

The impact of green credit policies on debt financing for heavily polluting enterprises

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Abstract: On October 16, 2022, in the report of the 20th National Congress of the Communist Party of China, China's dual carbon goal was once again emphasized, and China would actively and steadily promote carbon peaking and carbon neutrality. This paper selects the heavy polluting enterprises of A-share listed companies(2007-2021) as the research samples, using the non-heavy polluting enterprises as the control group, and applying the double difference model to explore the effect of green credit policy on the debt financing scale and debt financing cost of heavy polluting enterprises. Empirical tests show that, on the one hand, the promulgation of the Green Credit Guidelines significantly reduces the financing scale of heavily polluting enterprises and increases the financing cost of their liabilities. On the other hand, compared with non-state-owned enterprises, the green credit policy has a greater impact on the financing cost of state-owned enterprises' liabilities.

1. Preface

1.1. Research Background

The report of the 20th National Congress of the Communist Party of China proposed to "actively and steadily promote carbon peaking and carbon neutrality". "Green credit" provides a guarantee for the construction of a "two-type" society and the strategy of sustainable development.

1.2. Research Methods

Firstly, the evaluation index is established, and the analytic hierarchy method is used to analyze the weight of each evaluation factor. Secondly, a set of evaluation system combining internal control and external control was constructed based on China's national conditions; Finally, STATA15 is used for descriptive statistics, correlation tests and model tests.

2. Research hypotheses on the impact of green credit policies on debt financing

Compared with non-heavy polluting enterprises, heavy polluting enterprises are more likely to be focused by all sectors of society, resulting in more serious results and greater negative impacts. Based on the above analysis, these hypotheses is proposed:

H1: After the promulgation of the Guidelines, the scale

of debt financing for heavy polluting enterprises would decrease significantly compared to non-heavy polluting enterprises.

H2: After the promulgation of the Guidelines, the debt financing costs of heavy polluting enterprises would increase significantly compared with non-heavy polluting enterprises.

H3: After the promulgation of the Guidelines, it is more obvious that state-owned enterprises are more constrained by debt financing than non-state-owned enterprises.

3. Research design of green credit policies affecting debt financing

3.1. Model Building

In this study, heavy polluting enterprises are used as the experimental group and non-heavy polluting enterprises as the control group. Treated=1 represents heavy polluting enterprises, and Treated=0 represents non-heavy polluting enterprises. Time=1 represents the year after the implementation of the green credit policy, that is, 2012-2021, and Time=0 represents the year before the implementation of the green credit, that is, before 2012. This paper draws on the research methods of Zhou Li'an and Chen Ye (2005)^[1] to set up the following model.

$$Loan_{ij} = \alpha_0 + \alpha_1 Treated_i \times Time_t + \eta X_{i,t-1} + \lambda_i + V_t + \varepsilon_{it} \quad (1)$$

$$Cost_{ij} = \beta_0 + \beta_1 Treated_i \times Time_t + \beta X_{i,t-1} + \lambda_i + V_t + \varepsilon_{it} \quad (2)$$

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Among them, $Loan_{it}$ and $Cost_{ij}$ are the t-year debt financing scale and debt financing cost of the i th enterprise; $Treated_i$ is a grouped dummy variable; $Time_t$ is a time dummy variable; $Treated_i \times Time_t$ is a double differential variable; $X_{i,t-1}$ are the firm control variables (considering the lag effect), and λ_i is the individual fixed effect; v_t is the time-fixed effect; ε_{it} is a random perturbation term.

3.2. Selection of data sources and indicators

3.2.1, Sample data

In this paper, the data was taken from the CSMAR and Wind databases in which the heavily polluting listed enterprises in A-shares from 2007 to 2021 were selected as the the experimental group, and the rest as the control group¹.

Finally, 7790 listed companies were obtained from databases and acted as the total observation samples, including 3490 in the experimental group and 4300 data in the control group. In order to remove outlier interference, continuous variables are tailed by Winsorize in both the upper and lower layers. Data processing is carried out using STATA15.0 software.

