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Green Credit Policy and Financing Costs in China's New Energy Vehicle Supply Chain

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Abstract. Against the backdrop of China's carbon peaking and carbon neutrality goals, green credit has become an important policy instrument for directing financial resources toward low-carbon industries. This study examines financing-cost patterns among 15 Chinese A-share listed firms in the new energy vehicle (NEV) supply chain from 2015 to 2022. Using 115 firm-year observations, the analysis combines descriptive statistics, period comparison, pooled OLS regression, and two-way fixed-effects estimation. The results show that average financing costs are lower in 2019-2022 than in 2015-2018, but the difference is not statistically significant. In the pooled OLS model, firm size is negatively associated with financing cost, whereas the later-period indicators, profitability, and debt-to-equity ratio, are statistically insignificant. After controlling for firm and year fixed effects, the association between firm size and financing cost weakens substantially, and none of the examined firm characteristics remains statistically significant. These findings highlight the importance of accounting for firm heterogeneity and time effects when examining financing-cost patterns in China's NEV supply chain.

Keywords: green credit, new energy vehicles, financing cost, panel data, China

1. Introduction

China's carbon peaking and carbon neutrality goals have increased the importance of directing financial resources toward low-carbon industries. The Green Credit Guidelines, issued in 2012, encourage financial institutions to incorporate environmental and social risks into lending decisions and to support environmentally beneficial activities [1]. Financing is particularly important for the new energy vehicle (NEV) supply chain, where vehicle manufacturing, batteries, and key components require substantial capital investment. By improving access to credit or lending terms for environmentally responsible firms, green credit may contribute to lower financing costs. However, differences in firms' financial conditions and banks' credit screening may lead to heterogeneous financing outcomes.

Previous studies have examined the effects of green credit on corporate financing. Evidence from Chinese listed firms suggests that green credit can influence both the scale and cost of debt financing, with particularly pronounced effects among heavily polluting enterprises [2, 3]. Research on new energy enterprises has also examined how green credit and government subsidies relate to their bargaining position in the credit market [4]. Nevertheless, firm-level evidence focusing

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specifically on financing-cost patterns within China's NEV supply chain remains relatively limited. Examining this sector may therefore provide additional evidence on how financing costs vary across firms and over time under China's evolving green-finance environment.

This study examines 15 listed Chinese NEV supply-chain firms from 2015 to 2022. It compares financing costs between 2015-2018 and 2019-2022 and estimates pooled OLS and two-way fixed-effects models incorporating firm size, profitability, and debt-to-equity ratio. Average financing costs are lower in the later period, although the difference is not statistically significant. After controlling for firm and year fixed effects, none of the examine firm characteristics remains statistically significant. By focusing on a specific industry chain, this study provides firm-level evidence on financing-cost patterns in China's evolving green-finance environment.

2. Literature review and hypothesis development

2.1. Credit allocation and financing costs

Green credit may influence financing costs by changing how banks allocate loans and assess borrowers. Environmental screening can restrict lending to activities with greater environmental risks, while firms and projects that meet green lending criteria may gain better access to credit or more favorable borrowing terms. Evidence from heavily polluting firms shows that the Green Credit Guidelines have been associated with reduced debt financing and higher financing costs for these firms [3]. This pattern is consistent with a reallocation of credit, but does not imply that every firm in a lower-carbon industry automatically receives cheaper financing. Banks continue to assess financial risk, and firms within the same industry may differ in their eligibility for green credit. Credit financing costs have also been identified as a channel through which green credit policy affects corporate innovation in a separate study of Chinese firms [5].

For new energy enterprises, financing conditions may also depend on their bargaining position relative to banks. Prior research suggests that green credit can indirectly improve this position, while the outcome may vary with other forms of support [4]. These channels provide a plausible basis for expecting more favorable financing conditions for some firms in the NEV supply chain, although their effect on financing costs remains an empirical question.

2.2. Existing evidence and the timing of policy transmission

Studies of Chinese listed companies have examined the relationship between green credit and corporate financing costs, including heterogeneous effects across firms [2]. Policy transmission need not be immediate: banks require time to adjust lending practices, while firms may gradually change their financing and investment decisions. Research on other outcomes illustrates this possibility. Xu et al. [6] find that the effect of the Green Credit Guidelines on environmentally friendly firms' ESG performance becomes apparent only in later years, while Qin and Cao [7] report a delayed carbon-emission response. These studies examine ESG performance and carbon emissions rather than financing costs. They therefore support allowing for adjustment over time, but do not establish a seven-year lag in the financing costs of NEV firms.

Existing research covers broad samples of listed companies, heavily polluting industries, and new energy enterprises. Firm-level evidence focusing specifically on financing-cost patterns within the NEV supply chain remains relatively limited. This study addresses this narrower question by examining whether financing costs differ between earlier and later years of the sample.

