang (2010), through the analysis of China’s green credit policy and banks’ social response reports, concluded that banks have reduced credit from highly polluting and high energy-consuming projects. For example, in 2008, ICBC [8] curtailed 16.2 billion Yuan (US \$2.4 billion) and China Construction Bank [9] curtailed 64.4 billion Yuan (US \$9.4 billion) worth of lending in these sectors [10].

However, pollution from air emissions in China remains high. The Global Environmental Performance Index Report issued by Yale University Environmental Law and Policy Center (YCELP), Center for International Earth Science Information Network of Columbia University (CIESIN), and World Economic Forum (WEF) ranks China 120th out of 180 countries in the world and 177th in the air quality index [11]. In addition, at least one scholar, looking at limited banking data, concluded that the effect of the green credit policy is far from expected [12].

Therefore, there is reason to believe that green credit is not as effective a tool in China as most scholars in the area have argued. This paper reexamines the issue of whether the last decade of environmental green credit guidelines have positively affected the debt financing patterns of companies. In specific, the research looks at the case of heavy polluting industries in China to see whether there is a positive relationship between CEID and corporate green financing in this environmentally-critical area.

2. Literature Review

As an incentive mechanism, green credit policies are relatively new. In 1974, the Federal Republic of Germany founded the world’s first policy-oriented environmental protection bank [13]. The German Rejuvenation Credit Bank, which is the national policy bank, used the capital market and commercial banks to implement financial a subsidy policy on environmental projects, maximizing the role of government-subsidized funds [14].

The most well-known example of an environmental information disclosure policy is the Toxic Release Inventory (TRI), first employed in the United States in 1985 and later incorporated into the Pollution Prevention Act of 1990 [15,16]. Other countries have followed the United States in making disclosure of environmental information part of their laws. Disclosure became part of the European Union Constitution in 2002, when the Aarhus Convention was ratified in Denmark. The British Companies Act of 2006 required companies listed on the London Stock Exchange to report environmental impact in their annual Business Review [17].

At present, “green credit” has spread worldwide and is supported and valued by more and more financial institutions. So-called “Boerdisi principles” and “Equator Principles” have become operational guidelines for international banks’ green credit practices [18]. Additionally, environmental disclosure practices have expanded significantly worldwide [19]. For example, the United States sets

legally enforceable standards to emphasize that banks need to take responsibility for the use of credit funds, thereby restricting loans that do not meet the green credit criteria and promoting effective development of a green economy [20]. Barclays Bank in Britain has set up a social and environmental credit guide—including having a risk assessment talent pool within the bank to review prospective loans—and supports green credit in technology and projects [21].

2.1. Corporate Environmental Information Disclosure (CEID)

In the past 20 years, the number of corporations that disclose environmental information in annual reports and other communications media has increased significantly. The main purpose of introducing environmental information disclosure policies is to reduce informational asymmetries and put, if necessary, pressure on corporations to reduce emissions. CEID can play a role of non-financial information disclosure, such as to assess social and environmental impacts of corporate activities, to measure the effectiveness of corporate social and environmental programs, to report corporate social and environmental responsibilities, and to allow external and internal information systems for comprehensive assessment of sustainability impacts for all corporate resources [22]. There are many corporations in developed countries which disclose environmental reports independently, however, most listed companies in heavy polluting industries in China disclose environmental information in their social responsibility reports or environmental reports separately, according to the requirements of the 2010 China Environmental Information Disclosure of Listed Companies [23]. Inevitably, corporate environmental reporting acts as the vehicle for providing environmental data designed to satisfy the accountability relationships and to indicate corporate consciousness through a moral discourse on environmental issues [24].

Environmental information disclosure is an important way for corporations to pass on their environmental responsibility performance to stakeholders and to alleviate agency problems caused by asymmetric information [25]. The level of disclosure of environmental information reflects the degree of corporate environmental responsibility of the companies. Through the environmental information disclosure system, governments can better protect the public's right to know environmental conditions and ensure the implementation of the public participation mechanism [26]. That is, the disclosure—by definition—reduces the information asymmetry between stakeholders and senior executives, decreasing a companies' ability to manipulate information on environmental practices and limiting a companies' ability to manage impressions of environmental responsibility [27]. However, the case from Chinese energy firms during 2008–2014 found that when gas, thermal power generation, and hydro firms increased their level of CEID, their cost of debt increased, but when solar and wind power firms increased their level of CEID, their cost of debt decreased. The implication is that heavily polluted companies are not inclined to disclose more environmental information because of the high debt costs [28].

