

Green credit, business investment and new bank loans

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Abstract. Based on the entropy weight TOPSIS method, this paper classifies the A-share listed companies from 2007 to 2020 into green enterprises and heavy pollution enterprises, and empirically studies the impact of green credit policy on enterprise investment scale and new bank loans. The results show that the green credit policy has a positive effect on the investment scale and new bank loans of green enterprises, and the hypothesis is still valid after entropy balance and many robustness tests. Secondly, the green credit policy is asymmetric, that is, the policy effect on state-owned enterprises, small and medium-sized enterprises and polluted areas is stronger.

1 Introduction

Since the founding of the Communist Party of China, with the acceleration of the modernization process and the rapid development of economy, the problem of environmental pollution has become more and more serious. This paper divides enterprises into heavy pollution enterprises and green enterprises by entropy TOPSIS method, and analyzes that the investment scale of enterprises and bank loans are inhibited by green credit policy. Research on the role of green credit policy on enterprises mainly focuses on energy saving and emission reduction and investment and financing. On the one hand, the literature on the impact of green credit on energy conservation and emission reduction of enterprises holds that the lack of financing cost constraints on power and other industries with large emission of pollution and insufficient restraint on long-term liabilities can improve the environmental performance of their industries by promoting short-term borrowing^[1]. It is believed that green credit has a positive effect on reducing coal use^[2]. On the other hand, there are different opinions on the influencing factors of green credit policy on enterprise investment and financing, as one of the main bodies of green credit policy, heavy pollution enterprises, green credit has a positive impact on their investment efficiency by strict bank contract^[3] and the implementation of environmental pollution insurance^[4]. Accordingly, this paper wants to solve the following two questions: Does green credit have an impact on the investment scale and bank loans of green enterprises and heavy pollution enterprises? Does Green Credit Have Its Asymmetry?

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2 Research hypothesis

Through previous literature, we can see that excessive free cash flow of enterprises will lead to serious over-investment, but lack of cash flow of enterprises will easily lead to insufficient investment of enterprises. Therefore, green credit policy may weaken the underinvestment of green enterprises by increasing cash flow, and reduce the overinvestment of heavy polluting enterprises by restraining cash flow. In this way, green enterprises have more opportunities to expand their investment scale, heavy pollution enterprises have to face the choice of expanding production or industrial transformation, and make a more cautious assessment of investment opportunities. To sum up, this paper puts forward the following assumptions:

Hypothesis 1: After the release of the green credit policy, the investment scale of green enterprises increases significantly compared with that of heavy polluting enterprises.

Because banks and other lending institutions will pay more attention to whether enterprises increase the risk of environmental pollution in the production process, after the implementation of the green credit policy, banks and other lending institutions will release more loans to green enterprises, while restraining the loan scale of heavily polluted enterprises. To sum up, this paper puts forward the following assumptions:

Hypothesis 2: After the release of the green credit policy, compared to the heavily polluting enterprises, the scale of new loans of green enterprises increased significantly.

The sample of listed companies is divided into non-state-owned and state-owned enterprises. Compared with non-state-owned enterprises, state-owned enterprises are less subject to environmental supervision and more dependent on the financing facilities of bank loans. Therefore, the impact of green credit policy on the investment scale of state-owned enterprises and new bank loans will be more obvious. In addition, if the sample of listed companies is divided into small and medium-sized enterprises and large enterprises. Compared with small and medium-sized enterprises, large enterprises are not easily discriminated against in financing and suffer weaker financing constraints, so green credit policy will promote the investment scale of small and medium-sized enterprises and new bank loans more obviously. Finally, if the sample of provinces where listed companies are registered is divided into green areas and polluted areas. Compared with enterprises in green areas, enterprises in polluted areas have more vigorous demand for reducing emissions from local governments, and because of the poor environment in polluted areas, local people have stronger ideas to change the status quo. Therefore, the impact of green credit policy on the investment scale of enterprises in polluted areas and new bank loans will be more obvious. To sum up, this paper puts forward the following assumptions:

Hypothesis 3: After issuing the green credit policy, the impact of the policy on state-owned enterprises, small and medium-sized enterprises and polluted areas is more obvious.

