

The Impact of Green Factory Rating on Corporate ESG Performance

Yihan Zhao*

International College, Jiangxi University of Finance and Economics, Nanchang, China, 330013

*Corresponding author: 13979188078@163.com

Abstract. Against the backdrop of the "dual carbon" goal and the deepening of the green development concept, this paper adopts the data of China's A-share listed companies from 2012 to 2023, and takes the green factory rating policy as an entry point to test the impact of this policy on the ESG performance of firms and its internal mechanism. The results show that firms awarded with green factories are conducive to enhancing their ESG performance. Mechanism analysis shows that green factory rating can promote corporate ESG performance through two paths: alleviating financing constraints and stimulating green innovation. Heterogeneity analysis finds that the policy has a more significant effect on the ESG performance of enterprises in low-carbon pilot cities and eastern regions. This paper provides empirical evidence and decision-making reference for improving the green industrial policy system and promoting the practice of corporate sustainable development.

Keywords: Green factory rating, ESG performance, Financing constraints, Green innovation.

1. Introduction

With the acceleration of the global climate governance process and the transformation of China's economy to high-quality development, the environmental responsibility and sustainable development ability of enterprises have become the key dimensions of their core competitiveness. ESG performance, as a comprehensive evaluation system integrating the environment, society, and governance, has become an important link between corporate micro-behaviour and macro-sustainability goals [1]. Existing studies have widely revealed the interaction between ESG and various variables, that high levels of ESG performance can help reduce corporate financing costs[2] and enhance corporate market value and long-term valuation[3], that larger firms are more likely to carry out ESG practices due to their resource endowment advantages, and that firms with a higher proportion of institutional investor shareholdings usually have better ESG performance. In this context, China's green factory rating policy since 2016, as a key environmental regulatory tool led by the government, how to act on the ESG performance of enterprises through financing constraints, green innovation and other mechanisms to promote the synergy between economic development and ecological protection has become a core issue of concern for academics and policy makers.

Industry is the main area of energy consumption and pollution emission in China, and its green transformation is the key to achieving the "double carbon" goal. In order to promote the green development of the industrial sector, China has implemented the green factory assessment policy since 2016 based on the "General Rules for Green Factory Evaluation", which comprehensively evaluates enterprises in the five dimensions of "plant intensification, harmlessness of raw materials, cleanliness of production, resourcefulness of wastes, and low-carbon energy", and selects green manufacturing benchmark enterprises by means of official certification. By 2023, 1,713 national green factories have been announced on the official website of the Ministry of Industry and Information Technology (MIIT), covering 31 major manufacturing categories such as iron and steel, chemicals, food, etc., and the influence of the policy continues to expand. It has been shown that the rating can alleviate the information asymmetry between enterprises and market players through the signalling effect, and at the same time help enterprises to obtain institutional legitimacy and then policy support such as tax incentives [5]. However, the existing literature mostly focuses on the impact of green factory rating on the single environmental performance of enterprises, and the research on the

mechanism of the policy effect on the ESG performance of enterprises is still weak. The enhancement of enterprise ESG performance depends on resources [4], green factory assessment can alleviate financing constraints by sending signals to financial institutions, as well as forcing enterprises to green innovation with mandatory requirements [5], two paths to influence enterprise ESG performance, and the policy effect of green factory assessment may be heterogeneous due to regional and other factors, but the existing research has not yet been explored in depth.

In view of this, this paper takes Chinese A-share listed companies from 2012 to 2023 as the research sample to test the impact of green factory rating on corporate ESG performance, and deeply analyses the mediating roles of financing constraints and green innovation, as well as examines the moderating effects of low-carbon city pilots and regional differences. The research contribution of this paper is mainly reflected in the following: firstly, it expands the research on the economic consequences of the green factory rating policy, and enriches the evaluation dimension of the policy effect from the comprehensive perspective of ESG three-dimension; secondly, it reveals the double intermediary mechanism of financing constraints and green innovations, which provides micro-evidence for understanding how the policy affects the ESG performance of enterprises; thirdly, it examines the heterogeneous characteristics of the policy effect, which provides empirical references for the formulation of the differentiated green industrial policies provides empirical references.

