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| RESEARCH ARTICLE

ESG and Commercial Credit Financing: Based on Government Subsidies and Polluted Areas

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| ABSTRACT

This paper investigates whether and how firms' Environmental, Social and Governance (ESG) performance affects commercial credit financing (SCF) in the context of Chinese listed companies. Using panel data on A-share firms and ESG ratings, this study constructs a comprehensive measure of SCF based on supplier-provided trade credit and estimate fixed-effects models. The results show that ESG performance is positively and significantly associated with SCF. Further analysis reveals pronounced heterogeneity: ESG enhances SCF only in non-heavily polluting industries and among firms receiving government subsidies, while the effect is insignificant for heavily polluting and non-subsidised firms. These findings suggest that ESG operates as a credible financing signal when it reflects voluntary engagement. The results imply that firms can treat ESG as part of their financing strategy and use it to improve access to supplier credit. Suppliers can also incorporate ESG indicators into credit-risk assessment. Policymakers may strengthen ESG disclosure rules and subsidy design to support more efficient, sustainability-oriented supply-chain finance.

| KEYWORDS

ESG, commercial credit financing, government subsidy

| ARTICLE INFORMATION

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1. Introduction

Global economic and business strategies are increasingly centred on the transition to green and sustainable development. In light of the challenges posed by climate change and social inequality, Environmental, Social, and Governance (ESG) performance has become an essential non-financial criterion for evaluating a company's long-term sustainability and robustness. Reflecting commitments to environmental responsibility, social duty, and superior governance, ESG criteria are becoming deeply embedded in investment decision-making, regulatory frameworks, and stakeholder evaluations (El Ghoul et al., 2011).

China's push for high-quality growth and carbon neutrality has hastened the institutionalization of ESG practices. However, financing constraints remain acute for many private-sector and medium-sized firms. As a result, trade credit serves as a vital substitute for bank debt. Through instruments like accounts payable and commercial notes, these enterprises use supplier financing to preserve liquidity and support continuous operations.

Although extensive literature indicates that enhanced ESG performance diminishes the cost of bank loans, bonds, and equity by mitigating information asymmetry and perceived risk, there is significantly less understanding of the impact of ESG on commercial credit (Gross & Robert, 2011; Chava, 2014). Current research predominantly emphasizes formal capital markets or individual ESG characteristics, neglecting the economically substantial financing avenue of trade credit. Furthermore, the methods and boundary conditions that determine whether ESG promotes or hinders trade credit are inadequately defined.
This research investigates the impact of ESG performance on commercial credit financing for Chinese listed companies, and if this relationship is influenced by industrial pollution intensity and government subsidies. This study broadens the ESG-finance

literature by concentrating on a significant emerging market and supplier-provided credit, offering new insights into the financial implications of ESG within supply-chain financing.

The subsequent sections of the paper are structured as follows. Section 2 examines the pertinent literature and formulates the research hypothesis. Section 3 delineates the data, variables, and empirical framework. Section 4 presents the foundational results, robustness test, and endogeneity test. Section 5 discuss the heterogeneity analysis. Section 6 summarize the findings from the empirical results and provide suggestions for related groups.

2. Literature review and research hypotheses

2.1 Literature review

Existing ESG literature has originated from the concept corporate social responsibility (CSR) and stakeholder theory. Empirical evidence suggests that better ESG/CSR can decrease the cost of equity and therefore improve access to capital financing (Chava, 2014). Krüger [4] also confirms that firm value can be improved with better ESG by lowering information asymmetry and risk. Moreover, a study reveals that ESG disclosure is also shown to improve transparency and investor protection, thereby mitigating agency problems and increasing valuation (Dhaliwal ,2014).

Commercial credit financing is a core element of firms' capital structure, particularly when bank lending is imperfect or costly. Suppliers often act as quasi-financial intermediaries by providing goods and services on account, thereby easing customers' liquidity constraints and stabilising production (Petersen & Rajan, 1997). Recent work links this trade-credit channel to ESG performance. Huang et al. (2023) provide early evidence for Chinese A-share firms and document a robust positive association between ESG scores and commercial credit financing, viewing ESG-driven CCF as part of the broader informal financing system. Luo et al. (2023) demonstrate that ESG ratings enhance trade credit by mitigating information asymmetry, augmenting operational efficiency, and diminishing business risk. Yang et al. (2025) further find that ESG enhances CCF through better information transparency, more diversified suppliers and reduced operational risk. Finally, Han and Wu (2024) demonstrate that business credit acquisition not only responds to ESG performance but also mediates the positive effect of ESG on firm value, highlighting trade credit as a key transmission channel.

