Frontiers in Economics and Management Volume 7 Issue 8, 2026
ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

Does the Short-Selling Mechanism Enhance Corporate ESG Performance?

Yatong Lu[a]

Business College, Harbin University of Commerce, Harbin, Heilongjiang, 150028, China

[a]Email: rongbm@dingtalk.com

Abstract

Using the data of Chinese A-share listed companies from 2010-2024, we use the model of " Margin Trading and Securities Lending" as an experimental model. The adoption of the Staggered Difference-in-Differences (DID) model is used to investigate the effect of short selling on ESG performance and their basic channels. These results show that short sales can greatly enhance ESG performance. This finding is still reliable following a series of robust controls, such as concurrent trend trials, excluding COVID-19 epidemics, omitting companies located in municipalities directly under the central government, estimates of PSM-DID and placebos. Based on the mechanism, it is found that short sales can increase ESG's performance by two main ways, namely, improvement of inner management and reduction of asymmetric information. The heterogeneous analysis also shows that short sales have a greater impact on ESG results in SOEs, smaller companies and more competitive sectors. The research has provided a new demonstration of how capital market monitoring mechanisms can enhance corporate sustainability, and has also offered useful insights into how to improve the design of margin trading and securities lending regimes and apply differentiated regulatory policies.

Keywords

Short-Selling Mechanism; ESG Performance; Internal Governance; Information Asymmetry.

1. Introduction

The goal of " Carbon Peak and Carbon Neutrality" has made the transition of Integrated Green and Low Carbon into one of the country's strategies. To counter this, the PBOC and China Securities Regulatory Commission (CSRC) have adopted Green Finance Guidelines and Listed Companies' Sustainability Reporting Guidelines. This has marked a major change in the provision of ESG information from an optional approach towards the integration of binding and regulatory norms. Corporate ESG has gone beyond just managing its reputation; it is now having a direct impact on the cost of funding, entry into the marketplace, and the promotion of politics, thus making it a key factor in determining key competitiveness. Today's ESG practices, however, are confronted with an apparent conflict between "speech and action." Because of the short term performance stress and the need to maximise the profits of shareholders, managers are likely to be short-sighted because of loose supervision and inadequate motivation. At the same time, some companies use selective disclosure to emphasize the positive messages and hide the substantial negative ones like the infringement of the environment or the labour dispute. Over time, this will weaken ESG's credibility, and when adverse events are inevitable, companies will face serious reputation damage and market resistance. Against this background, the short sale system built into the Margin Exchange and Securities Loan Scheme provides an exterior discipline that is market-oriented. The unique pay-off structure of short-selling has made it possible for investors to benefit from the recognition and trading of negative

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

information, which has created a major loophole in conventional supervision, this has effectively spread the supervisory role across a wide range of market players. If the ESG investment of an enterprise is insufficient or the information is not reliable, the market forces and the price signals may force managers to internalise ESG aspects in the strategic decision making process, thus significantly improving the ESG performance of the company.

In this paper, we use Chinese A-share companies from 2010-2024 to prove the relation of short selling with ESG performance by means of theory inference and demonstration. Additional empirical studies show that better internal management and less asymmetric information are the main channels by which companies can increase the complexity of ESG reporting. This impact is especially pronounced for companies that are active in highly competitive markets and for smaller companies.

This research's marginal contribution is triple. Firstly, although the current literature mainly deals with the effects of short-selling on particular types of non-financial firms, this article expands the analysis angle to ESG's "completeness" and "truthfulness". It illustrates a dual path - the optimization of corporate governance and the mitigation of asymmetric information - by which short-selling inhibits opportunistic behaviour, providing new insights into how the power of capital markets promotes sustainability. Secondly, in contrast to previous studies which focus on the adjustment of inner management elements, this paper makes an innovative introduction to the competitive strength and the size of the enterprise. The fact that short sales have a greater margin impact on ESG results for smaller companies in competing sectors highlights the increased effectiveness of the surveillance of foreign markets for those with less solid administrative bases or strong competition constraints. It offers a new theory foundation for the development of differentiated regulation. Thirdly, through the use of the external impact of the phased extension of qualifying securities in China and the use of a staggered DID model, this research has effectively alleviated endogenous concerns and provided strong causality to the ESG performance. Not only does this model supplement current methodology, it also provides key guidelines for regulatory authorities who wish to improve their short selling regime and to encourage high quality ESG information.