2. Theoretical Analysis and Research Hypotheses

2.1. The Impact of Green Factory Rating on Corporate ESG Performance

From the perspective of signalling theory, the "green compliance signal" conveyed by green factory certification will prompt companies to further strengthen ESG practices in all dimensions. The market recognition brought by the signal transmission will force enterprises to improve the internal governance structure and social responsibility system, and thus achieve synergistic improvement [1]. From the perspective of organisational legitimacy theory, being assessed as a green factory means that the enterprise is in line with the national green development orientation, and is able to obtain policy support from the local government. In addition, green factory certification can effectively improve the relationship with stakeholders and enhance its legitimacy so as to gain a competitive advantage [6]. Stakeholders will legitimately supervise the management, which will inhibit the short-sighted behaviour of the enterprise management and promote the enterprise to continuously improve its environmental performance and governance capacity, thus enhancing its own ESG performance.

Based on the above analysis, the following hypothesis is proposed:

Hypothesis 1: Green factory rating has a positive effect on corporate ESG performance.

2.2. The Influence Mechanism of Green Factory Assessment on Corporate ESG Performance

2.2.1 Financing constraint effects

Referring to the study of Du Ran et al [6], this paper will clarify the relationship between green factory rating and enterprise ESG performance based on the financing constraint perspective. Green factories synergise credit preferences, government subsidies and market credits to provide financing loans to rated enterprises, effectively alleviating their financing constraints. The effective alleviation of financing constraints provides financial support and policy guidance for corporate ESG practices. The expansion of long-term credit scale can provide abundant external funds for enterprise development, reduce the cost of credit, ease the financing constraints of enterprises, and provide direct financial support for the ESG practice of enterprises.

Based on the above analysis, the following hypothesis is proposed:

Hypothesis 2: Green factory ratings can enhance firms' ESG performance through financing constraint effects.

2.2.2 Green innovation effect

The evaluation procedure of green factory requires enterprises to implement the green development concept in the whole process from the initial stage of production to the whole production process. This helps to force enterprises to carry out green innovation [5]. Green innovation is also a core means for enterprises to improve environmental performance, which can simultaneously optimise the social and governance dimensions of ESG [7]. From the environmental dimension, green innovation directly promotes enterprise ESG performance improvement. Enterprises reduce carbon emission intensity through the development of low-carbon production technologies and improve resource utilisation through the development of waste recycling processes, which are directly related to the core indicators of the ESG environmental dimension. From the social and governance dimension, green innovation has significant spillover effects. The technology research and development system formed in the process of green innovation will force enterprises to improve their internal governance structure, which will in turn enhance the normality of the governance dimension [8].

Based on the above analysis, the following hypothesis is proposed:

Hypothesis 3: Green factory rating improves ESG performance of companies through green innovation effect.

3. Model Specification

3.1. Baseline Regression Model

In order to explore the impact of green factory rating on corporate ESG performance, this paper sets up a benchmark regression model as shown below:

$$ESG_{i,t} = \alpha_0 + \alpha_1 Gf_{i,t} + \sum \alpha_k Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

Among this, the subscripts i and t denote firms and years, respectively, and $ESG_{i,t}$ is the explanatory variable, that is, corporate ESG performance. $Gf_{i,t}$ is the core explanatory variable, if the firm is a green factory, the value is 1, otherwise it is 0. To control for other factors that may affect the ESG performance of a firm, a set of control variables is selected. The model incorporates firm- and year-level fixed effects to eliminate the effects of firm differences and time trends, μ_i is firm fixed effect, λ_t is year fixed effect, $\varepsilon_{i,t}$ denotes the random error term in the model. α_1 is the core coefficients of interest in this paper, describes the impact of green factory ratings on corporate ESG performance, if α_1 is significantly positive, it means that the green factory rating boosts the ESG performance of the company and vice versa.