2.2. Green Credit

In 2002, the World Bank's International Financial Corporation (IFC) and the Bank of Holland proposed green credit loan criteria (now called the Equator Principles). The Equator Principles are "a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects". The Principles are "primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making [14]". One year later, in 2003, the Equator Principles (EPs) were formally ratified by 10 financial institutions with the aim of promoting financial institutions to take social and environmental responsibilities. The members of Equator Principles Financial Institutions (EPFIs) have increased from the original 10 to 92 in 37 countries at April 2018 (for more information about Equator Principles, one could refer to <http://www.equator-principles.com/>).

Green credit is often referred to as sustainable financing or environmental financing, even though the two terms are technically different. Sustainable financing means that banks provide financing

facilities for sustainable commercial projects and use credit to guide sustainable development [29], while environmental financing refers to the specific financial instruments designed to deliver environmental quality and transform environmental risks. Green credit financing includes both aspects, the credit and the financial instruments.

Under the Equator Principles guidelines, banks can provide loan applicants to those who perform well in environmental protection credit loans. In addition, when undertaking secured loans or mortgage loans, banks should examine guaranteed legal persons, economic organizations, or natural persons and mortgages for environmental risks and environmental liabilities [30]. For corporations with environmental problems, banks must control the loan limit according to the seriousness of the problem, shorten the loan period, and raise the loan interest rate, so as to improve the bank's ability to defend the credit risk. For environment-friendly corporations, banks should implement preferential policies, such as increasing credit amount, extending loan years, and reducing interest rates [31].

However, even if policies have been developed to increase environmental information disclosure, this does not necessarily mean that the policies will be effectively implemented. In China, large nationalized commercial banks do not form the main body of the financial sector. Instead, the country's state-owned commercial banks are the principal agents of sustainable finance [32]. As a result, government agencies routinely interfere with issuing securities. In addition, the government largely determines interest rates in China. Consequently, yield curves are not market determined, and therefore may not accurately reflect risk [33]. Furthermore, banks whose CEOs have former government experience also have a disproportionate advantage, in that these CEOs are able to use their contacts to ensure loans with companies with higher returns on assets, lower default risks, and lower credit risks [34].

The assessment of green credit's actual effectiveness, however, is inconsistent. Some scholars believe that the green credit policy effectively curbs investment in the polluting industries in the short, medium, and long term. These scholars argue that green credit plays a role in promoting energy saving, emission reduction, and economic development for the whole society, while others believe it promotes environmental risk management for commercial banks. An additional strain of criticism from scholars suggests that the inhibition effect of green credit policy is waning [2,35–38].

Additionally, scholars have debated the impact of green policies in the context of developing countries. For one, developing countries' economies are still dependent on energy-intensive industries to fuel industrialization and urbanization. Until the current export and investment-driven economic growth pattern fundamentally changes the rigid demand for export, investment activities will weaken, if not overwhelm, the policy's effectiveness [2,30,39]. Case studies have suggested that collusion between governments and corporations to provide false environmental information to the bank will still allow credit to flow without forcing compliance with green credit restrictions [12,40]. Furthermore, both the limited infrastructure for enforcement and the corporate culture encourage, rather than discourage, collusion. The commercial banks and corporations are more likely to collude in the absence of external constraints [41]. Moreover, banks, middle level managers, and their customers do not understand the policy of green credit, and the risk management consciousness is weak. Corporate managers are indifferent to environmental protection; corporations lack environmental management support systems, and employees lack environmental training and education.

2.3. *The Connection between CEID and Green Credit*

In general, public disclosure of environmental information will increase the corporate environmental and financial performance [42]. The more detailed the corporate environmental information disclosure, the easier the loan applicant can obtain loans [43,44], especially short-term loans [45]. However, under certain circumstances studies have also found negative correlations or irrelevance between CEID and green credit. With the implementation of green credit, commercial banks increasingly provide loans to high energy-consuming corporations, or corporations with higher debt ratios disclose less environmental accounting information in order to avoid the risk of debt repayment [46–48].

3. Research Models and Hypotheses

According to signal transmission theory, the more environmental information disclosed, the more likely that bankers will be willing to give loans under specific conditions. These conditions are that the information provided by the corporation will decrease both the waste of resources and the inefficiency of collecting information about the corporate environmental practices. Signal transmission theory also implies that it is in the loan seekers' interests to pass more information to the other side to avoid possible adverse selection problems.

In a perfect situation, the government could avoid the adverse selection problem by requiring corporations to fully disclose environmental information for market transactions. Corporations that invest more in environmental protection, constantly innovate environmental protection technology, and reduce waste emissions will fully disclose environmental information in order to obtain bank loans even when delivering that information to the bank comes at a higher cost.

