

# Green Credit Policy and Enterprise Strategic Transformation: Empirical Test of Heavy Pollution Industry

Fenglin Duan <sup>a</sup>

*School of International Education, Wuhan University of Technology, 122 Luoshi Road, Wuhan, China*

**Keywords:** Green Credit, Heavy Polluting Enterprises, Enterprise Strategy, Difference in Difference Method, Financing Constraints.

**Abstract:** The implementation of the 'green credit guidelines' is an important measure to promote the green and low-carbon development of China's economy. Under the background of big data economy and digital management, how to better play the role of green credit policy and promote the green transformation of enterprises is an important topic to be studied and solved urgently. This paper takes the implementation of green credit policy as a quasi natural experiment, selects China's A-share listed companies from 2010 to 2018 as the research sample, and empirically tests the impact of green credit policy on enterprise strategy and its mechanism by constructing PSM-DID model. It is found that the implementation of green credit policy has significantly improved the strategic incentive progress of heavy polluting enterprises. After a series of robustness tests, the conclusion is still valid. The intermediary effect test results show that financing constraints play a significant intermediary role in the promotion of green credit to the progress of enterprise strategy. The research of this paper provides a certain theoretical basis and policy enlightenment for the strategic transformation of heavy polluting enterprises and the adjustment of green credit policy.

## 1 INTRODUCTION

In recent years, with the increasingly serious problem of environmental pollution, the party and the state attach great importance to the construction of ecological civilization. The report of the 19th CPC National Congress clearly pointed out "developing green finance" and took it as one of the ways to promote green development. On October 29, 2020, the proposal of the Central Committee of the Communist Party of China on formulating the 14th five year plan for national economic and social development and the long-term objectives for 2035 pointed out that we should accelerate the promotion of green and low-carbon development, improve and optimize the legal and policy guarantee for green development, vigorously develop green finance and promote the green transformation of key industries and important fields. In addition, 2020 is the 15th anniversary of China's concept of "green water and green mountains are golden mountains and silver mountains" and the key year for the conclusion of the 13th five year plan. It can be said that green finance

was, is and will still be one of the important economic construction goals in the future. At the same time, it is an important measure and necessary way for China to achieve green development. As a key measure to guide the green allocation of credit resources, green credit plays an important role in promoting green and low-carbon economic development and promoting green innovation of enterprises. In 2012, the former CBRC issued the guidelines on green credit, which put forward clear requirements for banking financial institutions to effectively carry out green credit and vigorously promote energy conservation, emission reduction and environmental protection. On the one hand, through green credit, give full play to the role of banking financial institutions in guiding the flow of social funds and allocating resources, and guide the internal funds and social funds of the financial system to flow from the pollution field to the green field. On the other hand, it is required to promote green credit from a strategic perspective, improve support for green economy, low-carbon economy and circular economy, and strengthen the supervision of financial institutions on fund users, so as to better serve the real

---

<sup>a</sup> <https://orcid.org/0000-0003-23338-4444>

economy and promote the transformation of development mode.

The existing literature on green credit in China mainly focuses on the following aspects: First, analyze the risk and uncertainty of green credit from the macro level. For example, Shen Hongtao and Ma Zhengbiao (Shen, Ma, 2014) studied from the normative level of empirical analysis and believed that the implementation of green credit must solve the contradiction between environmental protection and economic benefits, and correct the concept of GDP only performance of local governments. Xu Sheng et al (Xu, et al, 2018) analyzed the impact of green credit on high-quality regional economic development by studying the mechanism of green credit on industrial structure upgrading. Second, analyzed the implementation effect of green credit policy from the micro level. For example, Wen Subin and Zhou Liulu (Wen, Zhou, 2017) found that green credit can effectively drive enterprises to carry out technological innovation and improve pollution control level by analyzing the impact of green credit on enterprise financial performance and enterprise value. Chen Xingxing et al. (Chen, et al, 2019) took the implementation of the green credit guidelines as a quasi natural experiment. By constructing the commercial credit index of 17873 A-share listed companies from 2006 to 2015, they found that green credit had a significant financing penalty effect, increased the investment in environmental governance of heavy polluting enterprises and promoted the structural adjustment of heavy polluting industries. Zhan Hua (Zhan 2021) analyzed the measurement indicators of enterprise environmental disclosure level and found that green credit promoted the improvement of enterprise environmental information disclosure level through financing constraints and environmental performance channels. In conclusion, we know that green credit inhibits the credit financing of heavily polluting enterprises, significantly improves the level of environmental information disclosure of enterprises, helps to promote technological innovation and industrial structure upgrading of enterprises, so as to promote the transformation of economic development mode and the construction of ecological civilization. However, there is little literature on the relationship between green credit and enterprise strategy. Will the implementation of green credit policy change the strategic choice of heavy polluting enterprises? Does this impact have differentiated performance among different enterprises? This will become the core issue of this paper.

This paper takes the implementation of green credit policy as a quasi natural experiment, selects China's A-share listed companies from 2010 to 2018 as the research sample, and empirically tests the impact of green credit policy on enterprise strategy and its mechanism by constructing PSM-DID model. Based on the enterprise strategy theory of miles et al (1978, 2003), enterprises are divided into prospectors, defenders and analyzers according to the differences of enterprise strategy and progress in this paper. This paper expands the relevant research on the economic consequences of green credit policy, and has some enlightenment for the strategic transformation of heavy polluting enterprises, which has both academic and practical significance. The contributions of this paper include: First, with the help of green credit policy as a quasi natural experiment, the double difference regression after propensity score matching is used to better alleviate the endogenous problem. Secondly, it examines the impact of green credit policy on corporate strategy from the micro perspective of listed enterprises, and provides the theoretical basis of impact mechanism and heterogeneity. Thirdly, it examines the economic consequences of the green credit policy from the strategic level of the company, which provides an empirical reference for promoting the green and low-carbon development of the domestic capital market.