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2.3. Hypothesis development

The *Green Credit Guidelines* were introduced in 2012. To explore financing-cost patterns after an extended period during which lending practices could adjust, this study divides the 2015–2022 sample at 2019. This cutoff is a research-design choice motivated by the possibility of gradual policy transmission; 2019 is neither a new policy implementation date nor a lag length established by prior studies. If sampled firms gained better access to credit or more favorable borrowing terms over time, their average financing costs would be expected to be lower in the later period. Accordingly, the following hypothesis is proposed:

H1: The average financing cost of listed NEV supply-chain firms is lower in 2019-2022 than in 2015-2018.

This hypothesis tests a difference between two observed periods. A lower later-period average would be consistent with the proposed financing channel but would not, by itself, establish a causal effect of green credit.

3. Research design and methodology

Firm-level financial data are obtained from the China Stock Market & Accounting Research (CSMAR) database. The sample comprises 15 Chinese A-share listed firms in the new energy vehicle (NEV) supply chain, including vehicle manufacturers and suppliers of batteries and key components, over the period 2015-2022. The final unbalanced panel contains 115 firm-year observations, with 55 observations in 2015-2018 and 60 in 2019-2022. Continuous variables are winsorized at the 1st and 99th percentiles to limit the influence of extreme values.

The dependent variable, *Financing Cost*, is measured as financial expenses divided by total liabilities and multiplied by 100. This financial-statement-based measure serves as a proxy for financing cost rather than the interest rate on a specific bank loan. *Size* is measured as the natural logarithm of total assets; Profitability as net profit divided by total assets and multiplied by 100; and *Debt-to-Equity* as total liabilities divided by shareholders' equity and multiplied by 100. *Later Period* equals one for 2019-2022 and zero for 2015-2018. This indicator is used to compare financing-cost patterns between the earlier and later sample periods and does not represent a new policy implementation in 2019.

Descriptive statistics include the mean, standard deviation, skewness, kurtosis, and coefficient of variation. A two-tailed independent-samples t-test is used to compare mean financing costs between the earlier and later periods, with Cohen's d reported as a measure of effect size. Because firms may contribute observations to both periods, the t-test is treated as an initial comparison that does not account for within-firm dependence. A pooled ordinary least squares (OLS) model is then estimated to examine the period association after controlling for observed firm characteristics:

$$FinancingCost = \beta_0 + \beta_1 LaterPeriod_t + \beta_2 Size_{it} \quad (1)$$

$$+\beta_3 Profitability_{it} + \beta_4 Debt - to - Equity_{it} + \varepsilon_{it}$$

where i indexes firms and t indexes years. The coefficient β_1 captures the conditional difference between the two sample periods and is not interpreted as a causal effect of green credit. To account for time-invariant firm-specific heterogeneity and common year-specific factors, a two-way fixed-effects model is also estimated:

$$\mathrm{FinancingCost}_{it} = \alpha_i + \lambda_t + \gamma_1 \mathrm{Size}_{it} + \gamma_2 \mathrm{Profitability}_{it} + \gamma_3 \mathrm{Debt} - \mathrm{to} - \mathrm{Equity}_{it} + \varepsilon_{it} \quad (2)$$

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The terms α_i and λ_t denote firm and year fixed effects, respectively. Later Period_t is omitted from Equation (2) because it is fully determined by the year indicators. Standard errors in the fixed-effects model are clustered at the firm level to account for within-firm dependence. Equation (2) therefore examines the associations between firm characteristics and financing costs after accounting for firm and year effects.

4. Empirical results

4.1. Descriptive statistics and period comparison

Table 1 presents descriptive statistics for the 115 firm-year observations. The mean financing cost is 0.443%, with a standard deviation of 0.972 percentage points, indicating considerable variation across observations. Profitability also varies substantially, whereas firm size is relatively less dispersed.

Table 1. Descriptive statistics

Variable	N	Mean	SD	Skewness	Kurtosis	CV
Financing Cost (%)	115	0.443	0.972	0.093	−0.180	219.3%
Firm Size	115	24.555	1.424	0.152	−0.612	5.8%
Profitability (%)	115	4.068	4.775	−0.432	0.659	117.4%
Debt-to-Equity (%)	115	60.029	13.779	0.060	−0.014	23.0%

Note: Firm Size is the natural logarithm of total assets. CV denotes the coefficient of variation, calculated as the standard deviation divided by the mean.

Table 2 compares financing costs in the earlier and later periods. Mean financing cost decreases from 0.483% in 2015-2018 to 0.407% in 2019-2022, a difference of 0.076 percentage points. However, the difference is not statistically significant in the two-tailed independent-samples t-test ($t(113) = 0.417$, $p = 0.678$), and the effect size is small (Cohen's $d = 0.078$). The mean comparison therefore does not provide statistical support for H1. It describes a lower average financing cost in the later period but does not establish a significant period difference or a causal effect of green credit policy.