Despite this rapid progress, several gaps remain. First, the ESG–commercial credit literature is still relatively young compared with the extensive research on ESG and bank or capital-market financing. Most existing studies focus on China as an emerging market with imperfect legal and financial systems, which raises the question of how generalizable these findings are to other institutional contexts. Second, although existing work has identified core mechanisms such as information asymmetry, efficiency, and risk, the role of institutional factors such as government subsidies has not been studied on a large scale. Third, ESG seems more informative in non-heavily polluting industries where ESG engagement is more voluntary and less compliance-driven. However, the underlying reasons and boundary conditions are not yet fully understood (Chen et al., 2025; Li et al., 2025).

2.1 Research hypotheses

From the perspectives of information asymmetry, signalling theory and stakeholder theory, firms with stronger ESG performance are more transparent and better controlled. They display a clearer long-term orientation and accumulate reputational capital with key stakeholders, including suppliers. As a result, suppliers perceive lower default risk and have more confidence in these firms' willingness and ability to honour trade credit. Consequently, ESG-leading firms are expected to obtain a higher level of commercial credit from their suppliers. Thus, the hypothesis is given as follows:

H1: Better corporate ESG performance positively impacts commercial credit financing.

Second, the ESG–SCF relationship is unlikely to be the same across industries. In heavily polluting sectors, ESG activities are mainly driven by mandatory regulation. In non-heavily polluting sectors, ESG engagement is more voluntary and differentiated. Firms that invest more in ESG send a stronger signal of quality, risk management and commitment to sustainable development. Suppliers are therefore more likely to treat ESG as a credible signal and adjust credit terms, so the positive effect of ESG on SCF should be stronger in non-heavily polluting industries. Thus, the hypothesis is given as follows:

H2: The positive effect of ESG performance on commercial credit financing is stronger in non-heavily polluting industries than in heavily polluting industries.

Third, government subsidies play a distinctive role in China. Subsidies do not only provide direct financial support; they also act as a form of certification. Receiving subsidies signals that a firm has been screened and recognised by the government for innovation capability, strategic importance or regulatory compliance. When such public support coincides with strong ESG performance, the two signals reinforce each other. For suppliers, ESG performance backed by subsidies is more likely to be seen

as substantive, credible and sustainable rather than symbolic. This "double signalling" effect strengthens the extent to which ESG relaxes credit constraints and increases commercial credit. By contrast, for firms without subsidies, ESG may appear less credible or less well-resourced and therefore has a weaker influence on suppliers' credit decisions. Thus, the hypothesis is given as follows:

H3: The favourable influence of ESG on commercial credit financing is more pronounced for companies that benefit from government subsidies compared to those that do not receive such support.

3. Data and Research Design

This paper use China's A-share listed companies between 2013 and 2022 as sample data. Corporate ESG rating data primarily originates from Sino-Security Information Service, while other data sources include the CSMAR database and Wind database. To enhance result stability, data cleansing procedure is listed as follow: (1) excluding ST, ST* samples; (2) excluding financial sector companies; (3) removing missing data values (4) to avoid extreme values, all continuous variables are winsorized at 1% and 99% quantiles to avoid extreme values.

3.1 Variable description

3.1.1 Dependent variable

Commercial credit financing primarily encompasses accounts payable and notes payable. This study uses the ratio of net commercial credit financing to year-end total assets as the proxy variable for commercial credit financing (SCF). The calculation is given as below:

$$SCF = \frac{Net}{Total\ Assest}$$

Where Net is calculated as:

$$Net\ = (accountspayable + notespayable + advances) - (\text{accounts receivable } + \text{notes receivable } + \text{advances})$$

3.1.2 Independent variable

The independent variable in this paper is corporate ESG performance. Given the insufficient coverage of ESG-related information disclosure in China's capital markets, this study adopts the Sino ESG rating system to calculate firms' ESG performance. Sino constructs an evaluation system across three dimensions: Environmental (E), Social (S), and Governance (G), each comprising multiple sub-indicators. After standardizing each indicator, different weights are assigned. A composite score is calculated through weighted aggregation. Stocks are screened based on this score to determine index weights, ultimately forming the Sino ESG Index. The Sino ESG rating assigns nine tiers from "AAA" to "C," with AAA being the highest and C the lowest. This paper assigns values from 1 to 9 to each rating from C to AAA.