## 2 THEORETICAL ANALYSIS AND HYPOTHESIS

### 2.1 Green Credit Policy and Enterprise Strategic Transformation

The guidelines on green credit put forward clear requirements for China's banking financial institutions to effectively carry out green credit and vigorously promote energy conservation, emission reduction and environmental protection. The policy promotes the implementation of incentive and restraint measures through a series of measures, promotes the standardization and institutionalization of the system, and shows the strong determination of the Chinese government to deal with environmental problems. This paper holds that the implementation of green credit policy will promote the strategic transformation of China's heavily polluting enterprises from the following three aspects, and there are two possibilities for the change of enterprise strategy.

First, the green credit policy has a significant financing penalty effect. Green finance measures require commercial banks to strictly control the direction and scale of credit and curb the lending space for polluting projects. Thus, heavy polluting enterprises face higher financing threshold and financing cost (Liu, et al., 2019; Chen, 2019). According to Su Dongwei and Lian Lili (Lian 2018), the financing decisions of enterprises are greatly affected by the supply of financial markets. The increase of credit threshold has significantly reduced the long-term debt financing of heavily polluting enterprises. On the one hand, under financing constraints, heavily polluting enterprises lack funds to carry out projects, so they may change from prospectors to defenders and adopt a more conservative enterprise strategy. On the other hand, considering the obvious capital oriented mechanism in the green credit policy, heavily polluting enterprises may tend to change their development mode and find a new way out (Wang, 2021, Wang, 2021), so they may choose a more radical enterprise strategy and change from defender to prospectors.

Second, the green credit policy has an investment restriction effect on heavily polluting enterprises. Under the green financial measures, the financial asset allocation of heavily polluting enterprises is interfered by the government and the market, and the financing cost of non green projects increases. Therefore, the inefficient investment of enterprises, especially over investment, has decreased significantly (Wu, et al., 2012). In addition, the green credit policy requires heavily polluting enterprises to reduce pollutant emissions and improve their environmental governance capacity. Under the condition of limited financial resources, environmental governance investment must have a "crowding out effect" on productive investment in the short term (Wang, etc. 2021). The investment of heavy polluting enterprises is limited, and the enterprise strategy may tend to be conservative. However, from the perspective of transformation and development, facing the dilemma of double restrictions on financing and investment, heavy polluting enterprises may increase green investment in order to find a new development outlet (Wang, etc., 2021), making the enterprise strategy from conservative to radical.

Third, the green credit policy will bring greater public pressure and moral condemnation to heavily polluting enterprises. In addition to reducing the debt financing of heavily polluting enterprises, public opinion will also affect the investment and financing behavior and enterprise strategy of enterprises

through supervision mechanism and reputation mechanism (Zhu, Tan, 2020). On the one hand, public opinion pressure forces heavily polluting enterprises to strengthen environmental governance, improve the level of environmental information disclosure and reduce inefficient investment (Zhan, 2021). In this case, the corporate strategy may tend to be conservative, making the corporate change from prospectors to defenders. On the other hand, the social reputation mechanism will promote enterprises to establish a corporate image in line with the concept of green development. Heavily polluting enterprises may increase green investment, seek strategic transformation and adopt more radical strategies to change from defender to prospectors.

Based on the above analysis, this paper puts forward the following assumptions:

Hypothesis H1a: Green credit policy will turn heavy polluting enterprises from prospectors to defenders.

Hypothesis H1b: Green credit policy will turn heavy polluting enterprises from defender to prospectors.

## 2.2 Intermediary Effect of Financing Constraints

Firstly, the green credit policy has reduced the total amount of funds and financing channels of heavily polluting enterprises to a certain extent, making enterprises face more severe financing constraints. From the perspective of banking financial institutions, under the strict green financial measures, commercial banks are bound to strictly control the credit gateway of heavily polluting enterprises and improve their loan threshold. Banks use credit supervision means to strictly control the credit approval process for enterprises with high energy consumption and high pollution, Raise the financing threshold and cost of enterprises (Allet, 2015; Zhu, Tan, 2020). From the perspective of the whole capital market, green credit guides social funds from the polluting field to the green field. Under this policy guidance, the willingness of external creditors to provide debt capital for heavily polluting enterprises is weakened (Wu, et al., 2012), investors will reduce their investment in polluting enterprises, so the debt financing level of heavily polluting enterprises will decline. Secondly, the aggravation of the financing constraint level of enterprises will change the strategic choice of enterprises. Specifically, there are two possible changes. On the one hand, after the implementation of the green credit policy, heavily polluting enterprises facing financing constraints lack

free cash flow for investment. Therefore, managers will be more cautious in making investment decisions, reduce unnecessary investment and choose defensive enterprise strategies (Hovakimian, 2011). Using the investment cash flow sensitivity model, Fazzari et al (Fazzari, et al, 1988) found that financing constraints will inhibit enterprise performance, which makes the corporate change from prospector to defender and choose a more conservative strategy. On the other hand, green credit dynamically increases the opportunity cost of environmental pollution through credit channels. In order to get rid of the current situation of financing constraints, heavily polluting enterprises tend to increase clean investment and reduce polluting investment. Enterprises hope to seek transformation and development through green innovation (Wang, 2021). Therefore, they may adopt a more radical corporate strategy, changing from defenders to prospectors. Based on the above analysis, this paper puts forward the following assumptions:

Hypothesis H2: The level of corporate financing constraints plays an intermediary role between green credit policy and corporate strategy.

### 3 RESEARCH DESIGN

#### 3.1 Sample Selection and Data Source

This paper takes the listed companies on China's Shanghai and Shenzhen main board, small and medium-sized board and gem as the research object, and the data sample interval is 2006-2018. The sample data are taken from Guotai'an financial database (CSMAR). In order to improve the reliability of the data, this paper processes the original data as follows: (1) Exclude listed companies in the financial industry and ST listed companies. (2) Eliminate the data that are obviously abnormal, such as sample with an asset liability ratio greater than 1 or a share price bubble less than 0. (3) Samples with missing or partially missing data are excluded. (4) A total of 1% tail reduction is performed on both sides of continuous variables to avoid the influence of extreme values. After the above processing, this paper obtains the unbalanced panel data of 14966 samples from 2006 to 2018.

