

Article

Green Loans and Green Innovations: Evidence from China's Equator Principles Banks

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Abstract: Green innovation is critical for promoting environmental protection but largely relies on the support of bank financing. How the participation of banks facilitates green innovation remains largely unexplored. Using a sample of A-share listed firms in China, this study examines the impact of new loans from Equator Principles banks on green innovations. Consistent with the framework of the stakeholder theory, we find that new loans from Equator Principles banks significantly foster green innovations of borrowing firms. Several robustness tests are conducted, and the conclusion remains valid. Further analysis shows that the relief of financial constraints of borrowing firms and the scrutiny of corporate financing projects by Equator Principles banks jointly contribute to the promotion of corporate green innovation. Heterogeneity tests indicate that new loans from Equator Principles banks are more effective in heavily polluting and more competitive industries and among firms with higher levels of executive education. Overall, our findings suggest that stakeholder engagement in environmental governance is an important means of improving corporate green innovations in emerging markets.

Keywords: green loans; green innovations; Equator Principles banks; project scrutiny



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1. Introduction

Although green innovation is of great significance to sustainable development, most companies cannot afford it due to its uncertainties, high investment, and long R&D cycle [1,2]. Therefore, several countries have taken measures to introduce green credit policies, which require financial institutions to incorporate more corporate environmental factors into credit assessment [3] and are increasingly driving corporate environmental performance through their influence on enterprises' financing processes [4,5]. Previous empirical studies have found converging evidence of the positive effects of green credit policies on green innovations [5–7], environmental protection [8], and developing a green economy [9]. In this regard, scholars have drawn on a central concept of financial constraints to argue the influence mechanism of green credit policies [10,11]. Unfortunately, due to the lack of an explicit green credit management process, the role of banks as creditors involved in the environmental governance of debt firms is still unclear.

Green innovation is vital to achieve the internalization of external environmental pollution and simultaneously promote economic growth [12]. In spite of extensive evidence of its benefits, firms may not automatically pursue green innovation because it is characterized by externality and uncertainty [13]. An important determinant of firms' green innovation decisions is pressure from stakeholders [14,15]. Prior numerous studies examining the driving factors that affect corporate green innovations have mainly been concerned with institutional [16] and market pressures [17,18]. Due to the growing standardization and formalization of environmental pollution control regimes, environmental regulation has hindered economic growth and development, which was originally the

driving force behind green technology innovations [19]; hence, determining how to guide other stakeholders to support firms' green innovations is an urgent issue.

The Chinese government is actively involved in green development in reaction to the emerging environmental crisis [20]. The central government has not only listed environmental performance in the cadre evaluation [21], but has also implemented a variety of policies aimed at solving severe environmental problems. However, due to the complexity of environmental issues and the asymmetry of information, the implementation process of environmental regulation policies often results in policy distortions, which means that the expected policy effects and economic dividends cannot be achieved. Therefore, exploring a sustainable development path that can accomplish coordination between environmental protection and economic growth has become a key problem requiring an urgent solution [19,22].

Bank loans, as an essential source of financing for firms [10], are increasingly utilized to enforce corporate environmental responsibility. To leverage financial stakeholders' involvement in the environmental governance of firms, one form of policy innovation that has been explored in China is green credit policies [9], which encourage banks to restrict credit to companies that have violated environmental regulations while favoring environmentally friendly companies, on the basis of information obtained from local environmental authorities [23]. Sun et al. believe that this type of policy can mitigate the enforcement and incentive defects resulting from formal environmental regulations. The engagement of banks complements the enforcement procedures of environmental authorities by setting strict loan processes and rejecting credit to polluting enterprises. Furthermore, enterprises have an incentive to achieve a cleaner production process, as they can receive favorable loan decisions as a result. Therefore, green credit policies are considered an important complementary measure to China's existing environmental regulations.

Banks had already noticed environmental risks before the formulation of green credit in China, and the Equator Principles were introduced by the international major financial institutions in 2002. Since then, over 110 banks from 37 countries have accepted the Equator Principles, which provide banks with a benchmark for scrutinizing, identifying, and dealing with the environmental and social risks associated with prefinancing projects. When it comes to formulating green credit policy, the Equator Principles have great influence. However, compared with the credit management processes of the Equator Principles, only the basic principles are outlined in green credit policies, not specific management methods. Since the advent of the Equator Principles in 2003, the Equator Principles Association has continuously revised and updated the Equator Principles. Broadly, there are two main streams of literature in line with Equator Principles. First, a large body of work from the evolution and its functions of the Equator Principles [24–26] demonstrated that banks that adopt the Equator Principles take more consideration into social, ethical, and environmental policies [25,27,28]. Second, numerous studies from the perspective of financial institutions focused on adopting Equator Principles-driven factors [29] and economic consequences [30,31]. Chen et al. proved that banks adopting the Equator Principles have higher liquidity and positive returns [31], which supports the reputational risk hypothesis. The correlational studies conducted so far support Equator Principles; however, few studies have focused on the banks that have adopted the Equator Principles (Equator Principles banks) as creditors, as well as their involvement in the governance of debt companies.

This paper aims to explore how Equator Principles banks affect corporate green innovations. This adds to our understanding of the financial stakeholder as a creditor and their involvement in debt companies and the environmental governance effect. There are two marginal contributions of this article as described below.

First, according to the stakeholder theory framework, with regard to the effects of the involvement of China's Equator Principles banks, we use samples of Chinese nonfinancial A-share list companies, assess the governance effect of Equator Principles banks' engagement on company environmental performance, and examine the ratio of new corporate

loans from Equator Principles banks to total new corporate bank loans, which are more representative of green loans, along with the impact on debt corporate green innovations.