2. Literature Review, Theoretical Analysis, and Research Hypotheses

2.1. Corporate ESG Performance and Behavior

Since 2020, the concept of ESG has garnered escalating societal attention, leading to a burgeoning body of related literature.

Current research focuses on ESG performance in terms of outside institutions, market mechanisms, and corporate governance. In terms of the system, there has been empirical evidence that Green Finance Reform, Innovation Pilot Zones[1], and Low-Carbon City Pilots[2] have dramatically improved ESG standards. Furthermore, macro management systems, such as the social credibility[3] and the optimized operation environment[4], also have a constructive effect. The focus on the environment in the Governmental Work Reports, for example, is associated with an improvement in the efficiency of ESG through higher public subsidies for the environment[5]. Worldwide, it was observed that the introduction of binding ESG disclosure requirements increases the liquidity of companies at company level, especially if they are government driven, strictly implemented and used by companies in a less informed environment[6]. In terms of the market, ESG performance is greatly affected by the behaviour of the information-broker and the interested parties. Joint institutional ownership is linked to reduced ESG results through increased market forces and monopolistic rents[7]. As an important surveillance system, the media focus can help to improve ESG's transparency[8] and prevent "green washing" practices[9], though too much media scrutiny could aggravate the differences in ratings[10]. Positive ESG mood communicated through the media can

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

significantly stimulate the enterprise's energy innovation, particularly in areas where the consumption of energy is high and where there is a well-developed environmental financial infrastructure[11]. The ESG strategy is also influenced by the outside environment, and the increased involvement of companies in ESG has, ironically, been accompanied by increased geopolitical and policy risks[12].

Superior ESG results in a range of positive results for companies. Existing studies show that a powerful ESG qualification can stimulate green innovation[13] and promote the creation of a new, high-quality productivity[14]. Nevertheless, several research shows a nonlinear, U-shape relationship in which companies with a low ESG rating tend to give priority to operating improvements rather than to environmental ones, especially those that are less profitable and more risky[15]. In terms of investment, the results of ESG can substantially reduce the inefficiency of the investment[16]. In terms of funding, it is effective in reducing funding costs and easing restrictions[17]. In terms of total results, the results of ESG have a proven track record of improving the efficiency of the company[18] and the transparency of its financial statements[19]. Last but not least, the performance of ESG shows significant spillover effects: in the supply chain, the ESG of the core company catalyzes synergy between the upstream and downstream partners and encourages the innovation of the vendor[20]. Moreover, ESG results from a partner company in a single enterprise can stimulate the development of green innovation between its member companies[21]. The benefits of ESG are also reflected in the real economy, which substantially increases the number of employees at the firm level and improves the job structure by increasing the size of the workforce and attracting the workforce[22].

Therefore, the study of enterprise ESG performance is in the fast developing stage and the exploration is deep. As Sustainable Development Goals continue to be addressed globally and increased access to data, there is great potential in this area to produce valuable scientific knowledge that is essential to create a greener, more inclusive and accountable economy and society.

2.2. The Short-Selling Mechanism

Previous studies of short selling in Chinese capital market mainly concentrated on how it directly affects the behaviour of firms, which has proved to be effective as an outside power. Research indicates that from a company's management perspective, it is effective to reduce leverage manipulation[23], research manipulation[24], as well as tax avoidance[25], while significantly enhancing corporate social responsibility performance[26]. In terms of information disclosure, the pressure on short sale encourages companies to choose high quality auditors[27], which can decrease the occurrence of financial fraud[28] and improper conduct[29].

Following the development of the study, two main pathways were identified: the informational impact and the management effect. Short selling system can improve the supervision of the market through drawing the attention of the analysts[30], improving the information content of the shares[31] and decreasing the asymmetric information[32]. It also acts as a disincentive to managers by limiting short-sightedness and self-seeking behaviour, thus reducing agent costs[33]. Although margin transactions and stock loans may aggravate the maturity mismatch between investment and funding[34], the risk of short-selling affects the funding choices of firms by changing the cost of financial distress[35]. In addition, short-selling can substantially lower the funding cost of firms' debt, suggesting that there is a cross market spillover effect in the stock and loan markets[36].