### 3.2 Variable Setting

#### 3.2.1 Enterprise Strategy Type

Drawing on the empirical measurement method of enterprise strategy proposed by Bentley et al. (Bentley, et al, 2013) and Higgins et al. (2014), this paper uses the following six indicators to construct the enterprise strategy index: (1) The tendency of enterprises to develop new products, which is measured by the proportion of R & D expenditure in sales revenue. (2) The ability of an enterprise to effectively produce and distribute its products and services, which is measured by the ratio of the number of employees to sales revenue. (3) Enterprise growth potential, which is measured by the historical growth rate of sales revenue. (4) Product expansibility, which is measured by the proportion of sales expenses and management expenses in sales revenue. (5) Organizational stability, which is measured by the fluctuation of the number of employees, that is, the standard deviation of the number of employees divided by the average number of employees. (6) Capital intensity, which is measured by the proportion of fixed assets in total assets. According to the research of Zhang Yanchao et al (Zhang, et al, 2021), compared with defenders: (1) Prospectors have stronger desire to develop new products and higher research expenditure. (2) Prospectors have lower requirements for production efficiency and have a larger ratio between the number of employees and sales revenue. (3) The revenue growth trend of prospectors is obvious and the growth is stronger. (4) Prospectors pay attention to the expansion of product market and have higher sales and management expenses. (5) The organizational stability of prospectors is poor, and the tenure of employees is generally short. (6) Prospectors pay more attention to human capital investment, the investment in fixed assets is relatively lower than that of defensive enterprises, and the capital intensity is lower.

The above six indicators take the moving average value of the past five years, and each "year industry" sample is divided into five groups from small to large. For the first five variables, the minimum group is assigned 0 and the maximum group is assigned 4. For the last indicator, the reverse method is adopted. The maximum group is assigned 0 points and the minimum group is assigned 4 points. Finally, for each "company year" observation value, the values of the six indicators are summed up, and finally the enterprise strategy index strategy with a value range of 0-24 is obtained. This indicator measures the

degree of strategic radicalization of an enterprise. The higher the strategic score, the more inclined the enterprise is to become an prospector, and the higher the degree of strategic radicalization of the enterprise.

### 3.2.2 Green Credit Policy

Treated is the company dummy variable. This paper distinguishes heavy polluting enterprises according to the notice on printing and distributing the classified management directory of environmental protection verification industry of Listed Companies in 2008 and the industry classification standard of CSRC in 2012. If the sample is a heavily polluting enterprise, the variable is taken as 1, otherwise it is taken as 0. Post is a time dummy variable. The green credit guidelines were officially published in February 2012. Therefore, if the sample year is 2012 and later, the variable is taken as 1, otherwise it is taken as 0.

### 3.2.3 Financing Constraint Index

Referring to the research of Jiang Fuxiu et al. (2016) and Li Wenjing et al. (2017), this paper uses KZ index to measure the level of enterprise financing constraints. The index is calculated by Kaplan and Zingales (1997). The larger the value, the higher the degree of financing constraints faced by enterprises. The calculation formula of KZ index is as follows:

$$KZ = -\frac{OCF}{Asset} + 3.14Leverage - 36.37\frac{Dividends}{Asset} - 1.31\frac{Cash}{Asset} + 0.28TobinQ \tag{1}$$

In the formula, OCF, asset, dividers and cash are operating net cash flow, total assets at the beginning of the period, dividends payable and cash holding level respectively, and leverage and tobinq represent asset liability ratio and Tobin Q value respectively. The larger the KZ index, the higher the level of corporate financing constraints and the more seriously affected by financing constraints.

### 3.2.4 Control Variable

Based on the research of Wang Yejing et al. (2021), Meng Qingbin et al. (2019), Zhang Yanchao et al. (2021) and Han Yanjin (2021), this paper sets 10 control variables, including enterprise size (Size0, return on total assets (ROA), asset liability ratio (Lev), cash flow (Cf), equity concentration (Top5), combined title of board chair and CEO (Dual), executive compensation (Pay), board size (Board), state-owned enterprise (Soe) and listed years (FirmAge).In addition, in this paper, in order to control the impact of industry and year variables on financial risk, the industry (Industry) dummy variables are set according to the industry classification standard of the industry guidelines for listed companies (2012) of the CSRC. And the year dummy variables are set according to the year. The definitions of all variables in this paper are shown in Table1.

Table 1: Variable definition table.

| Variable type         | Variable name              | Variable symbol | Definition   |
|-----------------------|----------------------------|-----------------|--|
| Dependent variables   | Enterprise Strategy        | Strategy        | Refer to the measurement methods of Bentley et al. (2013) and Wang Huacheng et al. (2016).                     |
| Independent variables | Time dummy variable        | Post            | Based on the green credit guidelines issued in 2012, it is 0 before implementation and 1 after implementation. |
|                       | Enterprise dummy variable  | Treated         | When the company belongs to heavy pollution industry, the value is 1; otherwise, the value is 0.               |
| Intermediary variable | Financing constraint level | KZ              | KZ index of Kaplan and Zingales (1997)   |
| Control variable      | Enterprise size            | Size            | Natural logarithm of total assets  |
|                       | Return on total assets     | ROA             | Net profit divided by total assets   |
|                       | Asset liability ratio      | Lev             | Total liabilities divided by total assets  |
|                       | Cash flow                  | Cf              | Net cash flow from operating activities divided by total assets  |

|                                       |         |   |
|---------------------------------------|---------|---|
| Equity concentration                  | Top5    | Shareholding ratio of the top five shareholders   |
| Combined title of board chair and CEO | Dual    | When the chairman and general manager are held by one person, it is 1, otherwise it is 0. |
| Executive compensation                | Pay     | Natural logarithm of top three executives' compensation                                   |
| Board size                            | Board   | Number of board directors   |
| State-owned enterprise                | Soe     | 1 for state-owned enterprises and 0 for non-state-owned enterprises                       |
| Listed years                          | FirmAge | Years of listing  |