Voluntary disclosure theory predicts a positive association between environmental performance and the level of discretionary environmental disclosure. Superior environmental performers will convey their "type" by pointing to objective environmental performance indicators that are difficult to mimic by inferior type corporations. Inferior performers will choose to disclose less or to be "silent" on their environmental performance, thus being placed in a pool of corporations where investors and other users ascribe the "average type" to that pool. Disclosure contributes to enhancing the corporate core competitiveness, corporate governance structures, corporate images, and financing capabilities. In addition, voluntary disclosure can also reduce litigation costs [49,50].

However, voluntary disclosure—as the main policy for green credit—is unlikely to be effective in China for the following reasons. First, the market system is a relatively recent change from centralized control, and therefore relatively undeveloped. Second, the laws and regulations are relatively underdeveloped and the pollution enforcement relatively unsupervised. Third, the concentration of local authorities and the power of local corporations favor rent seeking.

According to risk management theory, banks should generally favor mandatory disclosure requirements, since the information will increase effective control and proper handling of losses and lower the decision risk caused by information asymmetry [51,52]. On the other hand, banks also tend to favor corporations with good operating conditions and product competition status, particularly when the corporation is continuing to expand market share. However, these corporations are not necessarily the companies that should obtain loans under green credit restrictions. That is, corporations that are heavy polluters could be extremely good credit prospects for financial returns, while at the same time being ineligible for loans under green credit restrictions. Thus, the banks potentially suffer from two mutually incompatible drives—the pull to loan to companies that will bring in the highest return and the push away from environmentally risky companies.

Under a centrally controlled system, local governments should obey the central government. In China, for example, local provincial governors are nominated by the central government and are assessed annually by the central government. However, governments at central and local levels balance different interests, with the central government interested in overall national aims and goals, and with local governments finding a balance between funding companies with reputable environmental records and the bank's available funding.

The principal agent relationship chain formed by the green credit policy for each stakeholder is shown in Figure 1:

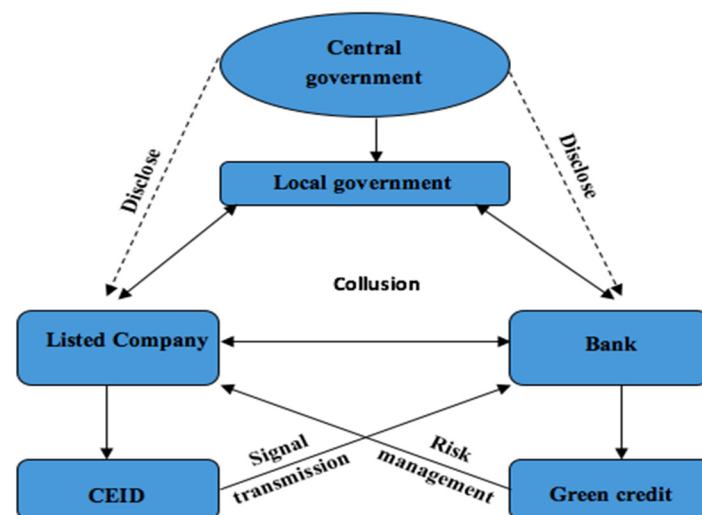


Figure 1. Principal agent relationship chain of green credit policy among stakeholders.

The relationship chain of green credit policy among stakeholders has three levels. At the top level, central government leads the local governments, and supervises the behavior of listed companies and banks. Central government acts as the principal mandating companies to protect the environment. However, supervising all companies' environmental friendliness is impossible; therefore, supervision relies on local governments for access to environmental information. At the second level, local governments implement green credit policies issued by the central government and supervise and administer listed companies and banks. Local governments play the role of supervisor in this principal–agent relationship. At the third level, listed companies (agents) and banks (the fourth party) make and implement green credit policy decisions. However, in China, banks may face collusion between local governments and listed companies, where they jointly cheat banks of credit funds with a forged Qualification Certificate of Environmental Protection [37], which can replace proper environmental information disclosure. The performance evaluation of local governments relates to the number of local listed companies, amount of tax collection, local revenue, and GDP; the higher these figures, the better the evaluation of local governments. Therefore, the local governments not only supervise the local listed companies, but also protect them, resulting in collusion. Local banks' main loaning customers are from local listed companies, and they are constrained by local governments' public services, meaning they are involved in collusion. The two possible scenarios are shown as follows:

Possible case 1: Environmental protection model. In this case, local governments and listed companies actively incorporate the environment in their management and loaning practices. Corporations fully disclose environmental information, and therefore banks make risk prevention decisions with sufficient information. In addition, banks follow green credit principles, increasing credit lines to corporations that meet environmental guidelines or refusing to increase loans for polluting corporations; if the corporation has more financing needs, it is more likely to fully disclose environmental information [49,53]. This model can circumvent the adverse selection problem, and maximize the effects of the green credit policy. Scenario one would logically show a strong and positive correlation between the quality of environmental disclosure that an individual corporation provides and the amount of green credit loans that the corporation receives.