3 Research design and empirical analysis

3.1 Data sources and model design

This paper selects China's A-share listed companies from 2007 to 2020, and excludes the following samples: ① ST shares, *ST shares; ② Enterprises that have been listed for less than one year; ③ Enterprises with a large number of missing data. ④ Eliminate financial industry companies. In the process, a few missing values are used to complete the annual average value and the tail is reduced at the 1% level. There were 10851 observations. The data are from CSMAR database and China Environmental Statistics Yearbook.

In this paper, the TOPSIS method is used to select the industrial wastewater discharge, industrial waste gas discharge, industrial sulfur dioxide discharge, industrial smoke (powder) dust discharge, general industrial solid waste production and hazardous waste production by referring to the pollution emission index selection of Su Dongwei^[5]. Based on the TOPSIS ranking of pollution emission data of various industries in 2011, and drawing lessons from the division of green industry and heavy pollution industry in the Green Industry Guidance Catalogue (2019 Edition) and Key Evaluation Indicators of Green Credit Implementation, this paper classifies the enterprises belonging to the industries ranked 1 to 24 as green enterprises, and divides them into green enterprises. The average emission of each index of 24 industries accounts for about 5% of all industries, and the rest of the industries are divided into heavy pollution enterprises.

This paper uses DID method to study the impact of green credit on new bank loans and investment scale of enterprises.

$$Inv_{it}(Loan_{it}) = \beta_0 + \beta_1treated_i + \beta_2year_t + \beta_3treated \times year + \gamma Controls_{it} + \mu_i + \lambda_t + \delta_i + \varepsilon_{it} \tag{1}$$

In the above formula, Inv is the investment scale of the enterprise, Loan is the newly added bank loan of the enterprise, treated is a dummy variable, and the green enterprise takes 1, otherwise the heavy pollution enterprise takes 0. year is a time dummy variable, 0 is taken before 2012, and 1 is taken otherwise. Controls are a selected set of control variables, Control variables include Tobin's Q (Tq), ownership concentration (Largest), stock returns (Ret), firm growth (Growth), current ratio (Lr), debt to asset ratio (Lev), return on assets (Roa), asset structure (As), operating cash flows (Cf) and the nature of the firm (Soe). and μ , λ , and δ represent the control industry, time, and province effects, respectively.

3.2 Empirical analysis

Table 1 reflects the descriptive statistics of the variables. It can be seen from the table below that after the implementation of the policy, the investment scale and new bank loans of heavily polluting enterprises decreased significantly.

Table1. The statistical description of variables.

Variables	Full sample			Heavily Polluting Enterprise			Green Enterprise		
	Mean	Median	St.Dev	Pre-policy average	Post-policy average	MeanDiff	Pre-policy average	Post-policy average	MeanDiff
Inv	0.075	0.061	0.049	0.079	0.075	-0.004***	0.072	0.075	0.002
Loan	0.025	0.006	0.216	0.050	0.017	-0.033***	0.026	0.025	-0.001

T value in parentheses. *, **, ***, denote statistical significance levels at 10%, 5%, and 1%, respectively

Table 2 reflects the regression results using did after entropy balancing. This paper uses Hainmueller^[6]for reference to select the square term and the cubic term of the control variable respectively, so as to estimate the weight of the control variable. As can be seen from the table below, the investment scale and new bank loans of green enterprises increase significantly after adding the square and cubic term

Table 2. Regression results of EB-DID.

Variables	Inv			Loan		
	(1)	(2)	(3)	(4)	(5)	(6)
treated×year	0.006** (2.519)	0.016*** (3.926)	0.015*** (3.495)	0.027*** (2.608)	0.038*** (3.265)	0.039** (2.402)
Constant	0.083*** (-14.973)	0.111*** (18.571)	0.112*** (18.951)	0.076*** (-3.101)	0.084*** (4.354)	0.087*** (4.561)
Controls	YES	YES	YES	YES	YES	YES
Square Controls		YES			YES	
Cubic Controls			YES			YES
Obs.	10851	10851	10851	10851	10851	10851
R ²	0.027	0.057	0.056	0.023	0.024	0.026