Second, unlike previous studies, we find that financial constraints alone do not reveal the whole story regarding financial institution involvement in corporate environmental governance. Consistent with the literature on green policies, which predicts that the mitigating financial constraints positively affect corporate green performance, we find that credit from Equator Principles banks mitigates the financial constraints of debt corporations. However, several findings are inconsistent. We find that there is no difference in the promotional influence of green loans on green innovations in SOEs and non-SOEs, while green loans have a more significant effect on promoting green innovations in larger-scale enterprises with low financial constraints [32]. Moreover, Equator Principles banks' scrutiny of corporate prefinancing projects forms a green governance effect to promote corporate green innovations, which is a substitute to the government's formal environmental regulation. Formulating natural environmental regulation power from the engagement of Equator Principles banks is a replacement for the government's environmental regulation.

We arrange the remaining structure of the paper as follows: Section 2 is the literature review; Section 3 contains the research design, including data sources, variables, and an empirical model; Section 4 analyzes the relationship between Equator Principles banks' new loans and the green innovation of debt firms, conducts several robustness tests, and analyzes the mechanism and function boundaries; Section 5 comprises the research conclusions and recommendations.

2. Literature Review and Theoretical Analysis

2.1. Literature Review

2.1.1. Stakeholder Influences on Green Innovations

Stakeholder theory, as developed by Freeman, argues that stakeholder relationships are the foundation of companies [33]. Since then, stakeholder theory has been universally used in corporate governance research [34]. A firm's development relies on its stakeholders, and they are closely connected with each other [35,36]; thus, stakeholder theory reminds companies that they should fulfil their social responsibilities while achieving corporate objectives. Financial institutions are important enterprise stakeholders; they provide debt capital for the company, support the daily operation of the firm, and obtain interest income from the enterprise. Simultaneously, financial institutions concerned about corporate social responsibility and behavior, as well as the environment, can lower their own environmental and social risks [37]. Due to environmental degradation throughout the world, over the last decade, many firms have turned to green innovations as a means of enhancing their competitive strength [38]. A firm's green innovation tactics are the result of an interaction between stakeholder power and the environmental preferences of management [39]. Numerous studies have examined the factors affecting a firm's green innovations under the framework of stakeholder theory [33,40].

Consumers and suppliers are important stakeholders in a company; they determine many aspects of the firm's operations, strategy, etc. [33], and they are an important force to encourage enterprises to take social responsibility and to improve environmental performance [41,42]. According to Van den Berge, consumers can pay a premium or reject companies to urge them to focus on protecting the environment [43], and this is an important driver of green innovation for companies [44]. Suppliers provide companies with materials and technologies [45], enabling them to produce high-quality ecological products in the most efficient way [46] and directly affecting their green production (including products and processes) capabilities; therefore, they are crucial to the green innovation potential of companies [14]. Novitasari and Alshebami confirmed that green supply chain management has a positive effect on competitive advantage [47]. As a result, suppliers and consumers have a strong incentive to help companies improve green innovation. In conclusion, numerous studies have confirmed the positive effect of business-related stakeholders on corporate green innovation.

The role of regulatory stakeholders in encouraging corporates to adopt environmental management practices cannot be ignored [48]. Companies that fail to meet the requirements of regulators can be punished, fined, charged, or lose their operating license [44]. Poter and Van der Linder believe that opportune environmental regulation helps “reversely force” firms to innovate in green technology [49]. Many studies have confirmed that formal environmental regulations have promoted green innovations [50–52]. However, neoclassical economics believes that environmental regulation increases corporate system compliance costs, as firms are required to cover pollution discharge fees for their pollution behaviors in production activities [53]. Due to the pressure on cash flow caused by these fees, managers are pushed to abandon green innovation projects with long timeframes and great uncertainty so as to pursue short-term performance [54].

Academia has not reached a consensus about how government environmental regulations affect corporate green innovations. Therefore, determining how to introduce other stakeholders into corporate environmental governance is crucial. Creditors provide debt capital for companies, support their production and operation activities, and obtain interest income from them; they are important enterprise stakeholders. According to Ghisetti et al., financial constraints have a negative relationship with investment in green technologies [55]. However, creditors have not been further connected with firms’ green innovations. External financing support is the basic premise of innovation (including green innovation); hence, it is important to further study the role of creditors in corporate green innovations.

2.1.2. Green Finance and Green Innovations

Green finance has been increasingly noticed by researchers in recent years owing to its potential to solve environmental problems. Compared with general finance patterns, green finance is primarily driven by policies and environmental concerns [56]. There has been a considerable number of studies conducted on the green financial market. Green finance is meant to reduce environmental pollution, as well as lower risk diffusion through the development of diversified financial instruments [57]. According to Yu et al., green finance means providing monetary support [11], such as green bonds and green stocks, to projects with ecological benefits, such as pollution reduction and energy conservation. Although several definitions of green finance have been generated, at its core, it is a form of financial innovation that promotes a balance between environmental protection and economic growth [11].

As the focus and center of China’s green financial system, green credit policies have drawn widespread attention from researchers. Green credit policies primarily leverage the ecological governance role by guiding the flow of funds. Relevant empirical evidence shows that green credit policies can strengthen the green innovation motivation of firms through the incentive and restraint mechanism [9,58]. Specifically, clean corporates find credit financing more accessible and easier to obtain, while polluting corporates confront stricter thresholds and pay more when procuring bank loans [58]. However, green credit policies are still flawed as they only outline basic Principles without specific management methods. Therefore, banks always lend by industry, and energy-intensive, high-polluting industries that cannot obtain bank credit do not have sufficient funds to improve their production efficiency [59], affecting the enthusiasm of these enterprises for industrial upgrading [60] and resulting in the improper allocation of capital funds, which goes against the ultimate goal of green credit policies [4].