3.1.3 Control variables

A comprehensive set of firm characteristics variables is included in the model in order to increase the accuracy of the regression results and reduce the issue of omitted variable bias. This research categorizes these controls into three dimensions, including (1) structural variables like firm size (size) and firm age (age); (2) financial health such as leverage (lev), operating cash flow (cashflow), collateral capability (collateral) and operating capability (opc); (3) corporate governance such as ownership concentration (own) and board independence (independence).

To empirically test the hypothesis, the regression mode is constructed as follows:

$$SCF_{i,t} = \beta_0 + \beta_1 esg_{i,t} + \beta_n Controls_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (1)$$

Where $SCF_{i,t}$ denotes the commercial credit financing of firm i in year t and $esg_{i,t}$ represents the firm's ESG level. The term $Controls_{i,t}$ reflect control variables. This research also includes industry effect and year effect to absorb time-specific shocks and time-invariant industry heterogeneity, respectively.

4. Empirical results and Discussion

4.1 Descriptive statistics

Table 1 displays the descriptive statistics for the main variables. The sample contains 13,826 firm–year observations. The dependent variable, SCF has a mean of −0.005 and a standard deviation of 0.124, ranging from −0.313 to 0.370, indicating that

SCF is centred slightly below zero and exhibits moderate cross-sectional dispersion. The core explanatory variable, ESG, has a mean score of 4.224 (SD = 1.094), with values between 1 and 8 and a median of 4, suggesting substantial variation in firms' ESG performance.

Table 1. Summary Statistics

VarName	Obs	Mean	SD	Min	Median	Max
SCF	13826	-0.005	0.124	-0.313	-0.006	0.370
esg	13826	4.224	1.094	1.000	4.000	8.000
size	13826	22.625	1.317	20.272	22.427	26.640
lev	13826	0.430	0.194	0.061	0.424	0.852
opc	13826	0.900	0.371	-1.597	0.990	1.651
age	13826	2.984	0.308	2.079	3.045	3.664
own	13826	33.561	15.013	8.020	31.220	73.980
cashflow	13826	0.052	0.063	-0.124	0.049	0.237
collateral	13826	0.216	0.162	0.002	0.183	0.698
independence	13826	0.381	0.066	0.250	0.364	0.600

4.2 Main results

The results of baseline models are shown in Table 2. It is found that ESG performance exhibits a positive relationship with SCF at the 1% level across all three models. In Columns (1) and (2), the estimated coefficient is 0.005. When year effect and industry effect are incorporated in the model, the coefficient retains a positive value. The above results indicate that the ESG and SCF relationship possesses both economic significance and resilience. The baseline regressions provide robust support for the hypothesis that superior ESG performance increases companies' access to commercial credit financing.

Table 2. Baseline Model Regression

	(1)	(2)	(3)
VARIABLES	SCF	SCF	SCF
esg	0.005***	0.005***	0.002***
	(5.71)	(6.01)	(2.68)
size		0.006***	0.004***
		(6.76)	(4.35)
lev		0.220***	0.160***
		(34.74)	(24.76)
opc		0.002	0.002
		(0.65)	(0.71)
age		0.035***	0.028***
		(11.13)	(8.16)
own		0.001***	0.001***
		(16.98)	(9.22)
cashflow		0.290***	0.299***
		(16.33)	(18.11)
collateral		0.003	0.071***
		(0.46)	(10.10)
independence		-0.032**	-0.031**
		(-2.29)	(-2.32)
Constant	-0.025***	-0.410***	-0.302***
	(-6.69)	(-20.21)	(-13.01)
Observations	13,826	13,826	13,826
R-squared	0.270	0.217	0.362
Industry Year	YES	NO	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3 Robustness Checks

Table 3 reports the robustness checks of the baseline results. The first robustness check chooses to exclude pandemic years and the results are shown in Table 3, column 1. The effect of esg on SCF remains positive and statistically significant at the 5% level. This indicates that the positive association between ESG and commercial credit financing is not driven by the special period that was removed from the sample. Additionally, column (2) replaces the ESG with its one-period lag, L.esg**.** Same results are found and significant at the 1%, implying that companies' past ESG efforts exert a positive impact on current commercial credit financing. Overall, these robustness tests confirm that the main finding, better ESG facilitates firms' access to commercial credit financing.