Possible case 2: Collusion model. In this scenario, local governments and listed companies actively collaborate to avoid green credit restrictions. Based on high costs, feeble environmental awareness, and other factors, some corporations are unwilling to invest in environmental protection. In the absence of central government's supervision, local governments have motives (lay over-emphasis on the GDP and stabilizing the political situation) to conceal the truth and collude with corporations to cheat banks into loaning to these collusive corporations. Scenario two logically would lead to a

weak and negative correlation between the quality of environmental disclosure that an individual corporation provided and the amount of the green credit loans that the corporation received.

A collusion model starts with the differences between expected revenue for local governments (E_g) and the expected revenue of corporations (E_c), respectively [37]. E_g is equal to the bribe (B) that local governments received plus the construction fees (ΔC) they saved, then minus the corporations' interests (I), the penalties of both local governments (f_g) and corporations (f_c) once collusion is brought to light. E_c equals to the environmental facility construction fees that corporations saved (ΔC) minus the cost of a corporation starting a major project (I), the bribe (B), and the punishment (f_c) when the collusion is unveiled.

$$E_g = v(1-t)B + tv\Delta C - tI_{(v')} - vdf_g - vdtf_c = \alpha v\Delta C - \alpha vdf_c - \alpha I_{(v')} - \alpha vdf_g \quad (1)$$

$$E_c = v\Delta C - vdf_c - I_{(v')} - vB = \frac{1-\alpha}{1-t}v\Delta C - \frac{1-\alpha}{1-t}vdf_c - \frac{1-\alpha}{1-t}I_{(v')} - \frac{1-\alpha}{1-t}vdf_g \quad (2)$$

For the above formula (1) and (2), ΔC is the cost of constructing environmental protection facilities that corporations save, and is perceived as corporation earning. $I_{(v')}$ is the interest rate banks use to regulate the risk of collusion, α is the bargaining power of local governments, and $1-\alpha$ is the bargaining power of corporations. The probability of the central government disclosing the collusion is d , the probability otherwise is $1-d$. Once collusions are disclosed, corporations and local governments will be fined at f_c and f_g , respectively. A corporation selects environmental protection at the probability of $1-v$, hence, the probability of not doing so is v .

Whether or not they adopt green credit policies to protect the environment, corporations and local governments reach an agreement in the process of bargaining. Corporations maximize their expected earnings by giving local governments bribes (B).

$$B = \frac{(\alpha-t)v\Delta C - vd(\alpha-t)f_c - (\alpha-t)I + (1-\alpha)vdf_g}{v(1-t)} \quad (3)$$

In this case, the corporation has made an extra profit because it has saved the cost of investing in environmental protection. The local government receives B , under the condition that it does not voluntarily expose or recognize such improper transactions. The greater benefits that B brings to corporations and local governments, the greater likelihood of collusion. We assume the bargaining power of the corporation and the government supervisor are, respectively, $1-\alpha$ and α ($0 < \alpha < 1$), so the bribe B can be determined as follows: $\max_B E_C^{1-\alpha} E_g^\alpha$.

Central government's role is to expose collusion between local governments and corporations, and determine the level of penalties. Banks act as an independent party to prevent and control risks through differential interest rate policies (stop lending or reduce the amount). The greater the risk of collusion, the more banks tend to delay the collusion through differential interest rates.

$$v = \frac{\Delta C - df_c - df_g}{2Am} \quad (4)$$

In formula (4), the corporate probability of not protecting the environment is positively correlated with ΔC and negatively correlated with f_c and f_g , which means collusion depends on the difference between the additional gains that corporations save and the penalties for both local governments and corporations when the collusion is unveiled. Obviously, the higher the cost of environmental protection facilities that non-green corporations save, the greater the temptation to collude. At the same time, collusion is a risk, and the higher the punishments for corporations and local governments, the lower the possibility of collusion. A is the capital, and m is discriminatory interest rate coefficients. Banks can control the loans by adjusting m in advance rather than supervise and punish the corporations. When $m > 1$, the coefficient helps the interest rate rise multiple times with the estimated collusion

incidence. When $m < 1$ or $m = 1$, the coefficient will decline or not affect the interest rate with the estimated collusion incidence. The higher the estimated collusion incidence is, the greater the corporations' financing costs are.

Based on the above descriptions of the differences in interests between the central government and the on-the-ground constraints of local governments, scenario two is the most likely one in China. Therefore, the research hypothesis of this paper is as follows: there is no positive correlation between corporate green financing and the quality of environmental information disclosure.

4. Research Design

4.1. Sample Selection and Data Resources

The study sampled heavy polluting corporations as identified by the Chinese Ministry of Environmental Protection [54]. Industries within this classification include thermal power, steel, cement, electrolytic aluminum, coal, metallurgy, chemical, petrochemical, building materials, paper making, brewing, pharmaceutical, fermentation, textile, tanning, and mining industries.