Despite limiting the blind expansion of polluting industries, green credit policies are not conducive to the industrial transformation and upgrading of these industries. Therefore, determining how to guide financial institutions to participate in the specific processes of corporate environmental governance is currently a common concern. Some scholars have presented a green loan theory, demonstrating that green bank loans may incentivize green innovations [61]. Nevertheless, empirical study on the possible correlation between green loans and green innovations is still lacking. Banks are an indispensable part of the financial system in China [62], and, until now, bank loans have been the

major source of external funds for corporates. In 2008, the Industrial Bank announced they would implement the Equator Principles, which was a first in China. The Equator Principles are aimed at providing a universal benchmark for banks to scrutinize, identify, and manage environmental and social risks when providing loans. Therefore, Equator Principles banks provide a good perspective from which to explore the influence of green loans on green innovations.

2.2. Theoretical Background and Hypothesis Development

Many countries have formulated policies to guide the financial institutions that are specifically involved in the process of environmental governance of enterprises [23,63]. The Equator Principles, as part of these very important policies, are financial industry benchmarks set up by major international financial institutions for assessing and managing the environmental and social risks in prefinancing projects (as shown on www.equator-principles.com (accessed on 22 September 2022)). The Equator Principles contain a total of ten benchmark principles. Within the universal framework of the Equator Principles, Equator Principles banks will only provide project financing for projects that meet both Principles 1–10 [30,64]. Among them, Principles 1–3 are related to prior project scrutiny and assessment (Principle 1: review and categorization; Principle 2: environmental and social assessment; Principle 3: applicable environmental and social standards), Principles 4–6 are related to ongoing project management and supervision (Principle 4: environmental and social management system and Equator Principles action plan; Principle 5: stakeholder engagement; Principle 6: grievance mechanism), and Principle 8 is related to remedial measures after the event (Principle 8: covenants).

Financial institutions have multiple incentives to adopt the Equator Principles and scrutinize financing projects according to their requirements [27,30,31]. First, it is conducive to reducing the environmental and social risks of banks [62]. Second, the brand value of the banks is enhanced. As the benchmark of environmental and social risk management for world-renowned financial institutions, the Equator Principles have immense environmental and social value, and they have greatly improved the brand value of the banks that have adopted them [25,28]. Third, it is conducive to improving the international reputation of banks, thereby attracting more international investors [30]. Therefore, from the perspective of stakeholders, Equator Principles banks have sufficient motivation to conduct a project review and evaluation of enterprises [29]. They will form a natural environmental regulation force for enterprises, encouraging them to carry out green innovations.

As mentioned above, within the framework of the equatorial principle, Equator Principles Banks scrutiny management processes are required to assess, supervise, monitor, evaluate, and report prefinancing projects before, during and after the event [25]. Above all, Equator Principles banks must assess environmental and social risks of prefinancing projects according to the relevant laws and regulations of the host country [65]. In addition, Equator Principles banks must monitor project operations and the implementation of the action plan [26,66]. Debt corporates must demonstrate effective stakeholder engagement and establish a complaint mechanism for them to negotiate and resolve issues in a timely manner for projects that have a potentially significant adverse impact on affected communities to ensure that debt firms adhere to the environmental and social commitments as set out in the loan agreements [67]. Furthermore, for all projects, if the debt corporates fail to meet its environmental and social commitments, Equator Principles Banks will take remedial measures, including declaring an event of default [68]. Therefore, Equator Principles Banks can promote green innovation of lending enterprises through two mechanisms. First, finance constraints limit enterprises' capabilities in green innovation [11,69]. The Equator Principles Banks as financial institutions provide loans to enterprises [31], alleviate their financing constraints [70,71], and reduce the capital obstacles associated with the green innovations of debt companies [9,58,72]. Second, Equator Principles Banks scrutiny management processes are mainly divided into three steps, i.e., before, during, and after the event. By assessing and supervising the environmental and social risks associated with

prefinancing projects as corporate stakeholders, monitoring project operations and the implementation of the action plan, and evaluating and reporting by Equator Principles Banks publicly at least annually, Equator Principles banks' environmental scrutiny through the case can produce the environmental governance effect on a debt company (Figure 1).

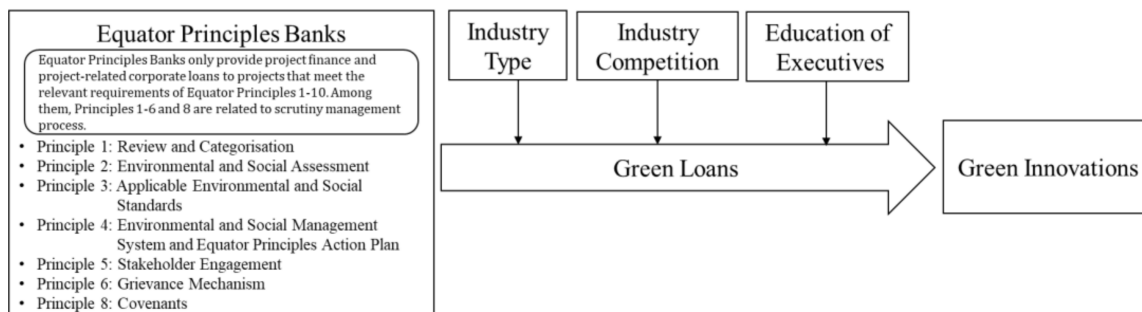


Figure 1. Theoretical model.

On the basis of the above analysis, we proposed the following research hypothesis:

Hypothesis 1. *New loans from Equator Principles banks can promote the green innovations of debt enterprises.*

3. Research Design

3.1. Data

The empirical analysis of this paper utilized the data of Chinese firms listed on the A-share market from 2008 to 2018. The 2008 to 2018 panel dataset was chosen for the following two reasons. First, after the international financial crisis in 2008, financial regulators in various countries began to pay attention to macro-prudential supervision; thus, 2008 was taken as the starting year of the sample period to exclude the impact of the financial crisis; second, in order to reduce the “noise” caused by policy interventions, in June 2018, the Bank of China included green bonds not lower than the AA level in the scope of medium-term lending facility (MLF) qualified collateral to achieve financial support for green assets; thus, 2018 was taken as the end year of the sample period.