3.2.2, indicator selection

The selected explanatory, explanatory, and control variables are shown in the following table

Table 1 Variable definition tables

The variable type	The variable name	Variable symbol	Variable interpretation
The variable being explained	Debt financing scale	Loan	Debt financing scale (Loan) = (short-term borrowings + long-term borrowings + non-current liabilities maturing within one year) / total assets at the end of the period
	Debt financing costs	Cost	Net finance charges/total liabilities
Explanatory variables	Double differential variable	Treated* Time	The value of Treated for heavy polluting enterprises is 1, otherwise it is 0; After 2012, the value of Time is 1, otherwise it is 0
Control variables	Enterprise size	Size	The natural logarithm of total assets at the end of the period
	Gearing ratio	Lev	Total liabilities at the end of the year / Total assets at the end of the year
	Return on assets	ROA	Year-end net profit/year-end total assets
	Net operating cash flow	CFO	Year-end cash and cash equivalents/year-end current assets
	Proportion of fixed assets	Struc	Total fixed assets at the end of the year / total assets at the end of the year
	Nature of Property	State	The value of state-owned enterprises is 1, otherwise it is 0

3.3. Data analysis and related inspections

3.3.1, Descriptive statistics

Table 2 Descriptive statistics of the main variables of the whole sample

variable	Observations	average value	Standard deviation	media n	minimu m	maximu m
Loan	7790	0.5413	0.5800	0.3781	0.0321	3.7762

Cost	7790	0.0872	0.2014	0.0231	-0.1081	0.4798
Time	7790	0.5000	0.5000	0.5000	0.0000	1.0000
Treated	7790	0.4480	0.4970	0.0000	0.0000	1.0000
Size	7790	21.5992	1.4595	21.4866	18.6194	25.6582
Lev	7790	0.8952	1.8420	0.4766	0.0119	13.4848
ROA	7790	0.0493	0.0698	0.0434	-0.2147	0.2575
CFO	7790	0.2900	0.1804	0.2532	0.0141	0.8168
Struc	7790	0.5375	0.2818	0.5108	0.1112	2.1573

Table 4-2 shows that the average debt financing scale and asset-liability ratio are 0.5413 and 0.8952, respectively, indicating that debt financing is still the main way for enterprises to raise money. The maximum value of debt financing scale is 3.7762 and the minimum value is 0.0321, which indicates the difference is significant, and the standard deviation is 0.5800, showing that the significant difference in debt financing scale between enterprises.

3.3.2, Time trend analysis

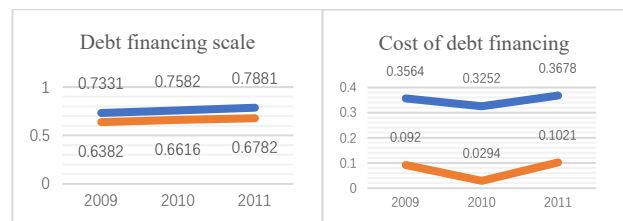


Figure 1 Time trend of corporate debt financing indicators from 2009 to 2011

It can be seen from Figure 1 that before the issuance of the Green Credit Guidelines, the trend of debt financing scale and debt financing cost in the experimental group and the control group was basically the same and was in line with the parallel trend assumption.

3.4. An empirical analysis of the impact of green credit policies on debt financing

3.4.1, the impact of green credit policies on the scale of corporate debt financing

Under the premise that the experimental group and the control group meet the parallel trend assumption, this part further uses the double difference model to perform regression analysis on the panel data, and the regression results for H1 are shown in Table 3.

Table 3 Empirical analysis results on the impact of green credit on the scale of corporate debt financing

variable	Loan
Time*treated	-0.21509***(-15.57)
Time	-0.10729***(-5.34)
Treated	-0.2095***(-10.91)
Lev	0.00107***(3.34)
ROA	-0.225946***(-2.63)
CFO	-0.063705**(-1.98)
Struc	0.193138***(9.09)
Size	-0.18577***(-45.4)

Year	control
Industry	control
Observations	7790
Constant	4.5013***(49.89)
r-square	0.2645

Note: The t-test values in parentheses, *, **, *** indicate that they are significant at the 10%, 5%, and 1% levels, respectively.

3.4.2, the impact of green credit policies on corporate debt financing costs

The impact of green credit policies on the debt financing costs of heavily polluting enterprises is discussed below, and the double difference test is carried out on H2, and the regression results are shown in Table 4.

Table 4 Empirical analysis results of the impact of green credit on corporate debt financing costs

Variable	Cost
Time*treated	0.006951**(2.29)
Time	-0.05574***(-11.76)
Treated	0.09856***(-10.09)
Lev	0.024459***(-15.15)
ROA	-0.03229(-0.78)
CFO	0.04077**(2.53)
Struc	0.24245(0.59)
Size	-0.003546**(-1.97)
Constant	-0.125882*(-1.92)
Industry	7790
Observations	control
Year	control
r-square	0.1181

Note: The t-test values in parentheses, *, **, *** indicate that they are significant at the 10%, 5%, and 1% levels, respectively.