The sampling was narrowed specifically to heavy polluting industries that the green credit policy is directly aimed at. An incidental advantage is that some studies have found that heavy polluting corporations disclose higher quality environmental information than other corporations [55,56]. Government guidelines encourage, but do not require, heavy polluting industries to regularly report environmental information.

The research project collected annual financial reports and social responsibility reports from 2008 to 2016 of all listed companies in the heavy polluting industries of Shanghai Stock Exchange (A), as the CEID quality in Shanghai Stock Exchange is better than that in Shenzhen's [57]. CEID selected the data from 2008 to 2015; the regulations on the implementation of the green credit mechanism was issued in mid-July 2007. Considering the lagging effect of green credit policy implementation, corporate green financing chooses the lagging option, that is, the data from 2009 to 2016. From this group, the research eliminated listed stocks that have suffered losses for two consecutive years (ST shares) and stocks that have stopped all transactions, cleared the price, and waited for delisting (PT shares) and vacancy samples. The final sample included 2560 observations from 320 firms. Data was processed used STATA13.0.

Consistent with overall regional patterns in China's economic development, there are 1275 sample corporations in the eastern part of the country (49.80% of the total), 749 corporations in the middle (29.26%), and 536 corporations in the western part (20.94%). The level of economic development in the east is relatively high, as the market is relatively strict and there are more listed companies. This is followed by the middle part, while the west is relatively far behind. There are 1687 state-owned corporations, accounting for 65.90% of the total, and non-state-owned corporations are 34.10% of the total. Heavy polluting corporations are mostly energy and mining industries, which are rigorously state-controlled and operated.

4.2. Variable Definition and Model

4.2.1. Dependent Variable—Green Credit

The study used long-term and short-term borrowing data proposed in annual financial reports of listed companies with slight modifications (discussed below) for statistical treatment. The use of corporate debt financing, especially the loan data obtained from banks [46,47,58,59], is one of two commonly used methods of determining green credit. The other—directly using bank data or bank survey data [12]—was less viable in the Chinese case, given that open bank data are relatively limited, and there are only 27 listed banks in China.

4.2.2. Independent Variable—Corporate Environmental Information Disclosure Level

The researchers used environmental information that corporations must disclose according to regulations on Information Disclosure of Listed Companies of China Securities Regulatory

Commission and the Disclosure Guidelines of the Ministry of Environmental Protection. CEID data was classified into 10 equally-weighted categories of indicators [60], such as environmental objective, environmental certification, energy-saving emission reduction, treatment of three wastes, environmental protection investment, environmental protection organization, pollution cost, environmental benefit, environmental reward, and other environmental information.

The researchers used content analysis [61] and index methods [62] to evaluate environmental information disclosure from qualitative and quantitative aspects. Based on the four dimensions of non-disclosure, general disclosure, detailed disclosure, and quantitative disclosure, they are assigned a score 0, 1, 2, and 3 respectively. In addition, each CEID value was obtained by aggregating all the specific indicator scores (0 means there was no environmental information, 1 means that 1–2 lines of environmental protection information were mentioned (the whole annual report and social responsibility reports added), 2 means that there were more than 3 lines of environmental information, and 3 indicated not only the mention of environmental information, but also specific value.).

CEID is influenced by many factors, among which corporate characteristics are the main internal factors [55,63,64]. The control variables include company size, company age, return on assets, financial risk, audit opinion, and ownership structure, which also choose the data of the lag phase. Two regulatory variables were included to investigate whether property rights differences (state-owned corporations or non-state-owned corporations) and regional differences moderated the impact of CEID on corporate green financing. The definitions and measurements of all variables are shown in Table 1.

Table 1. Variable symbols and definitions.

	Definition	Symbol	Measurement
Dependent variables	Long and short term loan ratio	LSSH	Long-term loan/Short-term loan
	Long-term loan ratio	LGDT	Long-term loan/Total liabilities
	Long-term loan matching	LDET	Long-term loan/Total assets
	Short-term loan ratio	STDT	Short-term loan/Total liabilities
	Short-term loan matching	SDET	Short-term loan/Total assets
Independent variables	Corporate environmental information disclosure	CEID	Comprehensive evaluation score (0–30)
Control variables	Company size	SIZE	The natural logarithm of the terminal total assets
	Company age	AGE	The number of years from the issue period to the current period
	Return on assets	ROA	Return on assets equal to earnings before interest, tax and abnormal items at fiscal year-end divided by average total assets
	Financial risk	LEV	Total debt divided by total assets at fiscal year-end
	Audit opinion	SOP	Measured by whether the accounting firm indicates that the company's disclosure information is accurate according with accounting regulations. Yes = 1, no = 0
	Ownership structure	SHA	Shareholding ratio of the largest shareholder/The sum of the shareholding ratio of the top five shareholders
Moderator variables	Company nature	STAT	State-owned company = 1, Non-state-owned company = 0
	Regional difference	AREAL	Eastern = 1, central = 2, western = 3