The sample was processed to meet our research needs by: (1) excluding financial and ST firms; (2) excluding all financial firms; (3) removing firms with missing research variables; (4) winsorizing continuous variables at 1% as well as 99% to reduce outlier effects. A total of 22,812 firm-year observations made up the final sample. Corporation data were compiled from China Stock Market and Accounting Research (CSMAR), and green patent data were collected from the China National Intellectual Property Administration (CHIPA).

3.2. Variables

3.2.1. Dependent Variable: Green Innovation

According to Li et al., we constructed the green innovation variable [61], which was equal to the natural logarithm of the number of granted green patents (including both utility and invention patents) plus one.

3.2.2. Independent Variable: Green Loan

Since 2008, nine banks in China have accepted the Equator Principles. We constructed the green loan variable to assess the impact of Equator Principles banks on companies, which represents the ratio of new loans from Equator Principles banks to total new corporate bank loans.

3.2.3. Controls

Following the previous literature [73], we controlled for several variables related to green innovations. We controlled for the power of institutional investors (Inst) and CEO (Dual) according to Wu et al. [74]. We followed Wang and Li and controlled for cash ratio (Cash), firm value (Tbq), board independence (Ind), and market-to-book value (Mtb) [73]. The specific variable definitions and statistical descriptions are shown in Table 1.

Table 1. Statistical description of variables.

Variable	Definition	N	Mean	SD	Min	Max
GreenInnovation	The natural logarithm of the number of granted green patents (including both utility and invention patents) plus one.	22,946	0.2689	0.6204	0.0000	3.0445
GreenLoan	The ratio of new loans from Equator Principles banks to total new corporate bank loans.	22,946	0.0012	0.0336	0.0000	1.0000
Inst	The percentage of shares held by institutional investors.	22,946	0.3660	0.2380	0.0002	0.8726
Dual	Equal to 1 if a CEO is also on the board of directors and 0 otherwise.	22,946	0.7327	0.4425	0.0000	1.0000
Mtb	The ratio of book value to market value.	22,946	0.3648	0.4814	0.0000	1.0000
Cash	Cash and cash equivalent to total assets.	22,946	0.1752	0.1469	0.0097	0.7135
Tbq	Market value of all shares/replacement costs of total assets.	22,946	1.9445	0.9306	0.0000	3.2189
Ind	The ratio of independent board members to the total number of board members.	22,946	0.3726	0.0526	0.3333	0.5714
Share	The percentage of shares held by directors and executives.	22,946	0.1410	0.2084	0.0000	0.6992

3.3. Empirical Model

To examine the influence of green loans on green innovations, according to Wang and Li, 2022 [73], we constructed a baseline regression model as follows:

$$GreenInnovation_{it} = \beta GreenLoan_{it} + \rho X_{it} + Firm\ FE + Year\ FE + Province\ FE + \varepsilon_{it} \quad (1)$$

where $GreenInnovation_{it}$ denotes the green innovation of firm i in year t , and $GreenLoan_{it}$ measures the green loan in firm i in year t . Hence, the coefficient ρ measures the effect of new Equator Principles bank loans on the green innovations of debt enterprises. We controlled for firm, year, and province fixed effects to eliminate unobserved firm-invariant, time-invariant, and province-invariant effects. ε_{it} represents the error term. Both firm- and year-level robust standard errors were clustered [73].

4. Results

4.1. Green Loans and Green Innovations

We first examined the influence of green loans on green innovations; column 1 in Table 2 shows the simplest case in which we included the key independent variable GreenLoan and the firm and year fixed effects. It shows a significantly positive coefficient for GreenLoan, meaning that a higher green loan can increase a firm's green innovations. Controlling for the firm and year fixed effects and firm-level characteristics, columns 2 and 3 show the regression results without and with province fixed effects. As indicated in column 3, the coefficient of GreenLoan is 0.1099, which means that, when GreenLoan increases by 1 unit, GreenInnovation increases by 0.1099 units on average. From an economic point of view, the more new loans that Equator Principles banks make to enterprises, the more the green innovations of enterprises can be promoted. This may be because the new loans provided by Equator Principles banks to enterprises provide necessary financial support for the production and operation of green innovations. In addition, a review of the environmental and social aspects of corporate prefinancing projects by Equator Principles banks produces more requirements for environmental governance and promotes green innovations.

Table 2. The influence of green loans on green innovations.

Dependent Variable	GreenInnovation	GreenInnovation	GreenInnovation
	(1)	(2)	(3)
GreenLoan	0.1079 ** (0.0466)	0.1103 ** (0.0482)	0.1099 ** (0.0488)
Inst		−0.0527 ** (0.0178)	−0.0527 ** (0.0177)
Dual		0.0229 * (0.0123)	0.0232 * (0.0124)
Mtb		0.0157 (0.0263)	0.0183 (0.0274)
Cash		−0.0432 (0.0281)	−0.0437 (0.0284)
Tbq		0.0356 ** (0.0155)	0.0346 ** (0.0155)
Ind		−0.0410 (0.0698)	−0.0402 (0.0710)
Share		−0.0462 (0.0470)	−0.0477 (0.0473)
Firm-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Prov-FE	No	No	Yes
_cons	0.2685 *** (0.0000)	0.2251 *** (0.0431)	0.2258 *** (0.0435)
Obs.	22,799	22,799	22,799
R-squared	0.6960	0.6966	0.6972

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

4.2. Robustness Tests

Several robustness tests were conducted to confirm our baseline regression results, including alternative measures of green loan and green innovations, an alternative estimation method, using instrument variables, and conducting Cox PH model analysis.

4.2.1. Alternative Measurement of Green Innovations

Green patent applications were used to substitute for green patent grants to measure green innovations. The results in Table 3 indicate that green loans were still significantly positively related to green innovations, meaning that the conclusion that green loans improve the level of green innovations of enterprises is valid.