Table 2. Comparison of financing costs by period

Period	N	Mean (%)	SD (percentage points)
2015–2018	55	0.4827	0.9358
2019–2022	60	0.4068	1.0098

Note: The mean difference is calculated as the earlier-period mean minus the later-period mean. The two-tailed test yields $t(113) = 0.417$, $p = 0.678$, and Cohen's $d = 0.078$. As some firms contribute observations to both periods, this test is interpreted as a preliminary period comparison.

4.2. Regression results

Table 3 reports the pooled OLS and two-way fixed-effects estimates. In the pooled OLS model, the coefficient on LaterPeriod is negative but statistically insignificant (B = −0.0745, p = 0.679). This is

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consistent with the period comparison: financing costs are lower on average in 2019–2022, but the period difference remains statistically insignificant after controlling for the observed firm characteristics. Firm Size is negatively associated with financing costs (B = −0.1927, p = 0.002), whereas Profitability and Debt-to-Equity are not statistically significant. The pooled model has an R^2 of 0.163 and is jointly significant ($F(4, 110) = 5.364$, $p < 0.001$).

With firm and year fixed effects included, the coefficient on Firm Size becomes much smaller and is no longer statistically significant (B = −0.0276, p = 0.896). Profitability also remains insignificant (B = −0.0174, p = 0.610). Debt-to-Equity retains a positive coefficient (B = 0.0201), but it is not statistically significant under firm-clustered inference (p = 0.156). The within R^2, measured relative to a model containing only the fixed effects, is 0.030. The three firm-level regressors are not jointly significant under firm-clustered inference ($F(3, 14) = 1.097$, $p = 0.383$). Thus, the negative association between Firm Size and financing cost found in pooled OLS does not persist after controlling for time-invariant firm characteristics and common year effects.

Table 3. Pooled OLS and two-way fixed-effects estimates

Variable	Pooled OLS: B (SE)	Two-Way FE: B (Clustered SE)
LaterPeriod	−0.0745 (0.1794)	—
Firm Size	−0.1927*** (0.0606)	−0.0276 (0.2071)
Profitability	−0.0262 (0.0258)	−0.0174 (0.0333)
Debt-to-Equity	0.0118 (0.0087)	0.0201 (0.0134)
Constant	4.6150*** (1.6099)	—
Firm fixed effects	No	Yes
Year fixed effects	No	Yes
Observations	115	115
Firms	15	15
R^2	0.163	0.642
Within R^2	—	0.030

Note: Standard errors are in parentheses. The fixed-effects model uses standard errors clustered by firm, with 15 firm clusters. LaterPeriod is omitted from that model because it is fully determined by the year indicators. The fixed-effects constant is not reported. $R^2 = 0.642$ includes the fixed effects; within $R^2 = 0.030$ measures the explanatory contribution of the three firm-level regressors relative to a model containing only fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The directions of the fixed-effects coefficients are unchanged under alternative standard-error calculations, although their statistical significance varies. Given the panel's eight-year time dimension, Driscoll–Kraay standard errors are used only as a sensitivity check. Under the firm-clustered specification used for the main table, none of the three firm-level regressors is statistically significant.

5. Conclusion

This study examined financing-cost patterns among 15 Chinese A-share listed firms in the new energy vehicle (NEV) supply chain, using 115 firm-year observations from 2015 to 2022. Average financing cost was lower in 2019-2022 than in 2015-2018, but the difference was not statistically

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significant, providing no statistical support for H1. In the pooled OLS model, firm size was negatively associated with financing cost, whereas the later-period indicator, profitability, and debt-to-equity ratio were not statistically significant. After controlling for firm and year fixed effects, the association between firm size and financing cost became statistically insignificant, while profitability and debt-to-equity also remained insignificant. These results do not provide evidence that green credit policy reduced financing costs or generated a delayed financing-cost effect.

The findings highlight the importance of distinguishing cross-sectional differences between firms from within-firm changes over time. In particular, the significant negative association between firm size and financing cost in the pooled OLS model did not persist after controlling for time-invariant firm heterogeneity and common year effects. This suggests that financing-cost patterns observed across firms should be interpreted cautiously and that a lower average financing cost in the later period alone is insufficient to identify the effect of green credit policy. Evaluations of financing conditions in the NEV supply chain should therefore account for firm heterogeneity rather than assume a uniform response across firms.

Several limitations should be acknowledged. First, the sample is limited to 15 listed firms, which may restrict the generalizability of the findings to other NEV firms or green industries. Second, the division at 2019 is an analytical choice rather than the implementation date of the Green Credit Guidelines and therefore does not provide a before-and-after identification of the policy effect. Third, the financing-cost measure is an accounting-based proxy constructed from financial expenses and total liabilities; it does not directly measure bank lending rates or distinguish green loans from other forms of borrowing. Future research could employ larger samples, longer observation periods, and loan-level data, together with research designs that allow more direct identification of the effects of green credit policy.

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