The following empirical research model was used to determine:

$$Y_{i,t} = \beta_{0i} + \beta_{1i}CEID_{t-1} + \beta_{2i}SIZE_t + \beta_{3i}AGE_t + \beta_{4i}ROA_t + \beta_{5i}LEV_t + \beta_{6i}SOP_t + \beta_{7i}SHA_t + \beta_{8i}STAT_t + \beta_{9i}AREAL_t + \mu_{i,t} \quad (5)$$

where $Y_{i,t}$ stands for dependent variable in period t , where t starts from 2009. In order to investigate the relationships between financing period, financing structure, financing scale, and the quality of CEID, this paper substitutes $Y_{i,t}$ for long-term and short-term loan ratio (LSSH), long-term loan ratio (LGDT), long-term loan matching (LDET), short-term loan ratio (STDT), and short-term loan matching (SDET), respectively. β_{1i} to β_{9i} are the scale parameters of each variable.

4.3. Data Description

According to the descriptive statistics results shown in Table 2, the average asset-liability ratio is as high as 58.7%, and the long-term loan is nearly 1.7 times the short-term loan. Short-term loans are often used to fund day-to-day operations, while long-term loans are mainly used in long-term asset projects,

such as large-scale equipment renewal, technological innovation, and fixed assets transformation, which are longer term and require higher funding.

The average level of CEID is low, roughly 10 out of a possible 30 points, which shows that the overall level of corporate environmental information disclosure in China is low. The maximum value is 28, the minimum is 0, and the variance is 6.099, indicating substantial variation among corporations. The overall size of the corporations is large with an average age over 12 years, and this suggests that the listed companies in the heavily polluted industries are those with long survival time and more human and material resource foundations. The average return on assets is 4.2%, which shows that the corporations' overall profitability is low, and the difference among the samples is large. The average audit opinions are basically unqualified audit opinions and the difference is small, which means that the quality of the annual reports of most listed companies meets the criterion of accounting standards. Ownership structure shows that equity concentration is high and more concentrated in the largest shareholder, with very small differences among the samples.

Table 2. Characteristics of variables.

Variable	Mean	Variance	Minimum	Maximum
LSSH	1.731	11.128	−0.095	398.773
LGDT	0.447	9.424	−0.014	320.275
LDET	0.189	3.148	−0.005	100.073
STDT	0.340	3.712	0.000	184.852
SDET	0.192	1.884	0.000	94.149
CEID	10.059	6.099	0.000	28.000
SIZE	22.300	1.625	0.000	29.374
AGE	12.965	4.286	0.000	26.000
ROA	0.042	0.576	−14.586	21.044
LEV	0.587	0.460	0.000	13.935
SOP	0.982	0.133	0.000	1.000
SHA	0.733	0.191	0.000	1.000

5. Results

Multiple Regression Analysis

The results show that there is no significant positive correlation between CEID and corporate green financing between any of the five variables, which supports a collusion model of green credit loaning. (The table of correlations is omitted with the limitation on table numbers.) Bank lending was not based on CEID, and CEID did not affect the substance of the corporate loans from the bank, either for long-term or short-term loans.

To further assess the impact of CEID on green financing, we applied a fixed effects model, which controlled the impact of the annual effect, and then examined the correlation between variables LSSH, LGDT, LDET, STDT, SDET, and CEID, respectively. Secondly, moderator variables were added to the most relevant variables (LSSH, LGDT, and LDET). This further specifies the different performances between different regions and different corporate ownership.

As expected, the three variables (LSSH, LGDT, and LDET) that are most closely tied to increasing environmental investments also show the clearest relationship between corporate green financing and CEID. Contrary to what would be expected in a functioning green credit system, however, all three are negatively related to CEID. The variables linked to short-term loans show no significant relationship to CEID. Negatively correlated and no significant correlation results support the collusion model.

The relationship becomes more complicated after separating ownership patterns and geographic indicators of development patterns. According to the multiple regression analysis (in Table 3), CEID and LSSH are negatively correlated at 1% significance for non-state-owned corporations, with no significant correlation for state-owned corporations. In the east, an economically developed region,

CEID and LSSH are significantly negatively associated (0.24%). The sample data of the central and western corporations are not significant.

Table 3. Fixed effects regression results.