3.2. Sample Selection and Data Sources

This paper selects A-share listed companies from 2012 to 2023 as the research sample, in order to ensure the accuracy of the data, referring to the study of Du Ran et al, the data of listed companies are processed as follows: (1) exclude the enterprises with ST or PT during the sample period; (2) exclude the data of the enterprises with the gearing ratio of less than 0 or greater than 1; (3) exclude the data of financial companies; (4) exclude the data of the financial indexes or other indexes data with serious missing data. In order to avoid the influence of outliers, continuous variables are subjected to 1 per cent reduction of the upper and lower tails. The list of green factory ratings comes from the official website of the Ministry of Industry and Information Technology. Enterprise data are from CSMAR and WIND databases.

3.3. Variable Measurement

3.3.1 Measurement of the Green Factory Rating

Green factory recognition follows the assessment standards of the General Principles for Green Factory Evaluation, and carries out assessment in five dimensions of "plant intensification,

harmlessness of raw materials, clean production, resourcefulness of wastes, low-carbon energy", and determines the final list through local recommendation, expert audit, and social publicity. If an enterprise is recognised as a "Green Factory" by the Ministry of Industry and Information Technology, it will be assigned a value of 1; otherwise, it will be 0.

3.3.2 Measurement of the Corporate ESG Performance

Referring to the study of Mao Qilian and Wang Yueqing [1], this paper adopts the CSI ESG rating score to measure corporate ESG performance. The score is based on the three dimensions of environment (E), society (S), and governance (G), and quantifies corporate sustainability practices through a standardised indicator system (covering carbon emission intensity, employee training investment, board independence and other sub-indicators), with a score range of 1 to 7 (1 being the worst ESG performance and 7 being the best).

3.3.3 Control Variables

In this paper, I refer to the studies of Huang Q [8], Meng Xianghui and Li Junlin [9], and select the following control variables: (1) Firm Size (Size), measured by the natural logarithm of the firm's total assets; (2) Leverage (Lev), measured by the ratio of total liabilities to total assets; (3) Liquidity Ratio (Liq), measured by the ratio of current assets to current liabilities; (4) Tobin Q (Tobin), measured using the ratio of the market value of the firm to its replacement cost; (5) Asset Structure (Structure), measured using the ratio of the sum of Net Fixed Assets and Net Inventory to Total Assets; and (6) Equity Structure (Top1), measured using the percentage of shares held by the first largest shareholder.

3.3.4 Mediating mechanism variables

This paper involves two types of mediating mechanism variables: (1) Financing Constraints (SA). Referring to the study of Ju et al [4], the SA index is used to measure the degree of corporate financing constraints, reflecting the restrictions on access to external funds faced by firms due to information asymmetry and agency conflicts. (2) Green Innovation (Green Patent, GP). Referring to the research of Wang Xin and Wang Ying [7], the level of green innovation is measured by the number of green patent applications of enterprises, which reflects the technological breakthroughs and innovation ability of enterprises in the areas of "cleaner production and low-carbon energy".

3.4. Descriptive Statistics

Table 1 presents the descriptive statistics of the study variables. At the sample level, except for the Tobin Q value (Tobin), which has a sample size of 5012 due to missing data on the market capitalisation of some enterprises, the remaining variables cover 5076 observations, with high sample coverage and good representativeness. The core variable Gf has reasonable fluctuations with ESG and control variables, which provides data support for subsequent empirical tests of the impact of green factory rating on ESG performance.

