The Impact of Provincial Governments' Focus on Green Development on Green Bond Credit Spreads

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Abstract. This study examines whether provincial governments' attention to green development is reflected in the credit-risk pricing of green bonds. The sample covers 2,658 Chinese green bonds issued from 2016 to 2024. Using provincial government work reports from the Chinese Research Data Services (CNRDS) database, we construct an attention index with the entropy-weight method. The index covers environmental protection and improvement, pollution control, resource conservation, collaborative governance, ecological-civilization construction, and sustainable development. Year and industry fixed-effects estimates show that stronger government attention is associated with narrower green bond credit spreads. Green innovation and environmental penalties are two possible transmission channels. Environmental-governance investment strengthens the negative association, whereas greater local government financing vehicle (LGFV) bond issuance weakens it.

Keywords: Government attention to green development; green bonds; credit spreads; green innovation; environmental governance.

1 Introduction

Green bonds channel funds into environmentally beneficial projects. Their credit spreads capture default and liquidity risk, as well as investors' assessments of environmental performance and greenwashing. Dorfleitner et al. found that second-party opinions and external verification lower yields; investors responded more favorably to more detailed green assessments [1]. Arat et al. reported that the yield advantage of green bonds over conventional bonds widened during the pandemic, suggesting greater resilience [2].

Certification quality and green risk also affect pricing. Experimental evidence from Colasante et al. shows that credible certification can make investors willing to accept lower yields and can limit the fall in demand caused by greenwashing [3]. Bertelli et al. find a small but significant price for green risk that varies across macroeconomic sectors and stages of market development [4].

Local governments allocate resources to environmental regulation, public spending, and project supervision. Their priorities may therefore affect the risk of green projects. Previous studies have examined certification, green premiums, and corporate environmental performance. Much less is known about whether local government attention

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enters the primary-market pricing of green bonds. We match provincial government work reports to green bond issues from 2016 to 2024. The analysis considers green innovation and environmental penalties as possible channels, and governance investment and debt pressure as boundary conditions [5].

2 Research Hypotheses

H1: Greater provincial-government attention to green development is associated with lower green bond credit spreads.

H2a: Provincial-government attention to green development is associated with lower green bond credit spreads through a higher level of regional green innovation.

H2b: Provincial-government attention to green development is associated with lower green bond credit spreads through stronger environmental penalties.

H3a: Environmental-governance investment strengthens the negative association between provincial-government attention to green development and green bond credit spreads.

H3b: Greater LGFV bond issuance weakens the negative association between provincial-government attention to green development and green bond credit spreads.

3 Research Design

3.1 Sample Selection and Data Sources

The sample contains green bonds issued in China between 2016 and 2024. Bond characteristics come from Wind, and government-bond yields come from the website of the National Financial Regulatory Administration. CNRDS supplies provincial attention, green-patent, and environmental-penalty data. Regional economic indicators, consumption measures, and environmental-governance investment are from the National Bureau of Statistics. Province-level LGFV bond issuance is compiled from the RESSET database.

We exclude observations with missing key variables and bonds issued by overseas firms or denominated in foreign currencies. The final sample contains 2,658 observations. Continuous variables are winsorized at the 1st and 99th percentiles. Bond-level controls include issue size, cross-market status, perpetual-bond status, embedded options, maturity, and credit rating. Province-level controls include GDP, per capita income, the financial industry's share of output, and the consumer price index.

3.2 Variable Measurement

The dependent variable is the green bond credit spread. It equals the bond's coupon rate minus the yield on a government bond with the same maturity. When no published government-bond maturity matches exactly, we use linear interpolation to obtain the corresponding yield. This measure removes differences in the term structure and makes risk compensation comparable across maturities (Table 1).

The main explanatory variable is provincial-government attention to green development. The CNRDS Environmental Attention Database counts keywords in provincial government work reports across six dimensions. They are environmental protection and improvement, pollution prevention and control, resource conservation, coordinated development and environmental co-governance, ecological-civilization construction, and sustainable economic and social development. We standardize each dimension by year, use its dispersion to obtain an entropy weight, and then calculate the weighted sum. The weights range from 0.1665 to 0.1671, so the six dimensions contribute almost equally [6].

Table 1. Descriptive Statistics for the Main Variables.

Variable	Mean	Median	Standard deviation	Maximum value	Minimum value	Sample size
Spread	0.592	0.316	0.742	4.021	0.047	2,658
Concern	0.331	0.353	0.100	0.574	0.101	2,658
Innovation	88.589	90.940	40.577	200.280	5.420	2,658
Punishment	2.325	0.406	7.405	61.200	0.000	2,658
Invest	11.685	12.076	1.456	13.769	0.000	2,658
Number	459.433	326.000	476.169	2,725.000	2.000	2,658

3.3 Model Specification

The baseline specification includes year and industry fixed effects. In Eq. (1), the subscripts identify the bond, province, year, and industry, respectively. The control vector contains bond- and province-level covariates, and heteroskedasticity-robust standard errors are reported [7].

$$Spread_{ipt} = \alpha + \beta Concern_{pt} + \gamma' Controls_{ipt} + \mu_t + \lambda_j + \varepsilon_{ipt} \quad (1)$$