Variables	LSSH	LGDT	LDET	STDT	SDET
CEID	−0.101 ** (−2.00)	−0.062 * (−1.68)	−0.020 * (−1.67)	−0.003 (−0.17)	−0.001 (−0.13)
SIZE	−0.476 (−1.46)	−2.364 *** (−9.99)	−0.804 *** (−10.32)	−0.135 (−1.22)	−0.050 (−0.89)
AGE	2.554 *** (3.73)	2.039 *** (4.10)	0.691 *** (4.22)	0.139 (0.59)	0.051 (0.43)
ROA	−0.150 (−0.32)	−0.052 (−0.15)	−0.002 (−0.02)	−0.008 (−0.05)	0.011 (0.14)
LEV	−0.589 (−0.89)	−0.657 (−1.36)	−0.175 (−1.10)	−0.081 (−0.36)	0.021 (0.18)
SOP	−0.427 (−0.23)	0.909 (0.67)	0.305 (0.68)	−0.015 (0.02)	0.028 (0.09)
SHA	0.140 (0.06)	−0.366 (−0.22)	−0.099 (−0.18)	−0.335 (−0.43)	−0.137 (−0.35)
Year Effect	control	control	control	control	control
β_0	−11.130 (−1.64)	33.923 *** (6.86)	11.514 *** (7.07)	2.273 (0.98)	0.861 (0.73)
R ²	1.74%	4.87%	5.15%	0.46%	0.42%
F value	2.82 ***	8.15 ***	8.64 ***	0.73	0.67

Variables	State-owned group (stat = 1)	Non-state group (stat = 0)	East (AREAL = 1)	Middle (AREAL = 2)	West (AREAL = 3)
	LSSH	LSSH	LSSH	LSSH	LSSH
CEID	−0.130 (−1.61)	−0.059 *** (−2.61)	−0.240 *** (−2.68)	0.040 (0.64)	0.051 (0.77)
SIZE	−0.015 (−0.03)	0.930 *** (4.38)	0.011 (0.02)	0.338 (0.51)	1.158 ** (2.02)
AGE	7.606 *** (5.33)	5.366 *** (3.08)	6.740 *** (4.76)	5.776 (1.07)	0.131 (0.04)
ROA	5.248 (1.12)	−0.080 (−0.63)	2.255 (0.57)	−0.080 (−0.24)	−0.183 (−0.12)
LEV	−2.177 (−1.27)	0.007 (0.03)	−1.074 (−0.77)	0.233 (0.20)	0.115 (0.07)
SOP	0.486 (0.14)	0.344 (0.51)	0.636 (0.17)	0.461 (−0.22)	0.089 (0.04)
SHA	3.875 (0.96)	0.137 (0.14)	2.402 (0.61)	2.432 (0.81)	−2.649 (−0.90)
Year Effect	control	control	control	control	control
β_0	−69.631 *** (−3.86)	−72.576 *** (−4.05)	−65.787 *** (−3.35)	−58.464 (−1.19)	−23.390 (−0.72)
R ²	3.60%	5.78%	3.74%	2.39%	2.98%
F value	3.79 ***	3.03 ***	3.02 ***	1.08	0.98

	LGDT	LGDT	LGDT	LGDT	LGDT
CEID	−0.104 * (−1.79)	−0.001 (−1.52)	−0.117 * (−1.67)	−0.001 (−0.33)	−0.003 (−0.82)
SIZE	−4.610 *** (−11.87)	0.022 ** (2.37)	−5.022 *** (−10.96)	0.019 (1.08)	0.023 (0.69)
AGE	−1.802 * (−1.75)	0.134 * (1.76)	−1.553 (−1.40)	0.051 (0.35)	−0.042 (−0.23)
ROA	−0.383 (−0.11)	−0.003 (−0.59)	1.749 (0.56)	−0.005 (−0.51)	−0.130 (−1.46)
LEV	−1.394 (−1.13)	0.001 (0.10)	−1.656 (−1.51)	−0.006 (−0.18)	−0.129 (−1.41)
SOP	1.110 (0.45)	−0.025 (−0.85)	−0.104 (−0.04)	−0.028 (−0.51)	0.023 (0.17)
SHA	−0.352 (−0.12)	−0.012 (−0.29)	−2.727 (−0.88)	0.075 (0.94)	−0.264 (−1.55)
Year Effect	control	control	control	control	control
β_0	121.295 *** (9.31)	−1.661 ** (−2.12)	131.548 *** (8.56)	−0.720 (−0.55)	−0.362 (0.19)
R ²	10.14%	8.38%	11.10%	4.97%	6.94%
F value	11.47 ***	4.51 ***	9.72 ***	2.31 ***	2.39 ***