Table 1 Descriptive Statistics

| Variable Name | Observations | Mean | Standard Deviation | Min | 1/4 percentile | Median | 3/4 percentile | Max |
|---------------|--------------|-------|--------------------|--------|----------------|--------|----------------|-------|
| ESG | 5076 | 4.300 | 0.830 | 1 | 4 | 4.250 | 5 | 7 |
| Gf | 5076 | 0.310 | 0.460 | 0 | 0 | 0 | 1 | 1 |
| Size | 5076 | 22.84 | 1.190 | 19.87 | 22 | 22.68 | 23.56 | 26.88 |
| Lev | 5076 | 0.440 | 0.170 | 0.0300 | 0.310 | 0.440 | 0.580 | 0.920 |
| Liq | 5076 | 1.960 | 1.590 | 0.170 | 1.120 | 1.510 | 2.230 | 22.83 |
| Tobin | 5012 | 1.830 | 1.200 | 0.660 | 1.170 | 1.470 | 2.050 | 21.30 |
| Structure | 5076 | 0.400 | 0.150 | 0.0200 | 0.290 | 0.390 | 0.500 | 0.850 |
| Top1 | 5076 | 33.33 | 14.35 | 3.620 | 21.80 | 31.43 | 42.79 | 85.23 |

4. Empirical Results Analysis

4.1. Baseline Regression

Table 2 reports the test results of the baseline regression model. Column (1) is the result of not including control variables and only considering the effect of green factory rating on firms' ESG performance. Further, column (2) adds firm-level control variables with firm-year double fixed effects to the results in column (1). The empirical results all indicate that green factory accreditation significantly enhances firms' ESG performance.

Table 2 Baseline Regression Results

| | (1) ESG | (2) ESG |
|---------------------|-----------------------|------------------------|
| Gf | 0.1779*** (0.0250) | 0.1275*** (0.0318) |
| Size | | 0.3397*** (0.0289) |
| Lev | | -0.6185*** (0.1260) |
| Liq | | 0.0034 (0.0102) |
| Tobin | | 0.0026 (0.0120) |
| Structure | | -0.2679** (0.1247) |
| Top1 | | -0.0003 (0.0016) |
| _cons | 4.2477*** (0.0140) | -3.1179*** (0.6614) |
| N | 5076 | 5012 |
| adj. R ² | 0.0097 | 0.4687 |

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The values in parentheses are cluster-robust standard errors. All regressions in this study cluster standard errors at the firm level. It applies to all subsequent tables.

4.2. Endogeneity Analysis

Firm self-selection bias in the green factory identification process may lead to biased causality estimation in the benchmark regression. To mitigate the endogeneity, this paper utilizes the policy shock property of green factory recognition to construct a natural experiment using the double difference method (DID) to separate the net effect of the policy.

The sample is divided into two categories: treatment group (Treat=1): firms with green factory recognition control group (Treat=0): firms without recognition; time dummy variable (Post=1): after the implementation of the green factory recognition (including the year of the recognition); the interaction term, DID = Treat×Post, inscribes the net effect of the policy on the treatment group. The regression model is:

$$ESG_{i,t} = \alpha_0 + \alpha_1 DID_{i,t} + \sum \alpha_k Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

Among this, μ_i is firm fixed effect, λ_t is year fixed effect.

In Table 3, column (1) is a parsimonious model with no control variables and the DID coefficient is 0.1145, indicating that green factory accreditation improves firms' ESG scores by 0.115 points on average. After adding control variables in column (2), the DID coefficient rises to 0.1275 and the

explanatory power of the model is enhanced. The positive impact of the policy remains significant even when controlling for characteristics such as firm size and gearing ratio. This result suggests that green factory certification not only "screens" ESG-performing enterprises, but also directly promotes enterprises to optimise ESG practices through policy incentives and compliance constraints.

The core logic of DID is "double-difference offsetting inherent differences": through the "time-trend difference" between the treatment group (recognised enterprises) and the control group (non-recognised enterprises), the interference of enterprises' innate ESG advantages is removed. In this study, the continued significance of the DID coefficients verifies the exogenous shock property of the policy [10]—the impact of green factory certification on ESG performance is not a continuation of the firm's inherent characteristics, but a result of the policy intervention.

In summary, the DID estimation initially mitigates the self-selection bias and supports the causal conclusion that "green factory certification significantly enhances corporate ESG performance".