Table 3. Robustness Checks

	(1)	(2)
VARIABLES	SCF	SCF
esg	0.002**	
	(2.10)	
L.esg		0.003***
		(3.07)
Constant	-0.202***	-0.217***
	(-14.54)	(-16.56)
Control Variables	YES	YES
Observations	9,931	12,769
R-squared	0.415	0.350
Industry Year	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.4 Endogeneity Test

This research uses two-stage least squares (2SLS) to enhance the accuracy and reliability of regression results and reduce potential endogeneity issues. The number of company stocks held by ESG investment funds (sesg) is employed as an instrumental variable measuring corporate ESG performance. As typical institutional investors, fund companies typically possess characteristics such as substantial investment capital and strong information collection and analysis capabilities. Moreover, institutional investors have the capacity to participate in corporate governance, exert positive influence on corporate decision-making, and thereby drive significant improvements in corporate performance. Additionally, ESG investment funds generally treat ESG principles as key reference criteria for investment or participation in corporate governance. Therefore, companies whose shares are held by ESG investment funds often see improvements in their ESG performance.

Referring to table 4, the instrumental variable sesg is strongly and positively associated with ESG. Specifically, the coefficient is 0.002 and significant at the 1% level. This indicates that the instrument has substantial explanatory power for firms' ESG performance and satisfies the relevance condition. In the second stage (Column 2), where SCF is regressed on the fitted value of ESG from the first stage, the coefficient on ESG is 0.016 with a t-statistic of 4.27. Overall, the results confirm that the positive relationship is not driven by endogeneity concerns.

Table 4. Results of Endogeneity test

	(1)	(2)
	First Stage	Second Stage
VARIABLES	esg	SCF
sesg	0.002***	
	(10.40)	
esg		0.016***
		(4.27)
Control Variables	YES	YES
Observations	13,826	13,826
R-squared		0.113

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5. Further analysis

In light of increasing global climate change, environmental protection has emerged as a fundamental issue of international concern. Currently, investors are increasingly examining corporate environmental consciousness, commonly believing that corporations exhibiting environmental stewardship indicate a dedication to stakeholder concerns beyond mere self-interest. The ESG framework intrinsically prioritizes environmental conservation, resulting in varied investor expectations for ESG performance among environmentally sensitive businesses. This gap may affect the efficacy of business ESG performance in obtaining commercial credit funding. Therefore, this work classifies sample companies into heavily polluting and non-heavily polluting industry groups in accordance with government official guidelines for industry classification.

Table 5 reports the heterogeneity analysis by pollution status. In Column (1), for firms in heavily polluting industries**,** the coefficient of esg is essentially zero and statistically insignificant. Hoewever, Column (2) shows that for firms in non-polluting industries, the coefficient on esg is positive and highly significant (0.005, t = 5.00). Thus, better ESG performance is associated with a higher level of commercial credit financing only among non-polluting firms. Overall, the results reveal clear industry heterogeneity: ESG facilitates access to commercial credit in non-polluting industries, whereas in heavily polluting industries ESG appears not to influence suppliers' credit decisions, consistent with the notion that ESG in these sectors is more compliance-driven and less informative at the margin. IN line with the existing literature, the results indicate that higher ESG performance helps firms obtain more trade credit, which is in line with the findings of Luo et al. (2023) and Chen et al. (2025). Similar patterns are found in previous studies by Li et al. (2025) and Zheng et al. (2025). For heavily polluting industries, prior studies suggest that ESG practices and environmental disclosure are largely a passive response to stringent regulation, with limited information content and a higher likelihood of greenwashing, which in turn weakens the signalling and reputational effects of ESG indicators (Liu et al., 2022).

Table 5 Heterogeneity test (Polluted vs Not Polluted)

	(1)	(2)
	Polluted	Not Polluted
VARIABLES	SCF	SCF
esg	0.000	0.005***
	(0.29)	(5.00)
Constant	-0.188***	-0.225***
	(-9.22)	(-15.25)
Control Variables	YES	YES
Observations	3,613	10,213
R-squared	0.387	0.357
Industry Year	YES	YES

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

According to Table 6, the heterogeneity analysis indicates that the positive impact of ESG performance on SCF is statistically significant solely among companies that receive government subsidies. In Column (1), for enterprises receiving subsidies, the coefficient on ESG is 0.006 and is statistically significant at the 1% level (t = 5.36). In other words, within subsidized firms, superior ESG correlates with increased levels of commercial credit financing. Regarding on column (2), it indicates that for firms without subsidies, the coefficient on ESG is positive yet minor (0.002) and statistically insignificant (t = 1.30), implying that ESG performance does not have a substantial impact on commercial credit financing within this subsample.