### 3.3 Model Building

Taking listed companies in heavy pollution industries as the experimental group, this paper uses the following fixed effect double difference model to test the impact of green credit policy on enterprise strategy types. The specific model is as follows:

$$\begin{aligned}
 Strategy_{i,t} = & \alpha + \beta_1 Post_t \times Treated_i \\
 & + \beta_2 Treated_i + \beta_3 POST_t \\
 & + \sum Controls_{i,t} \\
 & + \sum Indus + \sum Year + \varepsilon_{i,t}
 \end{aligned} \quad (2)$$

In the model,  $Strategy_{i,t}$  is the enterprise strategy type of company  $i$  at time point  $t$ . The independent variable  $Treated_i$  is taken as 1 when company  $i$  belongs to heavy pollution industry, otherwise it is taken as 0, which individually reflects the strategic difference between heavy pollution enterprises and non heavy pollution enterprises. The independent variable  $Post_{i,t}$  is 1 after the promulgation of the green credit policy, otherwise it is 0, which reflects the difference of enterprise strategy before and after the implementation of the green credit policy. The coefficient  $\beta_1$  of the interaction term  $Post \times Treated$  measures the processing effect of green credit policy. Controls include a series of control variables at the company level. Industry and year control the fixed effects at the industry and year levels respectively, and  $\varepsilon_{i,t}$  is the random disturbance term. If  $\beta_1$  is significantly less than 0, it indicates that the implementation of green credit policy has significantly transformed heavy polluting enterprises from prospectors to defenders. At this time, H1a is assumed to be true. Conversely, if  $\beta_1$  is significantly greater than 0, H1b is assumed to be true.

Further, referring to the sequential test method of intermediary effect proposed by Wen Zhonglin and ye Baojuan (Wen, ye, 2014), this paper examines the role channels of green credit policy affecting

enterprise strategic transformation. The test procedures of intermediary effect are as follows:

$$\begin{aligned}
 Strategy_{i,t} = & \alpha + \beta_4 Post_t \times Treated_i \\
 & + \mu Controls + \varepsilon_{i,t}
 \end{aligned} \quad (3)$$

$$\begin{aligned}
 KZ_{i,t} = & \alpha + \varphi Post_t \times Treated_i \\
 & + \mu Controls + \varepsilon_{i,t}
 \end{aligned} \quad (4)$$

$$\begin{aligned}
 Strategy_{i,t} = & \alpha + \beta_5 Post_t \times Treated_i \\
 & + \tau KZ_{i,t} + \mu Controls + \varepsilon_{i,t}
 \end{aligned} \quad (5)$$

In the model, the intermediary variable  $KZ_{i,t}$  represents the financing constraint level of the enterprise. If the  $\varphi$  and  $\tau$  coefficients in equations (3) and (4) are statistically significant at the same time and the direction meets the expectation, it indicates that the intermediary effect exists, that is, the implementation of green credit will change the strategic type of the enterprise by changing the financing constraint level of the enterprise. At this time, it is assumed that H2 is true. If at least one of  $\varphi$  and  $\tau$  is not statistically significant, this paper adds a bootstrap test to judge whether the mediating effect exists.

## 4 EMPIRICAL RESULTS AND ANALYSIS

### 4.1 Descriptive Statistics

Table 2 presents the descriptive statistical results of the main variables. The average value of enterprise strategy index is 12.08 and the median is 12. It can be seen that Chinese listed companies are generally analyzers, which is neither too radical nor too conservative. The standard deviation of enterprise strategic indicators is 4.897, indicating that there are great differences in the strategic types of different enterprises. The average ROA of total asset return is 3.201%. The average value and median of equity concentration are 49.88% and 49.69% respectively, which is in line with the reality of equity concentration of Listed Companies in China. The

average value of property right is 0.582, which reflects that in the research sample of this paper,

state-owned enterprises account for 58.2% and non-state-owned enterprises account for 41.8%.

Table 2: Variable descriptive statistics.

| Variable | N     | mean  | median | sd    | min    | max   |
|----------|-------|-------|--------|-------|--------|-------|
| Strategy | 14966 | 12.08 | 12     | 4.897 | 2      | 24    |
| Post     | 14966 | 0.670 | 1      | 0.470 | 0      | 1     |
| Treated  | 14966 | 0.371 | 0      | 0.483 | 0      | 1     |
| KZ       | 14966 | 4.002 | 3.753  | 2.182 | -5.983 | 15.91 |
| Size     | 14966 | 22.33 | 22.20  | 1.250 | 19.12  | 25.92 |
| ROA      | 14966 | 3.201 | 2.968  | 5.809 | -25.62 | 21.07 |
| Lev      | 14966 | 49.22 | 50.08  | 19.87 | 5.353  | 89.27 |
| Cf       | 14966 | 4.583 | 4.455  | 7.185 | -15.56 | 23.95 |
| Top5     | 14966 | 49.88 | 49.69  | 14.97 | 19.41  | 88.46 |
| Dual     | 14966 | 0.173 | 0      | 0.379 | 0      | 1     |
| Pay      | 14966 | 14.28 | 14.29  | 0.772 | 12.15  | 16.21 |
| Board    | 14966 | 8.943 | 9      | 1.794 | 5      | 15    |
| Soe      | 14966 | 0.582 | 1      | 0.493 | 0      | 1     |
| FirmAge  | 14966 | 20.78 | 22     | 5.516 | 9      | 29    |

### 4.2 Correlation Analysis

Pearson correlation test was performed on the main variables, and the results are shown in Table 3. There is a significant positive correlation between the level of financing constraints KZ and the degree of enterprise strategic radicalization, indicating that the intensification of financing constraints makes the

enterprise's strategic choice more radical, which preliminarily verifies H2. In addition, the absolute values of correlation coefficients between variables are far less than 0.8, so there is no serious multi collinearity problem in the model. At the same time, most control variables have significant correlation with enterprise strategic progress indicators, and the setting of control variables is meaningful.