Table 3 Endogeneity Analysis

| | (1) DID1 | (2) DID2 |
|----------------------------|-----------------------|------------------------|
| did | 0.1145*** (0.0321) | 0.1275*** (0.0318) |
| Size | | 0.3397*** (0.0289) |
| Lev | | -0.6185*** (0.1260) |
| Liq | | 0.0034 (0.0102) |
| Tobin | | 0.0026 (0.0120) |
| Structure | | -0.2679** (0.1247) |
| Top1 | | -0.0003 (0.0016) |
| _cons | 4.2676*** (0.0132) | -3.1179*** (0.6614) |
| <i>N</i> | 5076 | 5012 |
| adj. <i>R</i> ² | 0.4532 | 0.4687 |

4.3. Robustness Tests

4.3.1 Alternative Measurement of ESG

As mentioned earlier, listed companies have an incentive to exaggerate ESG performance and mislead rating agencies to give different ratings. To avoid this problem, the model is further re-estimated using Bloomberg ESG rating data as the key explanatory variable [11]. Column (1) of Table 4 shows that the estimates remain significantly positive at the 1% level. Although the absolute values of the coefficients are amplified by the differences in rating systems, the direction of significance is exactly the same as that of the benchmark regression, suggesting that the promotional effect of green factories on ESG performance is stable irrespective of the third-party ESG measure used.

4.3.2 Changing the sample interval

In May 2015, the State Council officially issued "Made in China 2025", which proposed the concept of green factories for the first time. The starting year of the benchmark regression sample is 2012, which contains data from the "pre-shock period" when the policy has not yet come into effect, which may interfere with the estimation results. In this paper, we shrink the sample interval to 2015-2023 after the policy is proposed to exclude the interference of early non-policy-driven ESG practices.

Column (2) of Table 4 shows that the regression coefficient of Gf is 0.0859, which is still significantly positive at the 5% level, suggesting that green factory ratings do promote firms' ESG performance.

4.3.3 Lagged Dependent Variable

Considering that the impact of green factory rating on corporate ESG performance may be lagged, this paper conducts a robustness test by extending the time of the impact of green factory rating. Column (3) in Table 4 lags the explanatory variables by 1 period, and the results show that green factory rating has a significant contribution to corporate ESG performance, which is consistent with the results of the benchmark regression.

Table 4 Robustness Tests

| | (1) Bloomberg ESG | (2) 2015-2023 | (3) Lagged Dependent Variable |
|---------------------|-------------------------|------------------------|----------------------------------|
| Gf | 1.3193*** (0.3507) | 0.0859** (0.0349) | 0.1674*** (0.0321) |
| Size | 2.8345*** (0.3371) | 0.2798*** (0.0404) | 0.2603*** (0.0313) |
| Lev | -5.1911*** (1.6215) | -0.4673*** (0.1690) | -0.0262 (0.1373) |
| Liq | 0.1644 (0.1093) | 0.0226 (0.0168) | 0.0285** (0.0130) |
| Tobin | 0.0377 (0.1057) | 0.0023 (0.0138) | -0.0079 (0.0123) |
| Structure | -2.0595 (1.5272) | -0.2303 (0.1673) | -0.0378 (0.1359) |
| Top1 | 0.0137 (0.0198) | -0.0066*** (0.0022) | -0.0007 (0.0018) |
| _cons | -34.4542*** (7.8658) | -1.7214* (0.9284) | -1.7223** (0.7191) |
| N | 2165 | 3758 | 4590 |
| adj. R ² | 0.8145 | 0.4906 | 0.4824 |

5. Heterogeneity Analysis

5.1. Heterogeneity of Low Carbon City Pilot

In this paper, I take the three batches of "low-carbon city pilot lists" announced by the National Development and Reform Commission (NDRC) from 2010 to 2017 as the grouping dimension, and explore the synergistic empowerment differences between green factory policies and low-carbon pilot policies. As shown in columns (1) and (2) of Table 5, the regression coefficients of green factories are significantly higher in low-carbon pilot cities than in non-low-carbon pilot cities, which indicates that green factories are more conducive to the enhancement of corporate ESG performance in low-carbon pilot cities. The reason is that low-carbon pilot cities have a more complete low-carbon policy system and a green development atmosphere, which creates a synergistic effect with the green factory policy and promotes the ESG practice of enterprises.