T value in parentheses. *, **, ***, denote statistical significance levels at 10%, 5%, and 1%, respectively

In this paper, the following four aspects of the robustness test. First, In this paper, 2010 as a dummy variable to achieve the placebo test, the regression results show that the interaction is not significant. Secondly, in order to avoid the interference of the policy of Energy Efficiency Credit Guidelines in 2015, the 2015 is set as a virtual variable to join the regression model. The results indicate that the interaction term is not significant. Thirdly, the statistical sample shows that the enterprises registered in Guangdong Province and Zhejiang Province account for 26.98%, so the sample of Guangdong Province and Zhejiang Province is deleted. The results indicate that the interaction term is not significant. Fourthly, in order to avoid the influence of the regression results, the industries ranked 1 to 18 are divided into green industries to return again. The results indicate that the interaction term is not significant. In conclusion, the conclusion is robust.

Table 3 reflects the results of firm heterogeneity regression. The total capital of enterprises is divided into four quartiles, with large enterprises larger than 75% and small and medium-sized enterprises the rest. The TOPSIS method is used to rank the emissions of each region in the year before the policy (that is, 2011), if it is greater than the median of 0.69, it is a green region. Table 3 shows that state-owned enterprises, small-scale enterprises and heavy pollution enterprises have better policy effect.

Table 3. Heterogeneity analysis.

Variables	State owned	Non-state-owned	Large-scale Enterprise	Small and Medium Enterprise	Green Area	Contaminated Area
	(1)	(2)	(3)	(4)	(5)	(6)
inv	0.007* (1.759)	0.005 (1.474)	0.005 (0.899)	0.006** (2.258)	0.007 (1.266)	0.007** (2.437)
Loan	0.029* (1.700)	0.021 (1.390)	0.034 (1.246)	0.020** (1.962)	0.035* (1.653)	0.023* (1.913)
Obs.	4204	6647	3074	7777	2859	8046

T value in parentheses. *, **, ***, denote statistical significance levels at 10%, 5%, and 1%, respectively

4 Conclusions and policy recommendations

First of all, through the double difference method, the green credit policy increases the investment scale of green enterprises and bank new loans, Secondly, from the heterogeneity analysis, we can see that the policy effect of state-owned enterprises, small and medium-sized enterprises and polluted areas is more effective. Combined with the above empirical results, the following two Enlightenments can be drawn: First, after the implementation of green credit, the investment scale of green enterprises and new bank loans have increased, indicating that the implementation of green credit policy has achieved certain results. Therefore, banks and other credit institutions should maintain prudent control of green credit delivery standards, while expanding more green financial products, to inject a steady stream of cardiotoxic agent into the economic vitality of enterprises. Secondly, there are some shackles in the role of green credit policy in promoting investment and loans of green enterprises, Therefore, Banks should design specific evaluation criteria to reduce its asymmetry and promote the economic development of the whole region.

References

1. H.Y. LIU. Correlation between enterprise environmental performance and green credit - - Based on data sample analysis of extractive services, paper and power industries, *Studies on Socialism with Chinese Characteristics*. 85 (2017) (In China)
2. Z.H. ZHU, Y.F. TAN. Contract Regulation and Investment Efficiency of Heavily Polluting Enterprises: Quasi-natural Experimental Evidence from Green Credit Guidelines, *East China Economic Management*. **34**, 74 (2020) (In China)
3. J.H. NING, Z.M. WAN. Influence of Environmental Pollution Liability Insurance on Enterprise Investment Efficiency from the Perspective of Green Credit, *Journal of Dalian University of Technology*. **41**, 48 (2020) (In China)
4. D.W. SU, L.L. LIAN. Does Green Credit Policy Affect Corporate Financing and Investment? Evidence from Publicly Listed Firms in Pollution—Intensive Industries in China, *Journal of Financial Research in China*. 123 (2018) (In China)
5. D.Q. SHI, H. DING, P. WEI, J.J. LIU, Can Smart City Construction Reduce Environmental Pollution, *China Industrial Economics*. 117 (2018) (In China)
6. Hainmueller J, Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies, *Political Analysis*. **20**, 25(2012)