Table 3. Robustness test: alternative measurement of green innovations.

Dependent Variable	GreenInnovation_a	GreenInnovation_a	GreenInnovation_a
	(1)	(2)	(3)
GreenLoan	0.1748 * (0.0798)	0.1758 ** (0.0779)	0.1722 ** (0.0764)
Inst		−0.0471 (0.0303)	−0.0461 (0.0300)
Dual		0.0066 (0.0170)	0.0068 (0.0174)
Mtb		0.0633 * (0.0324)	0.0646 * (0.0345)
Cash		0.0216 (0.0417)	0.0205 (0.0425)
Tbq		0.0454 ** (0.0161)	0.0436 ** (0.0162)
Ind		0.0065 (0.1564)	−0.0035 (0.1526)

Table 3. Cont.

Dependent Variable	GreenInnovation_a	GreenInnovation_a	GreenInnovation_a
	(1)	(2)	(3)
Share		−0.0916 (0.0663)	−0.0929 (0.0669)
Firm-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Prov-FE	No	No	Yes
_cons	0.3570 *** (0.0000)	0.2642 *** (0.0811)	0.2710 *** (0.0800)
Obs.	22,799	22,799	22,799
R-squared	0.7032	0.7037	0.7050

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

4.2.2. Alternative Measurements of Green Loans

We used GreenIno-dummy to measure green innovations, which is equal to 1 if a company has new loans from an Equator Principles banks, and 0 otherwise. Columns 1–3 in Table 4 show the coefficients of GreenIno-dummy, which are all positive at the 5% significance level, indicating that the conclusion that green loans improve the level of green innovations of enterprises is reliable.

Table 4. Robustness test: alternative measurements of green loans.

Dependent Variable	GreenInnovation	GreenInnovation	GreenInnovation
	(1)	(2)	(3)
GreenIno-dummy	0.0992 ** (0.0398)	0.1017 ** (0.0405)	0.1014 ** (0.0409)
Inst		−0.0527 ** (0.0178)	−0.0527 ** (0.0177)
Dual		0.0229 * (0.0123)	0.0232 * (0.0124)
Mtb		0.0156 (0.0262)	0.0182 (0.0274)
Cash		−0.0433 (0.0281)	−0.0437 (0.0284)
Tbq		0.0356 ** (0.0155)	0.0347 ** (0.0155)
Ind		−0.0411 (0.0698)	−0.0404 (0.0710)
Share		−0.0461 (0.0470)	−0.0477 (0.0473)
Firm-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Prov-FE	No	No	Yes
_cons	0.2684 *** (0.0000)	0.2251 *** (0.0431)	0.2258 *** (0.0435)
Obs.	22,799	22,799	22,799
R-squared	0.6960	0.6966	0.6972

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

4.2.3. Alternative Estimation Method

To avoid the influence of model selection on the research conclusions, we referred to Cameron et al. [75] and used the Tobit model instead of the ordinary least squares (OLS) model to retest the impact of green loans on green innovations. As indicated in Table 5, the coefficients of GreenLoan were positively significant at the 10% level. After replacing OLS

regression with the Tobit model, the conclusion that green loans promote green innovations remains unchanged.

Table 5. Robustness test: alternative estimation method.

Dependent Variable	GreenInnovation	GreenInnovation	GreenInnovation
	(1)	(2)	(3)
GreenLoan	0.1079 * (0.0569)	0.1103 * (0.0583)	0.1099 * (0.0588)
Inst		−0.0527 *** (0.0188)	−0.0527 *** (0.0189)
Dual		0.0229 * (0.0126)	0.0232 * (0.0128)
Mtb		0.0157 (0.0258)	0.0183 (0.0270)
Cash		−0.0432 (0.0295)	−0.0437 (0.0300)
Tbq		0.0356 ** (0.0154)	0.0346 ** (0.0155)
Ind		−0.0410 (0.0723)	−0.0402 (0.0739)
Share		−0.0462 (0.0467)	−0.0477 (0.0470)
Firm-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Prov-FE	No	No	Yes
_cons	−0.1838 *** (0.0124)	−0.2164 *** (0.0458)	−0.1068 (0.0753)
Obs.	22,946	22,946	22,946

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

4.2.4. Instrumental Variable

We used an instrumental variable approach to mitigate possible endogeneity issues. Allen et al. used the amount of bank loans available to enterprises as an instrumental variable for whether the enterprise has bank loans [62]. We borrowed from their practice and constructed our own instrumental variable (AvailableGreenLoan), i.e., the ratio of available Equator Principles bank loans to total available bank loans. The main reason for this is that the company's AvailableGreenLoan may have a significant positive correlation with the company's final actual GreenLoan, but have nothing to do with the company's GreenInnovation.

The test results of the instrumental variable method are shown in Table 6. In the first-stage regression, the coefficient of AvailableGreenLoan is 0.0505, which is significant at the 1% statistical level, meaning that the instrumental variable has a strong correlation with GreenLoan; the F value is 10.25, which is larger than 10, indicating the validity of the selected instrumental variable. In the second-stage result, the coefficient of GreenLoan is 0.1115, significant at the 5% statistical level, indicating that, after considering the endogeneity problem, green loans still improve the green innovations of debt enterprises.