5.2. Heterogeneity of Regions

In this paper, I will investigate the heterogeneous effects of green factory rating on firms' ESG performance in different regions, and the results, as shown in columns (3) and (4) of Table 5, show that the regression coefficients of green factories are higher in the eastern region than in the central and western regions, which suggests that the implementation of the green factory rating policy is

more conducive to the enhancement of firms' ESG performance in the eastern region compared with the central and western regions. The possible reasons for this are that eastern cities usually provide more support in terms of cash subsidies, tax incentives, and government procurement, and also have stronger environmental regulations, which leads to the fact that enterprises in eastern cities have a much higher motivation to apply for green factory certification and are much more beneficial than enterprises in the central and western regions.

Table 5 Heterogeneity Analysis

| | (1) No Low-carbon pilot cities | (2) Low-carbon pilot cities | (3) East regions | (4) Central and western regions |
|---------------------|--------------------------------------|-----------------------------------|------------------------|---------------------------------------|
| Gf | 0.0798* (0.0451) | 0.1608*** (0.0481) | 0.1324*** (0.0411) | 0.1257** (0.0505) |
| Lev | 0.2617*** (0.0451) | 0.3641*** (0.0404) | 0.3768*** (0.0362) | 0.2842*** (0.0519) |
| Lev | -0.6528*** (0.1797) | -0.3505* (0.1948) | -0.7690*** (0.1670) | -0.4022** (0.1970) |
| Tobin | 0.0042 (0.0143) | 0.0103 (0.0151) | -0.0064 (0.0130) | 0.0199 (0.0168) |
| Tobin | 0.0030 (0.0160) | 0.0121 (0.0193) | 0.0197 (0.0158) | -0.0245 (0.0190) |
| Top1 | -0.0213 (0.1769) | -0.3317* (0.1905) | -0.2517 (0.1601) | -0.3293 (0.2024) |
| Top1 | 0.0053** (0.0024) | -0.0077*** (0.0024) | 0.0015 (0.0022) | -0.0020 (0.0025) |
| _cons | -1.6352 (1.0237) | -3.5121*** (0.9310) | -3.8853*** (0.8336) | -1.9865* (1.1759) |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes |
| N | 2473 | 2420 | 3021 | 1990 |
| adj. R ² | 0.4849 | 0.4666 | 0.4583 | 0.4590 |

6. Mechanism Test

The impact of green factory rating on corporate ESG performance is not a single path, but is achieved through a chain of transmission formed by alleviating financing constraints and empowering green innovation. In this paper, we adopt a three-step mediation effect model and Bootstrap confidence interval test to systematically identify the significance and relative contribution of the two types of mechanisms.

6.1. Financing constraint mechanisms

Financing constraint is essentially a resource mismatch under market friction, and enterprises are unable to obtain external funds at a reasonable cost due to information asymmetry and agency conflicts, resulting in ESG practices being limited by internal cash flow. Green factories can reduce the information asymmetry between enterprises and the capital market through the signalling effect, alleviate the financing constraints, and provide financial support for environmental governance and social responsibility inputs in ESG practices. The results are shown in columns (1), (2), and (3) of Table 6, and the coefficients of green factories are all significantly positive, indicating that enterprises can significantly alleviate their financing constraints after obtaining the certification of green factories, which in turn significantly promotes ESG performance.