The coefficient of interaction terms in this table is 0.0069 and the value of t is 2.29, indicating that there is a significant positive correlation between the two. Compared with non-heavily polluting enterprises, the green credit policy significantly increases the debt financing cost of heavily polluting enterprises, validating H2.

3.4.3, The impact of green credit policies on corporate debt financing under the difference in property rights

According to property rights, the total samples were divided into state-owned enterprises and non-state-owned enterprises for double differential analysis, and the regression results are shown in Table 5 and Table 6.

Table 5 Empirical analysis results of the impact of green credit on debt financing of state-owned enterprises

Variable	(1)	(2)
	Loan	Cost

Time*treated	-0.185235***(-2.82)	0.040013***(-2.73)
Time	0.113884(0.57)	-0.02631***(-4.79)
Treated	-0.119201***(-7.97)	0.1504***(-9.45)
Lev	-0.002779***(-1.03)	-0.03033***(-11.5)
ROA	-0.70413***(-4.75)	0.00846(0.14)
CFO	-0.044627(-1.12)	-0.0694***(-2.70)
Struc	0.1458***(-3.73)	0.12358***(-3.00)
Size	-0.100465***(-13.87)	0.02836***(-5.81)
Constant	2.662***(-15.1)	-0.6287***(-6.24)
Year	control	control
Industry	control	control
Observations	3070	3070
r-square	0.1876	0.1491

Note: The t-test values in parentheses, *, **, *** indicate that they are significant at the 10%, 5%, and 1% levels, respectively.

Table 6 Empirical analysis results of the impact of green credit on debt financing of non-state-owned enterprises

Variable	(1)	(2)
	Loan	Cost
Time*treated	-0.006478(-0.22)	0.006812(0.55)
Time	0.08681***(-3.51)	-0.7704***(-11.27)
Treated	-0.43883***(-19.67)	0.04914***(-4.16)
Lev	0.010688*(1.69)	-0.02401***(-10.21)
ROA	0.37004**(-2.09)	-0.22349***(-3.63)
CFO	0.00731(0.14)	0.1191***(-5.71)
Struc	0.26296***(-7.44)	0.26526***(-8.82)
Size	-0.3104***(-30.42)	-0.01389***(-3.91)
Constant	7.1623***(-31.92)	0.2606***(-3.74)
Year	control	control
Industry	control	control
Observations	4720	4720
r-square	0.3931	0.1485

Note: The t-test values in parentheses, *, **, *** indicate that they are significant at the 10%, 5%, and 1% levels, respectively.

4. Conclusion and outlook

4.1. Conclusions

First, from the perspective of the scale of debt financing, after the introduction of the "green credit" guidelines, the proportion of debt financing for heavily polluting enterprises is significantly lower than that of non-heavy

polluting enterprises.

Second, from the perspective of debt financing costs, compared with companies with lighter environmental pollution, green credit policies significantly increase the debt financing costs of heavily polluting enterprises.

Third, under different property rights attributes, whether it is the scale of debt financing or the cost of debt financing, green credit policies have a greater impact on state-owned enterprises.

4.2. Policy Recommendations

First, from the point of view of the state, it is necessary to establish a green credit system that suits China's national conditions. Improve China's green finance legal system and corresponding supporting regulations.

Second, from the company's perspective, it should take corresponding social responsibilities while maximizing its benefits.

Third, from the perspective of the banking industry, first of all, financial institutions should make banks the main body of green credit implementation in order to better fulfill their social responsibilities; Furthermore, it is necessary to continuously develop various forms of green credit loans to provide favorable conditions for corporate pollution control projects and transformation of development methods.

Finally, from the perspective of internationalization, it is necessary to actively carry out green economy management on a global scale, actively respond to the requirements of "green" development, and ensure the optimal allocation of credit to the greatest extent.

References

1. ZHOU Li'an, CHEN Ye The policy effect of China's rural tax and fee reform: Estimation based on double difference model[J]. *Economic Research Journal*, 2005(08): 44-53
2. Blackwell D.W., Noland T.R., Winter D.B. The Value of Attestation by Public Accountant: Evidences from Loan Pricing [J]. *Journals of Accounting Research*, 1996, 36(1): 57-70.
3. Zhang B, Yang Y, Bi J. Tracking the implementation of green credit policy in China: Top-down perspective and bottom-up reform[J]. *Journal of environmental management*, 2011, 92(4): 1321-1327.
4. Joseph P.H. Fan, Sheridan Titman, Garry Twite. An International Comparison of Capital Structure and Debt Maturity Choices[J]. *Journal of Financial and Quantitative Analysis*, 2012, 47(1): 23-56.
5. Qian L H. The banking credit system China[J].