4.2.5. Cox PH Model Analysis

To test whether there is a reverse causality in the influence of green loans on green innovations, i.e., whether the green innovation performance of enterprises affects the possibility of obtaining loans from Equator Principles banks, we chose the Cox PH model for regression, which can analyze a variety of risk factors in the impact on the observed individuals at different times. The risk function of the specific Cox PH model is established as follows:

$$h(t, X) = h_0(t) \exp(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_m X_m), \quad (2)$$

where $h(t, X)$ is the function of green loans at time t after considering covariates, and $h_0(t)$ represents the baseline risk at time t , which depends on time t but not on other explanatory variables X . β is the coefficient of the risk factor, i.e., the influence on the interest event (green loan in this study); hence, we mainly focus on the sign and size of β_1 , i.e., the impact of corporate green innovations (GreenInnovation) on enterprises' green loans from Equator Principles banks. Columns 1–3 in Table 7 respectively show the impact of the company's green innovations in the current year, the previous year, and the previous 2 years on the green loans of the current year. The coefficients of GreenInnovation are not significant; thus, there is no evidence that the green innovation performance of enterprises affects the possibility of Equator Principles banks providing loans to them. This is because the review conducted by Equator Principles banks is for proposed investment projects, where it has a prudential check on environmental and social issues in project financing, rather than a review of the company's past experience and level of green innovations.

Table 6. Robustness test: instrumental variable.

Dependent Variable	GreenLoan	GreenInnovation
	1st Stage	2nd Stage
	(1)	(2)
AvailableGreenLoan	0.0505 *** (0.0026)	
GreenLoan		0.1115 ** (0.0495)
Inst	0.0019 (0.0016)	−0.0525 ** (0.0177)
Dual	−0.0006 (0.0009)	0.0231 * (0.0125)
Mtb	0.0012 (0.0021)	0.0185 (0.0274)
Cash	−0.0006 (0.0024)	−0.0437 (0.0284)
Tbq	−0.0007 (0.0009)	0.0346 ** (0.0155)
Ind	0.0023 (0.0074)	−0.0399 (0.0710)
Share	−0.0006 (0.0036)	−0.0478 (0.0473)
Firm-FE	Yes	Yes
Prov-FE	Yes	Yes
Year-FE	Yes	Yes
_cons	−0.0012 (0.0090)	0.2258 *** (0.0434)
Obs.	22,946	22,799
R-squared	0.0205	0.6972
Cragg-Donald Wald F statistic	10.21	

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

Table 7. Robustness test: Cox PH model analysis.

	t	t-1	t-2
	(1)	(2)	(3)
GreenInnovation	0.1753 (0.2787)	0.1833 (0.3248)	−0.0365 (0.4547)
Inst	−0.3358 (1.1996)	−0.3769 (1.1521)	−0.4450 (1.1697)
Dual	0.5518 (0.7197)	0.5499 (0.7197)	0.5325 (0.7156)

Table 7. Cont.

	t	t-1	t-2
	(1)	(2)	(3)
Mtb	0.6639 (0.5733)	0.6573 (0.5785)	0.7184 (0.5775)
Cash	−1.8691 (2.5586)	−1.9061 (2.5639)	−2.0168 (2.5647)
Tbq	0.6120 * (0.3284)	0.5845 * (0.3254)	0.4093 (0.3426)
Ind	1.9395 (4.2866)	1.8892 (4.2907)	1.9447 (4.2179)
Share	1.3114 (1.2014)	1.2183 (1.2137)	1.0803 (1.1814)
Obs.	21,825	21,634	20,692
R-squared	0.0477	0.0483	0.0478

Note: * indicates significance at the 10%.

4.3. Mechanism Discussion: Financing Constraint or Governance Effect?

We have already analyzed that the green loans provided by Equator Principles banks to enterprises can promote the green innovations of enterprises, according to two mechanisms: first, to alleviate the financial constraints of corporates; second, to produce the environmental governance effect of Equator Principles banks as a corporate stakeholder.

In order to verify the financing constraint mechanism, we set FC as the financing constraint positive indicator, measured by the absolute value of the Hadlock and Pierce index [76]. Moreover, previous studies documented that state-owned enterprises (SOE), compared to non-SOEs, behave differently in corporate policies and decision making such as innovation [70], dividend payment [77], tax aggressiveness [78,79], working capital management [80,81], the allocation of decision rights [82,83], corporate disclosures [84,85], financial reporting [86], and auditing [87,88]. Compared with non-SOEs, SOE financing is more convenient, and large-scale enterprises have fewer financing pressures than small-scale enterprises [89]; therefore, we also set variables Soe and Size. When a firm is state-owned, Soe is equal to 1 and 0 otherwise. Size is equal to the natural logarithm of the company's annual total assets plus one. We introduced the interaction terms $\text{GreenLoan} \times \text{FC}$, $\text{GreenLoan} \times \text{Soe}$, and $\text{GreenLoan} \times \text{Size}$ into model 1. The coefficient of $\text{GreenLoan} \times \text{FC}$, shown in Table 8 column 1, is 0.5335, significant at the 10% level, meaning that the influence of green loans on green innovations is more pronounced in companies with higher financial constraints. The coefficient of $\text{GreenLoan} \times \text{Soe}$ in column 2 is 0.0882 but is not significant, indicating that there is no difference in the effect of green loans on green innovations for SOEs and non-SOEs. The coefficient of $\text{GreenLoan} \times \text{Size}$ in column 3 is 0.0963 and is significant at the 1% level, indicating that green loans have a stronger effect on promoting green innovations in large-scale enterprises. In summary, the test results regarding whether financial constraints are a mechanism via which green loans influence green innovations are inconsistent. In conclusion, these results suggest that financial constraints, albeit a mechanism via which green loans influence green innovations, cannot fully explain the whole story. If financial constraints were the only mechanism, then, theoretically speaking, the promoting effect of green loans on the green innovations of enterprises should be stronger in non-SOEs as well as in small-scale enterprises. Clearly, we can see that financial constraints do not explain the entire story. This may be because loans by Equator Principles banks to enterprises are mainly facilitated through a scrutiny of the enterprises' projects. This scrutiny mechanism of projects eliminates the credit bias of financial institutions toward non-SOEs and small-scale enterprises, which is conducive to a more neutral credit flow.

Table 8. Mechanism analysis of green loans on green innovations.