In the Chinese context, firms that receive subsidies are often more likely to obtain bank credit and policy-oriented financial support, thereby facing lower overall financing constraints and bankruptcy risk. When such firms also exhibit strong ESG performance, suppliers perceive a combination of policy backing and responsible business conduct. This dual reinforcement strengthens suppliers' confidence in the firm's solvency and going-concern status and makes it rational to allocate more credit in the form of trade credit. In contrast, for firms that do not receive subsidies, suppliers tend to rely more heavily on hard financial indicators such as cash flow, leverage, and collateral to make credit decisions. In this context, ESG acts as a positive signal, but it does not provide a strong 'safety cushion' to encourage suppliers to significantly increase trade credit.

Table 6. Heterogeneity test (Subsidy vs Without Subsidy)

	(1)	(2)
	Subsidy	Without Subsidy
VARIABLES	SCF	SCF
esg	0.006***	0.002
	(5.36)	(1.30)
Constant	-0.211***	-0.213***
	(-12.53)	(-11.65)
Control Variables	YES	YES
Observations	7,012	6,814
R-squared	0.351	0.397
Industry Year	YES	YES

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The heterogeneity analysis indicates that ESG is more significant for commercial credit financing when firms have government subsidies, aligning with the view that subsidies enhance the informational and reputational importance of ESG. Prior studies show that better ESG performance can expand access to trade credit and alleviate financing constraints by mitigating information asymmetry and building reputational capital (Luo et al., 2023; Lian et al., 2025, Sun et al., 2025). In addition, government subsidies convey powerful certification and endorsement signals that enhance creditors' confidence and relax firms' financing constraints (Wu, 2017; Yan & Li, 2018; Li et al., 2021; Sun et al., 2024). Moreover, environmental and ESG-related subsidies have been shown to promote substantive green innovation and improvements in ESG performance resulting in better credibility and persistence of ESG signals (Han et al., 2024; Wang et al., 2024)

6. Conclusion

The empirical analysis shows that better ESG is beneficial to firms' commercial credit financing (SCF). From a theoretical perspective, these findings are consistent with information asymmetry, signalling and stakeholder theories: ESG operates as a non-financial signal that improves transparency, mitigates perceived risk and strengthens stakeholder trust within supply chains. Furthermore, ESG enhances SCF only in non-heavily polluting industries and among subsidised firms, while the effect is insignificant for heavily polluting and non-subsidised firms. This pattern suggests that ESG is more informative and credible when it reflects voluntary engagement and is reinforced by government endorsement, thereby delineating the institutional and industrial boundaries under which ESG functions as an effective financing signal. Relative to the existing literature, this research shifts the focus of ESG–finance research from formal capital markets to supplier-provided commercial credit, a key but often overlooked financing channel. In addition, it brings in industry pollution intensity and government subsidies at the same time, and thus highlights when and where ESG works as an effective financing signal.

Therefore, it is recommended that companies strengthen employees' awareness and dedication to ESG principles through targeted internal training and strategic external collaborations. They should incorporate ESG principles into daily operations and management practices to mitigate environmental degradation at its origin, enhance resource efficiency, emphasize corporate social responsibility, and elevate corporate governance standards. This methodology enables organizations to report ESG information with enhanced confidence, thereby assisting investors in acquiring a more precise comprehension of the company's performance. Furthermore, governments and regulatory authorities hold a crucial responsibility in promoting and incentivizing companies to proactively disclose ESG information. In this case, governments and regulators should gradually improve relevant regulations and frameworks to guarantee the authenticity and dependability of disclosed ESG data. Organizations that withhold ESG information ought to be subject to severe legal penalties.

Despite these contributions, significant limitations remain. The analysis uses data from Chinese listed corporations, which may limit its applicability to other enterprises or institutions. settings. In addition, the study uses composite ESG scores rather than the respective dimension of ESG which might neglect the specific effects from them. Future research could therefore emphasize and examine other countries and ownership structures, analysing the respective effects of E, S and G components, and employing supplier- or transaction-level data to investigate the impact.

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