Table 6 Financing constraint mechanisms

| | (1) Gross effect | (2) Gf→SA | (3) Gf+SA→ESG |
|---------------------|------------------------|------------------------|------------------------|
| Gf | 0.1275*** (0.0318) | 0.0212*** (0.0024) | 0.1094*** (0.0320) |
| Size | 0.3397*** (0.0289) | 0.0700*** (0.0022) | 0.2800*** (0.0320) |
| Lev | -0.6185*** (0.1260) | -0.0946*** (0.0094) | -0.5379*** (0.1271) |
| Liq | 0.0034 (0.0102) | 0.0063*** (0.0008) | -0.0020 (0.0103) |
| Tobin | 0.0026 (0.0120) | 0.0095*** (0.0009) | -0.0056 (0.0122) |
| Structure | -0.2679** (0.1247) | 0.0973*** (0.0093) | -0.3509*** (0.1260) |
| Top1 | -0.0003 (0.0016) | 0.0004*** (0.0001) | -0.0006 (0.0016) |
| SA | | | 0.8530*** (0.1984) |
| _cons | -3.1179*** (0.6614) | -5.5111*** (0.0492) | 1.5832 (1.2771) |
| N | 5012 | 5012 | 5012 |
| adj. R ² | 0.469 | 0.969 | 0.471 |

6.2. Green innovation mechanisms

The mandatory requirements of green factories for "cleaner production and lower carbon energy" have forced enterprises to achieve technological breakthroughs through green innovation. Green innovation can directly optimise the environmental dimension of ESG and strengthen the governance and social dimensions through the "innovation spillover effect". As shown in Table 7, the regression coefficients of green factories are all significantly positive, indicating that the green factory rating can significantly improve the level of green innovation of enterprises, and thus enhance ESG performance.

Table 7 Green innovation mechanisms

| | (1) Gross effect | (2) Gf→GP | (3) Gf+GP→ESG |
|-----------|------------------------|------------------------|------------------------|
| Gf | 0.1275*** (0.0318) | 11.9214*** (2.7026) | 0.1263*** (0.0469) |
| Size | 0.3397*** (0.0289) | 18.8848*** (2.4669) | 0.3714*** (0.0432) |
| Lev | -0.6185*** (0.1260) | -8.3807 (10.3951) | -0.7599*** (0.1794) |
| Liq | 0.0034 (0.0102) | 0.4412 (0.8384) | -0.0014 (0.0145) |
| Tobin | 0.0026 (0.0120) | 0.9106 (0.8893) | 0.0046 (0.0153) |
| Structure | -0.2679** (0.1247) | 13.1159 (11.2234) | -0.3579* (0.1937) |
| Top1 | -0.0003 (0.0016) | -0.0599 (0.1378) | -0.0018 (0.0024) |
| GP | | | 0.0011*** |

| | | | |
|---------------------|------------|-------------|------------|
| | | | (0.0004) |
| _cons | -3.1179*** | -4.2e+02*** | -3.6711*** |
| | (0.6614) | (57.4555) | (1.0043) |
| N | 5012 | 2276 | 2276 |
| adj. R ² | 0.469 | 0.822 | 0.458 |

7. Conclusion and Implications

Based on the empirical analyses of a sample of Chinese A-share listed companies from 2012 to 2023, this paper systematically examines the impact of green factory rating on corporate ESG performance and its mechanism of action, and the study draws the following main conclusions:

(1) Green factory accreditation not only filters out enterprises with better ESG performance, but also directly promotes enterprises to optimise sustainable development practices through policy incentives and compliance constraints.(2) Green factory accreditation can improve the ESG performance of enterprises through two mechanisms: financing constraint effect and green innovation empowerment.(3) In low-carbon city pilot regions, the synergistic effect of green factory policies and local low-carbon pilot policies is more obvious. With enterprises in the eastern region having a higher marginal effect on ESG performance after obtaining green factory certification than those in the central and western regions due to stronger policy support and stricter environmental regulations.

Summarising the above findings, the following policy and practice insights can be put forward:

Building an institutionalised conduction path for ESG performance improvement,activating the effectiveness of dual mechanisms,adapting to spatial heterogeneity and accurately deploy policy resources to enhance the marginal efficiency of ESG performance improvement among regions.

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