Table 3: Pearson correlation coefficient table.

|          | Strategy      | Post          | Treated       | KZ            | Size          | ROA           | Lev           | Cf            | Top5          | Dual  | Pay | Board | Soe | FirmAge |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------|-----|-------|-----|---------|
| Strategy | 1             |               |               |               |               |               |               |               |               |       |     |       |     |         |
| Post     | 0.201<br>***  | 1             |               |               |               |               |               |               |               |       |     |       |     |         |
| Treated  | 0.205<br>***  | -0.036<br>*** | 1             |               |               |               |               |               |               |       |     |       |     |         |
| KZ       | 0.039<br>***  | 0.164<br>***  | 0.054<br>***  | 1             |               |               |               |               |               |       |     |       |     |         |
| Size     | 0.064<br>***  | 0.221<br>***  | -0.008        | 0.074<br>***  | 1             |               |               |               |               |       |     |       |     |         |
| ROA      | -0.067<br>*** | -0.039<br>*** | 0.030<br>***  | 0.508<br>***  | 0.092<br>***  | 1             |               |               |               |       |     |       |     |         |
| Lev      | -0.036<br>*** | -0.107<br>*** | -0.050<br>*** | -0.545<br>*** | 0.374<br>***  | -0.338<br>*** | 1             |               |               |       |     |       |     |         |
| Cf       | 0.002         | -0.045<br>*** | 0.152<br>***  | 0.606<br>***  | 0.022<br>***  | 0.344<br>***  | -0.163<br>*** | 1             |               |       |     |       |     |         |
| Top5     | -0.046<br>*** | 0.040<br>***  | 0.024<br>***  | 0.128<br>***  | 0.324<br>***  | 0.147<br>***  | 0.047<br>***  | 0.100<br>***  | 1             |       |     |       |     |         |
| Dual     | 0.023<br>***  | 0.105<br>***  | -0.019<br>**  | 0.013<br>*    | -0.074<br>*** | -0.004        | -0.072<br>*** | -0.026<br>*** | -0.070<br>*** | 1     |     |       |     |         |
| Pay      | 0.060         | 0.369         | -0.135        | 0.237         | 0.486         | 0.241         | -0.004        | 0.063         | 0.118         | 0.037 | 1   |       |     |         |

|         |               |               |               |               |              |               |              |               |               |               |               |              |              |   |
|---------|---------------|---------------|---------------|---------------|--------------|---------------|--------------|---------------|---------------|---------------|---------------|--------------|--------------|---|
|         | ***           | ***           | ***           | ***           | ***          | ***           | ***          | ***           | ***           | ***           | ***           |              |              |   |
| Board   | -0.033<br>*** | -0.120<br>*** | 0.088<br>***  | 0.024<br>***  | 0.220<br>*** | 0.036<br>***  | 0.125<br>*** | 0.069<br>***  | 0.085<br>***  | -0.159<br>*** | 0.057<br>***  | 1            |              |   |
| Soe     | -0.037<br>*** | -0.184<br>*** | 0.023<br>***  | -0.077<br>*** | 0.163<br>*** | -0.041<br>*** | 0.185<br>*** | 0.022<br>***  | 0.136<br>***  | -0.244<br>*** | -0.121<br>*** | 0.258<br>*** | 1            |   |
| FirmAge | -0.173<br>*** | -0.351<br>*** | -0.007<br>*** | -0.162<br>*** | 0<br>***     | -0.013<br>*** | 0.229<br>*** | -0.008<br>*** | -0.082<br>*** | -0.174<br>*** | -0.136<br>*** | 0.106<br>*** | 0.371<br>*** | 1 |

Note: \*, \*\*, \*\*\* respectively indicate that the correlation between variables is significant at the statistical levels of 10%, 5% and 1%.

### 4.3 Parallel Trend Test

Bertrand (Bertrand 2004) pointed out that one of the preconditions for the effectiveness of the double difference estimation is that the experimental group and the control group meet the same trend hypothesis before being processed. Therefore, in order to verify the applicability of the DID model, this paper conducted a same trend test on the enterprise strategy types of the green credit policy experimental group and the control group, as shown in Figure 1 below.

The results show that before the implementation of the green credit policy in 2012, the growth trend of the enterprise strategic incentive progress of the experimental group and the control group remains roughly the same. While after the implementation of the policy, the growth trend of the strategic incentive progress of the experimental group and the control group is obviously different. Therefore, the premise of the same trend hypothesis is tenable, which means that it is appropriate to use DID model to test the impact of green credit policy on enterprise strategic incentive progress.

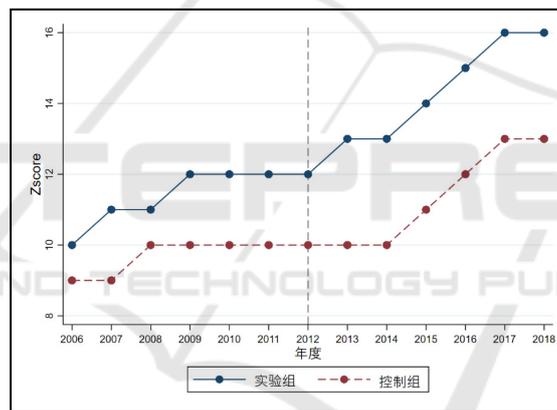


Figure 1: Parallel trend of enterprise strategic progress.

### 4.4 Regression Result Analysis

The benchmark regression results are shown in Table 4. Columns (1) and (2) of Table 4 show the regression results without control variables and with control variables respectively. The degree of enterprise strategic radicalization is significantly positively correlated with the implementation of green credit policy at the level of 1%, indicating that the green credit policy can significantly improve the strategic radicalization progress of heavily polluting enterprises whether or not the influence of other factors is controlled. Column (3) controls the impact of year and industry. The results show that the regression coefficient between green credit policy and enterprise strategic incentive progress is 0.858,

which is significant at the level of 1%, that is, after jointly controlling other factors, year and industry fixed effects, the implementation of green credit policy still plays a role in improving enterprise strategic incentive progress. Based on the regression results of column (1) (2) (3), hypothesis H1a is verified.