Dependent Variable	GreenInnovation	GreenInnovation	GreenInnovation	GreenInnovation	GreenInnovation
	Panel A: Mechanism of Financing Constraint			Panel B: Mechanism of Governance Effect	
	(1)	(2)	(3)	(4)	(5)
GreenLoan × FC	0.5335 * (0.2703)				
GreenLoan × Soe		0.0882 (0.1362)			
GreenLoan × Size			0.0963 *** (0.0220)		
GreenLoan × EnviroPenalty				−0.0939 ** (0.0352)	
GreenLoan × EnviroCourt					−0.1402 ** (0.0453)
GreenLoan	−0.5997 (0.3492)	0.0541 (0.1221)	−2.0943 *** (0.4955)	0.9090 ** (0.3091)	0.1209 ** (0.0499)
FC	−0.8951 *** (0.2720)				
Soe		0.0791 (0.0502)			
Size			0.0288 ** (0.0125)		
EnviroPenalty				0.0210 * (0.0100)	
EnviroCourt					0.1152 (0.0742)
Inst	−0.0570 ** (0.0185)	−0.0525 ** (0.0177)	−0.0541 ** (0.0179)	−0.0550 ** (0.0174)	−0.0524 ** (0.0177)
Dual	0.0235 * (0.0124)	0.0229 * (0.0124)	0.0235 * (0.0124)	0.0236 * (0.0126)	0.0233 * (0.0124)
Mtb	0.0202 (0.0274)	−0.0440 (0.0503)	0.0153 (0.0275)	0.0188 (0.0280)	0.0184 (0.0273)
Cash	−0.0493 (0.0295)	−0.0436 (0.0285)	−0.0400 (0.0285)	−0.0433 (0.0283)	−0.0441 (0.0285)
Tbq	0.0436 ** (0.0158)	0.0343 * (0.0155)	0.0295 * (0.0146)	0.0344 ** (0.0154)	0.0347 ** (0.0155)
Ind	−0.0412 (0.0704)	−0.0360 (0.0709)	−0.0299 (0.0715)	−0.0489 (0.0716)	−0.0408 (0.0709)
Share	−0.0559 (0.0457)	−0.0453 (0.0471)	−0.0442 (0.0470)	−0.0509 (0.0470)	−0.0484 (0.0473)
Firm-FE	Yes	Yes	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes	Yes	Yes
Prov-FE	Yes	Yes	Yes	Yes	Yes
_cons	1.3939 *** (0.3580)	0.2176 *** (0.0434)	−0.4017 (0.2914)	0.0528 (0.0883)	0.2164 *** (0.0446)
Obs.	22,799	22,799	22,799	22,659	22,799
R-squared	0.6975	0.6972	0.6974	0.6981	0.6972

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

To verify the green governance effect of Equator Principles banks, we set the dummy variables EnviroPenalty and EnviroCourt. When the environmental regulation intensity of the province to which the enterprise belongs is high (greater than the provincial average in China), the value of EnviroPenalty is 1; otherwise, it is 0. If there is an environmental court in the province where the enterprise is established, the value of EnviroCourt is 1; otherwise, the value is 0. We introduced the interaction terms GreenLoan × EnviroPenalty and GreenLoan × EnviroCourt into model 1, as shown in Table 8. The coefficient

of $\text{GreenLoan} \times \text{EnviroPenalty}$ in column 4 is -0.0939 , which is statistically significant at the 5% level. This indicates that green loans have a more significant effect on green innovations for enterprises in provinces with less environmental penalties. The coefficient of $\text{GreenLoan} \times \text{EnviroCourt}$ is -0.1402 , significant at the 5% level, indicating that Equator Principles banks have a more significant influence on green innovations for enterprises in provinces without environmental courts. In summary, the above results verify the mechanism of the green governance effect of Equator Principles banks. When the environmental regulation where an enterprise is located is relatively weak, Equator Principles banks can exert the green governance effect to improve the green innovations of debt enterprises. This is because, when Equator Principles banks provide project financing to enterprises, they scrutinize, review, and supervise specific projects to ensure that the enterprises observe their loan contract commitments regarding the environment. As an enterprise stakeholder, Equator Principles banks urge enterprises to carry out green innovations, thus forming a natural environmental regulation force. This green governance effect is a substitute for formal government environmental regulations.

4.4. Heterogeneity Effects

To further clarify the function boundary of green loans, in this section, we test if the positive relationship between green loans and enterprises' green innovations is influenced by industry type, industry competition, and the education of executives.

4.4.1. Industry Type

To examine if the relationship between green loans and green innovations is affected by industry type, we set IndustryPollution as a zero/one variable: 1 for heavily polluting industries (the classification method of heavily polluting industries refers to Cai et al. [90], and 0 otherwise. We conducted heterogeneity analysis by including the interaction variable of $\text{GreenLoan} \times \text{IndustryPollution}$, as illustrated in column 1 in Table 9; the coefficient of $\text{GreenLoan} \times \text{IndustryPollution}$ is 0.3106, significant at the 10% level. We believe that green loans have a greater incentive effect on the green innovations of firms that belong to heavily polluting industries. The application of the Equator Principles is only limited by the condition of project financing, not by the industry. Whether it is a heavily polluting industry or a clean industry, as long as the financing project meets the environmental and social standards, there is an opportunity to obtain loans from Equator Principles banks. As opposed to green credit policies, which restrict loans to firms in heavily polluting industries [91], the significance of the Equator Principles is that they aim to improve the environment by clarifying and concretizing vague environmental and social criteria in project financing, not rejecting all polluting industries. Therefore, new loans to enterprises from Equator Principles banks contribute to the upgrading of polluting industries.