The mechanism analysis proceeds in three steps: estimate the total association with the spread, estimate the mediator equation, and then add the mediator to the spread equation. These regressions provide evidence consistent with the proposed channels, but they do not identify structural causal mediation. For the moderation analysis, both the attention variable and the relevant moderator are centered before the product term is formed, as shown in Eq. (2) [8].

$$Interaction_{pt} = (Concern_{pt} - \overline{Concern})(Mod_{pt} - \overline{Mod}) \quad (2)$$

4 Empirical Results

4.1 Benchmark Regression

Table 2 reports three specifications: no controls, bond-level controls, and the full set of bond- and province-level controls. The coefficient on Concern is negative throughout (−0.379, −0.185, and −0.307). In the full specification, it is significant at the 1% level,

and model fit rises from 0.513 to 0.691. These results support H1. With Spread measured in percentage points, a one-standard-deviation increase in Concern (0.100) is associated with a reduction of about 0.0307 percentage points, or 3.07 basis points. The finding suggests that investors use regional governance information alongside bond terms and issuer ratings. Attention expressed in government work reports is most likely to be credible when it is backed by regulatory continuity and enforcement.

Table 2. Baseline Regression Results.

Variable	(1)	(2)	(3)
Concern	−0.379*** (0.107)	−0.185** (0.088)	−0.307*** (0.101)
Size		−0.042*** (0.007)	−0.035*** (0.007)
Market		−0.161*** (0.033)	−0.195*** (0.033)
Perpetual		−0.019 (0.074)	−0.063 (0.073)
Option		0.265*** (0.026)	0.305*** (0.026)
Maturity		−0.003** (0.001)	−0.004*** (0.001)
Rating		−0.864*** (0.028)	−0.845*** (0.028)
GDP			0.031 (0.021)
Income			−0.294*** (0.068)
Finance			0.497 (0.633)
CPI			−0.138*** (0.032)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Sample size	2,658	2,658	2,658
R^2	0.513	0.682	0.691

Note: Standard errors in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

4.2 Mechanisms and Moderating Effects

Table 3 reports the two proposed channels. In column (2), the coefficient on Concern in the Innovation regression is 53.144 and significant at 1%. When Innovation is added to the spread regression in column (3), its coefficient is −0.001, while Concern remains significantly negative. This pattern is consistent with partial mediation. Stronger policy attention can encourage green innovation through clearer rules and guidance. Innovation, in turn, may improve project quality, energy efficiency, and long-term operating prospects. The evidence therefore supports H2a, subject to the noncausal interpretation noted above.

The penalty results show a similar pattern. In column (4), the coefficient on Concern in the Punishment regression is 30.330 and significant at 1%. In column (5), the coefficient on Punishment is −0.002 and significant at 10%, while Concern remains significantly negative. Stronger penalties raise the cost of violations and reveal the intensity of policy enforcement. Both mechanisms may reduce uncertainty around green projects, which is consistent with H2b. Because penalty amounts are highly right-skewed

and the coefficient is only weakly significant, its economic interpretation should remain cautious.

Table 3. Tests of Mediating Channels.

Variable	(1) Spread	(2) Innovation	(3) Spread	(4) Punishment	(5) Spread
Concern	−0.307***	53.144***	−0.230**	30.330***	−0.236**
	(0.101)	(4.570)	(0.103)	(1.491)	(0.109)
Innovation			−0.001***		
			(0.000)		
Punishment					−0.002*
					(0.001)
Control variables	Yes	Yes	Yes	Yes	Yes
Year/Industry Fixed effects	Yes	Yes	Yes	Yes	Yes
Sample size	2,658	2,658	2,658	2,658	2,658
R^2	0.691	0.788	0.693	0.327	0.692

Note: Standard errors in parentheses; ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 4 reports the models based on centered variables. The coefficient on the interaction between centered environmental-governance investment and centered attention is −0.144 and significant at 1%. This result indicates that governance investment strengthens the negative association, supporting H3a. The interaction between centered LGFV bond issuance and centered attention is positive (0.001) and significant at 1%. Thus, heavier local debt issuance weakens the favorable attention signal, supporting H3b. As centering is a linear reparameterization, the interaction coefficients, standard errors, fitted values, and model fit are unchanged. The lower-order coefficients are not interpreted because their values depend on the chosen origin.

Table 4. Moderating-Effect Tests with Mean-Centered Variables.

Variable	(1) Baseline	(2) Governance investment	(3) LGFV issuance
$Concern^c$	−0.307*** (0.101)	Included	Included
$Invest^c \times Concern^c$		−0.144*** (0.053)	
$Invest^c$		Included	
$Number^c \times Concern^c$			0.001*** (0.000)
$Number^c$			Included
Control variables	Yes	Yes	Yes
Year/Industry Fixed effects	Yes	Yes	Yes
Sample size	2,658	2,658	2,658
R^2	0.691	0.693	0.693

5 Conclusions

Using a sample of 2,658 green bonds issued between 2016 and 2024, we find a negative association between provincial-level government attention to green development and green bond credit spreads: higher government attention is linked to lower credit spreads. Green innovation and environmental penalties serve as two underlying transmission channels. Environmental-governance investment strengthens this baseline relationship, while higher LGFV bond issuance partially offsets the main effect.

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