	LDET	LDET	LDET	LDET	LDET
CEID	−0.034 * (−1.79)	−0.001 * (−1.43)	−0.039 * (−1.69)	−0.000 (−0.41)	−0.001 (−0.96)
SIZE	−1.576 *** (−12.36)	0.018 *** (2.89)	−1.718 *** (−11.43)	0.012 (1.11)	0.031 *** (2.85)
AGE	−0.612 * (−1.81)	0.104 ** (2.08)	−0.532 (−1.46)	0.052 (0.58)	−0.038 (−0.63)
ROA	0.091 (0.08)	0.001 (−0.51)	0.747 (0.73)	−0.002 (−0.38)	0.064 ** (2.18)
LEV	−0.287 (−0.71)	0.008 (−0.06)	−0.464 (−1.29)	0.032 * (1.67)	0.080 *** (2.66)
SOP	0.371 (0.46)	−0.020 (−1.00)	−0.065 (−0.07)	−0.019 (−0.56)	0.033 (0.74)
SHA	−0.088 (−0.09)	0.020 (0.72)	−0.915 (−0.90)	0.066 (1.33)	−0.048 (−0.84)
Year Effect	control	control	control	control	control
β_0	41.300 *** (9.66)	−1.345 *** (−4.30)	44.902 *** (8.90)	−0.654 (−0.81)	−0.234 (−0.37)
R ²	10.81%	7.49%	11.85%	5.71%	11.02%
F value	12.32 ***	3.99 ***	10.46 ***	2.68 ***	3.96 ***

Note: ***, **, * represent significance at 1%, 5%, 10% levels, respectively.

Contrary to the LSSH results, CEID is weakly negatively correlated with LGDT at 10% significance for state-owned corporations, but not for non-state-owned corporations. CEID are weakly negatively correlated with LDET for both state-owned and non-state-owned corporations at 10% significance. The regional difference of this negative correlation is obvious. In the east, CEID is significantly negatively associated with LGDT (0.117%) and LDET (0.039%), while the central and western

corporations are not significant. All in all, these empirical results indicate that the green credit policy tends to be ineffective in China, especially in developed cities.

SIZE and AGE are both positively correlated with LGDT and LDET in non-state-owned corporations, while they are negatively correlated in state-owned corporations, which indicates that larger scale and more established relationships are helpful for non-state-owned corporations to get green credits. Other control variables—ROA, LEV, SOP, and SHA—are not significantly correlated with any of the five dependent variables. STDT and SDET do not show a statistically significant correlation with CEID.

6. Conclusions and Implications

Our results, using real world data from the Shanghai stock market, are consistent with the collusion model described by Duan and Niu (2011) [37].

The green credit policy did not achieve the expected goals of adjusting loan amount and duration or helping highly polluting corporations carry out technical transformation and industrial restructuring. The environmental information disclosure system did not transmit valuable signals to the market, and has not become a decision-making tool for bank risk management. This result is consistent with Zhang et al.'s survey of 12 commercial banks, which concluded that the effect of green credit policy is far from expected [12]. Lack of environmental information and unclear policy standards and details result in uncertainty in implementation.

The relatively high amount of variation of CEID may be related to the imperfection of the Chinese environmental information disclosure system and the lack of supervision by the regulatory authorities. It may also be because the mandatory disclosure system is still in its infancy and corporations are still not aware of its importance. The environmental risk management and control of banks are relatively new systems, which suggests that policy standards and details may be unclear and lead to uncertainty in implementation [65]. For example, the disclosure indicators, such as specific pollutant emissions, absolute value of energy consumption, establishment of environmental protection institutions, and benefit estimation of corporations in reducing environmental pollution, are not standardized. The mandatory disclosure policy must be strengthened with specific details and the disclosure information of environmental reports should be standardized. For specific pollutant emissions, to continue the previous example, the annual reports should clearly disclose the specific value of CO₂, SO₂, NO_x, and so on, as well as how much these emissions have been reduced compared with the previous year.

However, a more likely explanation is that high-energy intensive and labor-intensive industries are still an irreplaceable main force in local economic development. The rigid demand driven by export and investment essentially weakens the feasibility of green credit policy. Given the constraints, a collusion model becomes the realistic choice for local governments and corporations—even banks. In the short term, the economic interests of the three parties will be prioritized, but in the long-run the environmental welfare of the whole society will be damaged.

One feasible route to avoid collusion is to make environmental disclosure mandatory. Governments should require all listed companies to disclose specific pollutant emissions, not only the heavily polluted listed companies. Moreover, the mandatory environmental information disclosure should be included into China Enterprise Credit Archives Platform, which was established by the People's Bank of China and has the infrastructure to gather regulatory information on different regions and categories. This platform has both the capacity to provide authentic and effective corporate credit records, but also to share the credit information with commercial banks. Not incidentally, using this mechanism would also increase the transparency of green credit information, thus, also increasing the risk of collusion.

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