Table 4: Test of the impact of green credit policy on enterprise strategic progress.

| VARIABLES    | (1)<br>Strategy       | (2)<br>Strategy       | (3)<br>Strategy      |
|--------------|-----------------------|-----------------------|----------------------|
| Post×Treated | 3.002***<br>(34.74)   | 2.623***<br>(28.88)   | 0.858***<br>(7.22)   |
| Size         |                       | 0.346***<br>(8.23)    | 0.036<br>(1.13)      |
| ROA          |                       | -0.074***<br>(-9.61)  | -0.024***<br>(-4.34) |
| Lev          |                       | -0.010***<br>(-4.20)  | -0.005***<br>(-2.92) |
| Cf           |                       | 0.005<br>(0.90)       | 0.032***<br>(7.85)   |
| Top5         |                       | -0.028***<br>(-10.09) | -0.016***<br>(-8.14) |
| Dual         |                       | -0.091<br>(-0.87)     | -0.159**<br>(-2.16)  |
| Pay          |                       | 0.131**<br>(2.18)     | 0.074<br>(1.57)      |
| Board        |                       | -0.095***<br>(-4.23)  | -0.005<br>(-0.32)    |
| SOE          |                       | 0.440***<br>(4.93)    | 0.703***<br>(10.78)  |
| FirmAge      |                       | -0.136***<br>(-17.46) | 0.004<br>(0.60)      |
| Constant     | 11.293***<br>(270.13) | 7.376***<br>(8.46)    | 2.829***<br>(3.23)   |
| Year         | NO                    | NO                    | YES                  |
| Industry     | NO                    | NO                    | YES                  |
| Observations | 16,934                | 14,966                | 14,966               |
| R-squared    | 0.067                 | 0.102                 | 0.567                |

Note: \*, \*\*, \*\*\* respectively indicate that the correlation between variables is significant at the statistical levels of 10%, 5% and 1%. The value of *t* is in parentheses.

Table 5 shows the regression test results of the intermediary effect of corporate financing constraints. Among them, column (1) is the regression result when the intermediary variable is not included. At this time, the estimation coefficient of Post×Treated is significantly positive at the level of 1%, indicating that the implementation of green credit policy has significantly improved the strategic incentive progress of heavy polluting enterprises. Column (2) shows the regression results of the impact of policy implementation on intermediary variables. The estimation coefficient of Post×Treated is significantly positive at the level of 5%, indicating that green credit has significantly tightened the financing constraints of enterprises. Column (3) is the regression situation after the intermediary variable is included. It can be seen that the estimated coefficients of Post×Treated and KZ are significantly positive at the level of 1%, and the estimated coefficient of Post×Treated is lower than column (1), indicating that the financing constraint plays a significant intermediary role in the impact of green credit on the strategic incentive

progress of enterprises (Wen and Ye, 2014), which is verified. The influence path of "green credit → improvement of financing constraint level → improvement of enterprise strategic incentive progress". Based on the regression results of column (1) (2) (3), the hypothesis H2 is verified.

Table 5: Intermediary effect test of financing constraint level.

| VARIABLES    | (1)<br>Strategy      | (2)<br>KZ             | (3)<br>Strategy      |
|--------------|----------------------|-----------------------|----------------------|
| Post×Treated | 0.858***<br>(7.22)   | 0.088**<br>(2.25)     | 0.850***<br>(7.15)   |
| KZ           |                      |                       | 0.068***<br>(3.12)   |
| Size         | 0.036<br>(1.13)      | 0.370***<br>(35.58)   | 0.010<br>(0.29)      |
| ROA          | -0.024***<br>(-4.34) | 0.061***<br>(32.36)   | -0.028***<br>(-4.94) |
| Lev          | -0.005***<br>(-2.92) | -0.057***<br>(-98.59) | -0.002<br>(-0.72)    |
| Cf           | 0.032***<br>(7.85)   | 0.147***<br>(108.46)  | 0.023***<br>(4.38)   |
| Top5         | -0.016***<br>(-8.14) | 0.003***<br>(5.11)    | -0.016***<br>(-8.20) |
| Dual         | -0.159**<br>(-2.16)  | 0.038*<br>(1.74)      | -0.157**<br>(-2.14)  |
| Pay          | 0.074<br>(1.57)      | 0.112***<br>(7.31)    | 0.066<br>(1.41)      |
| Board        | -0.005<br>(-0.32)    | 0.016***<br>(2.92)    | -0.006<br>(-0.39)    |
| SOE          | 0.703***<br>(10.78)  | -0.019<br>(-0.84)     | 0.702***<br>(10.77)  |
| FirmAge      | 0.004<br>(0.60)      | -0.026***<br>(-14.34) | 0.005<br>(0.75)      |
| Constant     | 2.829***<br>(3.23)   | -4.270***<br>(-3.29)  | 3.112***<br>(3.53)   |
| Year         | YES                  | YES                   | YES                  |
| Industry     | YES                  | YES                   | YES                  |
| Observations | 14,966               | 22,664                | 14,966               |
| R-squared    | 0.567                | 0.692                 | 0.567                |

Note: \*, \*\*, \*\*\* respectively indicate that the correlation between variables is significant at the statistical levels of 10%, 5% and 1%. The value of t is in parentheses.

## 5 ROBUSTNESS TEST

### 5.1 Replace Interpreted Variable

Referring to the practice of Sun Jian et al. (2016), this paper replaces the strategic incentive progress index strategy with the dummy variable PROS representing offensive strategy and the dummy variable DEFE representing defensive strategy. When strategy  $\geq 18$ , PROS takes 1, otherwise 0. When strategy  $\leq 6$ , DEFE takes 1, otherwise 0. Then, according to the model (1), logit regression is used again for estimation. The regression results are shown in columns (1) and (2) of

table 6, and the research conclusions remain unchanged.