Recent studies have been focusing more on the micro-structure of short selling and its potential systemic risk implications. Although it is informative in terms of quantity, it can increase the idiosyncratic tail risk[31]. Moreover, the Margin Transaction and Securities Loan Mechanism

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

can transfer the risk impact to its counterparts in the same business[37]. Adjusting restrictions on the size of securities loans[38] or the application of upskilling rules[39] imply a complex trade-off between market liquidity, volatility, and pricing effectiveness. At the same time, the prohibition of short selling may drive out the informal liquidity suppliers and diminish the competitiveness of the liquidity supply, leading to a considerably longer recovery time for the bid-ask margin and the depth of the market -- a lasting impact that seriously undermines the resilience of the market[40]. Moreover, company behavior like insider purchase or stock withdrawal may accelerate the occurrence of short-squeeze[41].

As a result, the study of Chinese short selling has moved away from the preliminary verification of the impact of the management to the more subtle analysis of the underlying mechanism, the diversity of the context, the strategy impact, and the recent micro-structure design, cross market impact, and possible market risks.

2.3. Theoretical Analysis and Research Hypotheses

1) Short-Selling Mechanism and Corporate ESG Behavior

Short selling encourages companies to improve their ESG performance by managing as well as by means of disclosure. In terms of governance, the profit-driven short-sellers are active in finding and disclosing hidden negative ESG, thus putting on continuous outside supervision. Such pressure has a disciplinary effect by discouraging short-sightedness in management and self-regulation, which in turn lowers agency costs. In order to reduce the risk of falling shares, reputation losses, and increasing funding costs, managers are forced to actively enhance substantial ESG investments and improve their associated procedures, thus making them less vulnerable to short selling. As far as disclosure is concerned, short selling makes it easier to generate, distribute and value negative ESG data in the capital markets. Through attracting the attention of analysts and increasing the information efficiency of share prices, it greatly reduces the asymmetric information. This results in a more precise market valuation of the ESG results and a direct correlation between the ESG results and the value of the company and the approach to equity: the ESG managers control the bonuses and draw in the green capital, whereas the lazy ones are confronted with price-cutting rebates and funding restrictions, thus generating strong market incentives. Moreover, as a key proxy for outside information, media surveillance not only contributes to the quality of ESG's disclosure but also encourages "green washing", thus enhancing its informative impact. It is thus assumed that companies identified as qualifying for short sales will be exposed to increased outside pressure and more robust market signals, which will systematically improve their ESG results. Based on this analysis, we propose Hypothesis 1:

H1: Following designation as a short-selling eligible security, corporate ESG performance improves significantly.

2) Moderation Effects Analysis

The efficacy of short selling as an outside management system depends on the ability to respond to changes in corporate management and its ability to communicate. Strong internal management, such as increased independence of directors' supervision and the use of sophisticated techniques such as AI, is intrinsic to ESG's performance. Businesses with better corporate governance have more standardised decision making procedures and strong oversight mechanisms, which allow them to better understand the stress of outside short selling and convert this stress into a more effective way of managing and investing in ESG. On the contrary, companies with poor internal management might show a lack of sensitivity to outside surveillance signals because of acute agent issues or management shortsightedness, thus mitigating the regulatory impact of short selling. It is therefore assumed that a greater degree of internal management will reinforce the beneficial effect of short sales on the results of ESG.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

Moreover, short selling can decrease the asymmetric information among companies and the market by drawing the attention of analysts and enhancing the informative content of shares. Such a decrease in transparency strengthens the limits of management opportunism. Under low information asymmetric conditions, ESG's performance can be identified and valued more easily. Leading ESG firms could provide a capital boost, whereas the laggard would be confronted with a price rebate and a tightening of funding restrictions, creating an efficient market stimulus. At the same time, a less asymmetric environment reduces ESG's "green washing" and improves the ability and reliability of short-seller's exposure to bad news. On the contrary, if there is a high degree of asymmetric information, the market surveillance power will be unable to break through the company's veil, thus reducing its management effectiveness. Therefore, it is anticipated that less asymmetric information will reinforce the beneficial effect of short sales on ESG results. Based on this reasoning, we propose Hypothesis 2:

H2a: The positive effect of short-selling eligibility on corporate ESG performance is stronger in firms with higher levels of internal governance.