4.4.2. Industry Competition

Financial markets are often in turmoil; firms are inclined to look for competitive advantages in taking on social responsibility and pursuing environmental performance in more competitive industries [92–95], and are more likely to pursue green innovations. To examine if the relationship between green loans and green innovations is affected by industry competition, we set $\text{IndustryCompetition}$ as equal to 1 if the corporation is in a high-competition industry (Herfindahl–Hirschman Index is lower than the sample median), and 0 otherwise. In the regression result of column 2 in Table 9, the coefficient of $\text{GreenLoan} \times \text{IndustryCompetition}$ is 0.2757, significant at the 10% level. We, thus, believe that green loans have a greater incentive effect on the green innovations of firms in industries with higher competition.

Table 9. Heterogeneity effects of green loans on green innovations.

Dependent Variable	GreenInnovation	GreenInnovation	GreenInnovation
	(1)	(2)	(3)
GreenLoan \times IndustryPollution	0.3106 ** (0.1166)		
GreenLoan \times IndustryCompetition		0.2757 * (0.1346)	
GreenLoan \times ExecutiveEducation			0.1668 * (0.0906)
GreenLoan	0.0463 (0.0559)	−0.0018 (0.0468)	−0.0013 (0.0280)
IndustryPollution	0.0252 (0.0184)		
IndustryCompetition		0.0383 ** (0.0153)	
ExecutiveEducation			0.0008 (0.0100)
Inst	−0.0521 ** (0.0177)	−0.0508 ** (0.0176)	−0.0526 ** (0.0177)
Dual	0.0233 * (0.0124)	0.0235 * (0.0124)	0.0231 * (0.0125)
Mtb	0.0178 (0.0276)	0.0172 (0.0273)	0.0181 (0.0274)
Cash	−0.0432 (0.0284)	−0.0442 (0.0285)	−0.0437 (0.0284)
Tbq	0.0349 ** (0.0155)	0.0317 * (0.0151)	0.0347 ** (0.0155)
Ind	−0.0404 (0.0709)	−0.0418 (0.0714)	−0.0402 (0.0709)
Share	−0.0475 (0.0473)	−0.0486 (0.0475)	−0.0478 (0.0474)
Firm-FE	Yes	Yes	Yes
Year-FE	Yes	Yes	Yes
Prov-FE	Yes	Yes	Yes
_cons	0.2193 *** (0.0440)	0.2116 *** (0.0456)	0.2251 *** (0.0444)
Obs.	22,799	22,799	22,799
R-squared	0.6972	0.6975	0.6972

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Both firm- and year-level robust standard errors are clustered.

4.4.3. Education of Executives

Previous studies have shown that the characteristics of executives can affect corporate governance decisions, including executive gender [82,96], political connections [72,83], compensation, independent directors [97,98], and auditors [87]. Moreover, the educational background or academic experience of corporate executives determines the social performance awareness of corporate decision-making. The Equator Principles represent a relatively advanced governance method, and its implementation effect largely depends on the understanding and compliance of the policy by micro-subjects. Generally speaking, educational background is a reflection of ability to a certain extent. A higher education level of corporate executives reflects a greater likelihood of them being inclined to assume social responsibilities [99]. To examine if the relationship between green loans and green innovations is influenced by the education of the executives, we set ExecutiveEducation as a zero/one dummy variable: 1 for companies with doctoral degree executives, 0 otherwise. In column 3 in Table 9, the estimated coefficient of GreenLoan \times ExecutiveEducation is 0.1668, significant at the 10% level, meaning that green loans have a greater incentive effect on the green innovations of firms that have executives with a PhD.

5. Conclusions and Suggestions

As environmental protection has become increasingly important worldwide, various countries have adopted different policy and procedure measures to improve environmental quality and energy efficiency. Green innovation, as a key factor in environmental governance, is vitally important. In both the academic and the practical worlds, green innovation is highly regarded for its driving factors. It has been established in the literature that environmental regulations can be a tool to encourage enterprises to be involved in green innovations [100]. However, some scholars contend that environmental regulations that are too strict are now a barrier to economic development. Given that financial institutions directly affect a firm's access to capital, we used China's "Equator Principles bank" loans as a unique scenario and explored how green loans affect the green innovations of firms. We used the stakeholder theory framework as a basis to analyze firms listed on the A-share market in China from 2008 to 2018, coming to the below conclusions.

First, new loans from Equator Principles banks to enterprises significantly contributed to the green innovations of enterprises. This evidence indicates the power of stakeholders who implement green management effectively, driving the green innovation intentions of affiliated enterprises.

Second, financial constraints do not tell the whole story regarding financial institution involvement in the environmental governance of debt companies. Scrutiny of corporate financing projects by Equator Principles banks contributes to the promotion of corporate green innovations through green governance effects, and it is a substitute for formal government environmental regulation. This finding suggests that powerful stakeholders should pay more attention to, and be involved in, the project decisions of affiliated companies.

Third, the green innovations of enterprises in heavily polluting industries have increased significantly, and these enterprises faced more financial constraints after the issuance of the green guidance policy. Considering this evidence, compared with a one-size-fits-all policy, stakeholder engagement can help companies achieve a green transition.

Fourth, there has been a significant increase in green innovations by firms managed by senior executives with higher education. On the basis of these findings, it seems that green innovations need to be strengthened in terms of environmental awareness education.

Fifth, firms in competitive industries significantly promote green innovations as they are inclined to strive to obtain a competitive advantage through green development.

6. Research Limitation and Future Research

Despite exploring some new findings on Equator Principles banks' impact on green innovation, the sample was limited to Chinese firms. Due to the differences in financial market structures, institutional environments, etc. between countries, other countries may not be able to apply these findings directly. In the future, data from other countries can provide scholars, business managers, and policymakers with new ideas regarding environmental governance and green innovation.

Future research should consider the potential effects on debt companies' environmental performance of Equator Principles. Although green innovation is of great significance to sustainable development, other types of companies' environmental performance are also vital in sustainable development, such as green merge and green investment. Meanwhile, future construct quasi-experimental designs may be helpful for an even more detailed examination of the casual relationship between Equator Principles financial institutions and debt companies' environmental performance.

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