### 5.2 Change Estimation Method

In order to avoid the influence of company characteristics on the regression results, this paper controls the fixed effect at the company level and clusters the standard errors at the company level. The regression results are shown in column (3) in Table 6, and the research conclusions remain unchanged. At the same time, this paper changes the time interval of policy impact. The sample interval set in column (4)

(5) (6) in Table 6 is 2 years before and after the policy, 3 years before and after the policy, and 4 years before and after the policy. The regression result is

positive and significant, which is consistent with the previous conclusion.

Table 6: Robustness test results.

| VARIABLES    | Replace dependent variable |                       | Change estimation method | Change time interval |                   |                    |
|--------------|----------------------------|-----------------------|--------------------------|----------------------|-------------------|--------------------|
|              | (1)<br>PROS                | (2)<br>DEFE           | (3)<br>Firm Effect       | (4)<br>[-2,2]        | (5)<br>[-3,3]     | (6)<br>[-4,4]      |
| Post×Treated | 0.293***<br>(7.26)         | -1.294***<br>(-15.17) | 0.183***<br>(2.68)       | 2.05***<br>(12.82)   | 0.312**<br>(1.95) | 0.577***<br>(4.05) |
| KZ           |                            |                       |                          |                      |                   |                    |
| Convars      | Control                    | Control               | Control                  | Control              | Control           | Control            |
| Constant     | 9.958<br>(25.17)           | -1.886<br>(-3.69)     | 19.984<br>(16.23)        | 8.056<br>(5.40)      | 1.844<br>(1.27)   | 2.016<br>(1.72)    |
| Year         | YES                        | YES                   | YES                      | YES                  | YES               | YES                |
| Industry     | YES                        | YES                   | YES                      | YES                  | YES               | YES                |
| Firm         | NO                         | NO                    | YES                      | NO                   | NO                | NO                 |
| R2           | 0.29                       | 0.09                  | 0.11                     | 0.27                 | 0.52              | 0.53               |

### 5.3 Propensity Score Matching(PSM)

In order to avoid the deviation of the results caused by the possible problem of sample self selection, this paper uses the propensity score matching method (PSM) to perform 1:1 nearest neighbor matching on the samples. Like the main regression, this paper successively matches the control variables in the PSM robustness test, including Size, ROA, Lev, Cf, Top5, Dual, Pay, Board, Soe, FirmAge. The matching process is shown in Fig.2. From the value and comparison relationship of the specific statistics of each variable before and after matching, it can be seen that there are significant differences in each variable before matching, and there is no significant difference in the mean value of each variable after matching. After the nearest neighbor matching of the control variables, the double difference model is used for regression estimation again. The regression results of PSM-DID are shown in Table 7. The empirical results of this paper are robust, and the research conclusion is still valid.

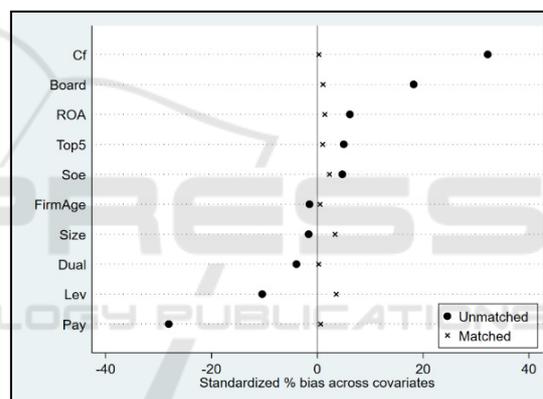


Figure 2: Results before and after PSM matching.

Table 7: PSM-DID Inspection results.

| VARIABLES    | (1)<br>Strategy       | (2)<br>Strategy     | (3)<br>Strategy    |
|--------------|-----------------------|---------------------|--------------------|
| Post×Treated | 2.920***<br>(32.23)   | 2.625***<br>(28.90) | 0.860***<br>(7.23) |
| Convars      | NO                    | YES                 | YES                |
| Constant     | 11.381***<br>(256.23) | 7.404***<br>(8.49)  | 2.866***<br>(3.27) |
| Year         | NO                    | NO                  | YES                |
| Industry     | NO                    | NO                  | YES                |
| Observations | 14,961                | 14,961              | 14,961             |
| R-squared    | 0.065                 | 0.103               | 0.567              |

## 6 CONCLUSION AND ENLIGHTENMENT

At present, China is vigorously developing green finance and promoting the green transformation of key industries and important fields. The introduction of green credit policy is of great significance to guide heavy polluting enterprises to carry out strategic transformation and realize green development as soon as possible. Based on this, this paper takes the formal implementation of the green credit guidelines in 2012 as a quasi natural experiment, selects China's A-share listed companies from 2006 to 2018 as a research sample, constructs a PSM-DID model to quantitatively evaluate the impact of green credit policy on enterprise strategy and its action mechanism. The study found that: First, after the implementation of the green credit policy, the strategic incentive progress of heavy polluting enterprises has been significantly improved. After a series of robustness tests such as replacing the dependent variable, changing the estimation method and changing the time interval, the conclusion is still valid. Second, according to the intermediary effect test, financing constraints play a significant intermediary role in the impact of green credit on enterprise strategic incentive progress. The green credit policy intensifies the financing constraints of heavy polluting enterprises, and then promotes the strategy of heavy polluting enterprises from attack to defense. Based on the above conclusions, the empirical results of this paper have the following enlightenment for the improvement and follow-up implementation of green credit policy:

First, local governments should vigorously implement the green credit policy to ensure that the policy is implemented in place. The government and commercial banks should give full play to the financing punishment effect of green credit policy and adjust the opportunity cost of environmental pollution through credit channels, so as to promote heavily polluting enterprises to increase clean investment and reduce polluting investment. Therefore, heavily polluting enterprises will have the motivation to carry out green innovation and strategic transformation. Second, local governments should actively optimize the systems and regulations related to green credit, establish an evaluation system for the effect of policy implementation according to the actual development of local enterprises, improve the relevant institutional environment and ensure the effect of policy implementation. Third, avoid "one size fits all" green credit. Even if the empirical results show that the green credit policy promotes the

heavily polluting enterprises to seek more radical strategic transformation, the financing constraints brought by the policy actually cause some obstacles to the green transformation of enterprises. Enterprises show more passive stress response, while active strategic response is insufficient. Therefore, local governments and banking institutions can provide financial support for environmental protection investment and green development for heavy polluting enterprises in combination with the actual situation, so as to better guide the green transformation of heavy polluting enterprises and stimulate the transformation power of enterprises.