H2b: The positive effect of short-selling eligibility on corporate ESG performance is stronger in environments characterized by lower information asymmetry.

3) Heterogeneity Hypotheses

It is expected that the management impact of short sales on ESG will be substantially mitigated by outside competition and corporate characteristics, i.e. shareholding and volume.

Competition in the industry has deeply shaped the company's behaviour. Research shows that joint institutional ownership reduces the efficiency of ESG by increasing market power, which implies that a lack of competition can reduce the inherent incentive to improve ESG. In high competition, companies tend to improve their ESG performance in order to foster reputation capital and ensure the legitimate interests of shareholders. Strong competition also increases the likelihood of replacement, with adverse information shocks exacerbated by short sales pressure resulting from higher market shares and higher funding costs, forcing companies to actively reinforce their ESG obligations. On the other hand, companies in monopoly or non-competition sectors have a strong market position and are exposed to less competition from outside, making them less vulnerable to short sales pressures and less incentive to increase ESG results. It can thus be assumed that the beneficial impact of short sales on ESG will be stronger in highly competitive sectors.

In terms of ownership structure, SOEs have different management features. Owing to the "lack of final ownership" and the intrinsic problem of asymmetric information, SOEs are likely to be affected by shortcomings in their internal oversight and by increased agent costs. As the market discipline, the short selling system can make up for the shortcomings of the inner management by discouraging the shortsightedness of management and self-interested behaviour and the strict control over the operation. SOEs, on the other hand, assume more political accountability and societal duties and align their ESG results in close alignment with the needs of the country's strategy. In the face of short selling, SOE managers are more inclined to react actively to outside surveillance and substantially improve their ESG procedures, in order to avoid political consequences, reputation damage, and higher funding costs. Therefore, it is anticipated that the beneficial impact of short sales on the results of ESG will be more pronounced for SOEs.

In terms of the size of the business, the smaller companies usually have to deal with more acute asymmetric information, less exposure to the outside world and more serious funding restrictions. As soon as they qualify for the short sale, they will see a substantial strengthening of the market review, greater analysis coverage, and a marked improvement in the information environment. Moreover, the increased capacity of the short-seller to dig up the bad news puts a terrible strain on the management. In addition, ESG results for smaller companies are more responsive to their funding costs and limitations, while an improvement in ESG brings

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

significant side effects in mitigating financial conflicts. By comparison, big companies are already attracting significant market interest, keeping fairly standardised reporting procedures, and having more sophisticated internal management arrangements, with little scope for margin enhancement. It is thus assumed that the beneficial impact of short sales on the results of ESG will be greater for smaller companies. On the basis of this, we propose Hypothesis 3:

H3a: The positive effect of short-selling eligibility on corporate ESG performance is stronger in industries with higher levels of competition.

H3b: The positive effect of short-selling eligibility on corporate ESG performance is stronger in state-owned enterprises (SOEs) compared to non-state-owned enterprises.

H3c: The positive effect of short-selling eligibility on corporate ESG performance is stronger in smaller firms compared to larger firms.

3. Empirical Design

3.1. Sample Selection and Data Sources

In this research, we use a sample of Chinese A-share firms from 2010-2024. The screening criteria shall apply to the first sample: (1) exclude companies in the financial industry, (2) exclude companies classified as STI (Special Treatment) or PT (Particular Transfer), and (3) exclude those who do not have a core parameter. The final sample comprises 46,483 firm-year observations. In order to reduce the effect of extreme outliers, all continuous variables are Winsorized at the 1st and 99th percentiles. The underlying financial information and SM information is derived from RESSET and CSMAR. The Huazheng ESG score is derived from WIND database.

3.2. Variable Definitions and Model Specification

1) Corporate ESG Performance: Dependent Variable

Corporate ESG results are evaluated by Huazheng ESG. These grades, from "C" through "AAA", are given an integral number between one and nine. Higher figures indicate better ESG performance.