## REFERENCES

- Allet M, Hudon M. Green Microfinance: Characteristics of Microfinance Institutions Involved in Environmental Management[J]. *Journal of Business Ethics*, 2015, 126(3):395-414.
- Bentley, K. A., Omer, T. C., Sharp. N. Y. Business Strategy, Financial Reporting Irregularities, and Audit Effort. *Contemporary Accounting Research*, 2013, 30(2): 780-817.
- Bertrand, M. How much should we trust differences-in-differences estimates[J]. *Risk Management and Insurance Review*, 2004, 119(1): 173-199.
- Chen Qi Has China's green credit policy been implemented -- Based on the analysis of loan scale and cost of "two high and one surplus" enterprises [J] *Contemporary finance and economics*, 2019 (3): 118-129.
- Chen Xingxing, Shi Yaya, song Xianzhong Green credit constraints, commercial credit and corporate environmental governance [J] *International financial research*, 2019, (12): 13-22.
- Fazzari S M, Petersen B C , Hubbard R G . Investment, Financing Decisions, and Tax Policy[J]. *Social Science Electronic Publishing*, 1998, 78(2): 200-205.
- Gayané Hovakimian. Financial constraints and investment efficiency: Internal capital allocation across the business cycle[J]. *Journal of Financial Intermediation*, 2011, 20(2): 264-283.
- Han Yanjin Enterprise strategic difference and executive compensation -- new evidence from efficiency contract theory [J] *Scientific research management*, 2021, 42(02): 181-189.
- Higgins, D., Omer, T. C., Phillips, J. D. The Influence of a Firm's Business Strategy on Its Tax Aggressiveness. *Contemporary Accounting Research*, 2015, 32(2): 674-702.
- Jiang Fuxiu, Shi Beibei, Ma Yunbiao Financial experience of information publishers and corporate financing constraints [J] *Economic research*, 2016, 51(06): 83-97.
- Kaplan, S. N. and Luigi, Z., 1997, "Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?", *Quarterly Journal of Economics*, (1): 169-215.

- Li Wenjing, Li Mangmang "Entity + finance": financing constraints, policy catering or market competition—— Empirical research based on different property rights [J] Financial research, 2017 (08): 100-116.
- Liu X H, Wang E X, Cai D T. Green credit policy, property rights and debt financing: Quasi-natural experimental evidence from China[J]. Finance Research Letters, 2019, 29: 129-135.
- Meng Qingbin, Li Xinyu, Zhang Xiuping Short selling mechanism, capital market pressure and corporate strategic choice [J] China industrial economy, 2019 (08): 155-173.
- Miles, R. E., Snow. C. C. Organizational Strategy, Structure and Process. New York: McGraw-Hill Press, 1978.
- Miles, R. E., Snow. C. C. Organizational Strategy, Structure, and Process. Stanford, CA: Stanford University Press, 2003.
- Shen Hongtao, Ma Zhengbiao Regional economic development pressure, enterprise environmental performance and debt financing [J] Financial research, 2014, (02): 153-166.
- Su Dongwei, Lian Lili Does green credit affect the investment and financing behavior of heavily polluting enterprises? [J]. Financial research, 2018, (12): 123-137.
- Sun Jian, Wang Baiqiang, Cao Feng, Liu xiangqiang Does corporate strategy affect earnings management? [J]. Management world, 2016 (03): 160-169 DOI: 10.19744/j.cnki.11-1235/f.2016.03.013.
- Wang Huacheng, Zhang Xiuping, Gao Shenghao Does corporate strategy affect over investment [J] Nankai management review, 2016, 19 (04): 87-97 + 110.
- Wang Liping, Xu Jiahui, Li Chuang Action mechanism and stage evolution of green financial policy promoting enterprise innovation [J] Soft science: 1-11.
- Wang Xin, Wang Ying Research on green credit policy promoting green innovation [J] Management world, 2021, 37 (06): 173-188 + 11.
- Wang Yanli, Lei Xiaodong, long Ruyin Does the green credit policy improve the investment efficiency of enterprises—— From the perspective of financial resource allocation of heavily polluting enterprises [J] China population, resources and environment, 2021, 31 (01): 123-133.
- Wang Yejing, Liu Yong, Shan Peng Research on the impact of entrepreneurial orientation on enterprise strategic focus [J] Scientific research: 1-16.
- Wen Subin, Zhou Liuli Influence mechanism of enterprise carbon information disclosure on financial performance -- the "inverted U" regulation of media Governance [J] Management review, 2017, 29 (11): 183-195.
- Wen Zhonglin, ye Baojuan Intermediary effect analysis: method and model development [J] Progress in psychological science, 2014, 22 (5): 731-745.
- Wu chaopeng, Wu Shinong, Cheng Jingya, Wang Lu An empirical study on the impact of venture capital on the investment and financing behavior of Listed Companies [J] Economic research, 2012, 47 (01): 105-119 + 160.
- Xu Sheng, Zhao Xinxin, Yao Shuang Effect analysis of green credit on industrial structure upgrading [J] Journal of Shanghai University of Finance and economics, 2018, 20 (02): 59-72.
- Zhan Hua How green credit affects enterprise environmental information disclosure -- An Empirical Test Based on listed enterprises in heavy pollution industries [J] Nankai economic research, 2021, (03): 193-207.
- Zhang Yanchao, sun Guangguo, Chen Siyang Industrial policy, resource allocation and enterprise strategy [J] Macroeconomic research, 2021 (06): 17-33 + 92.
- Zhu Zhaohui, Tan Yafei Contract supervision and investment efficiency of heavily polluting enterprises - a quasi natural experiment based on green credit guidelines [J] East China economic management, 2020, 34 (10): 74-86.