2) Independent Variable: Short-Selling Eligibility

The key independent variable is a binary indicator indicating whether a firm is eligible for short selling.

3) Control Variables

Firm Size, which is determined as the natural log of the total assets; Leverage, which is the sum of all the debts, ROA, which is calculated as the net profit divided by the sum of the assets; Fixed Asset Ratio, which is expressed as NPL/NAV; Board Size, which is expressed as the natural log of the number of directors; Ownership Concentration (Top 1), which is the proportion of shares held by the biggest shareholder; and Firm Age, which is the natural log of 1 + the difference in the period in which the company was established.

4) Moderating Variables

Internal Governance Quality (Corpgov): Based on well-established documents, we choose 8 indicators of management in terms of the composition of the board, motivation, shareholding and management features. Among them are: Separating the Chair from CEO (CeoNotPresident), Independent Director Ratio (IndDirectRatio), Board Shareholding Ratio (SharePoint), Executive Shareholding Ratio (SharePoint), Largest Shareholder Ownership (ShareContHolder), Board Size (DirectorNumb), Supervisory Board Size (Supervisornumb), and Natural Logarithms of Top 3 Executives' Salaries (Managercomp). The Principal Component Analysis (PCA) was used to build an integrated measurement of the quality of

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

internal governance, and the Corporate Governance Index (CGA) was developed for those 8 variables. Higher figures in this index suggest better management quality.

Information Asymmetry (ASY): Making use of detailed stock level trading data, we build an index of Liquidity Ratio, Illiquidity Ratio (LGD) and Return Reversal. The first main ingredient is extracted from the three measurements by Principal Component Analysis (PCA), and an Information Asymmetry Agent (ASY) is produced. Greater ASY indicates that there is more asymmetric information among enterprises and outside investors.

Table 1. Variable Definitions and Measurement

Variable	Variable Symbol	Variable Name	Definition
Dependent Variable	ESG	ESG Rating	Sino-Securities Index ESG Ratings
Independent Variable	did	Short-Selling Eligibility	Interaction term: Treat_i / Post_t. Treat_i equals 1 if firm i is ever designated as a short-selling eligible. Security during the sample period, 0 otherwise. Post_t equals 1 for years after the firm becomes eligible, 0 otherwise.
Mechanism Variables	ASY	Information Asymmetry	The primary component of the PCA is the Liquidity Ratio, the Illiquidity Ratio and the Return Reversal index.
	CorpGov	Corporate Governance Quality	Comprehensive index derived from eight governance variables via PCA.
Control Variables	Size	The Firm Size	Natural Log of Total Assets.
	Lev	Leverage	Total commitments/Total assets.
	ROA	Return from Assets	Net Income/Total Assets.
	Fixed	Fixed Asset Ratio	Net Fixed Assets/Total Assets.
	Board	The Board Size	Log of the total number of board members
	Top1	Ownership Concentration	Shareholding percentage of the largest shareholder.
	FirmAge	Firm Age	Natural logarithm of (Observation Year - Founding Year + 1).

3.3. Model Specification

In order to verify our assumptions, we use the Staggered Division in Division (DID) model, which is defined as follows:

$$ESGi,t=\alpha+\beta(Treati\times Postt) + \gamma Controlsi, t + \mu i + \lambda t + \varepsilon i,t$$

Here I stands for the company and t for the year. The term Treati × Posti, t represents the main explanatory variable used. The model includes firm fixed effects μi to control for time-invariant, unobserved firm-specific heterogeneity, and year fixed effects λt to account for common macroeconomic shocks and time trends. Controlsi, t denotes the vector of control variables defined previously. The coefficient of primary interest is β. A statistically significant and positive estimate for β would provide support for Hypothesis H1.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

4. Empirical Results and Analysis

4.1. Descriptive Statistics

The descriptive statistical data for the complete sample are given in Table 2. The average of the independent variable was 0,3795, which suggests that about 38 percent of the sample observations are for the first year under the short sale principle. The mean ESG rating was 4.1371, which was in line with previous studies. A standard deviation of 1,0823 shows significant cross sectional differences between companies' ESG performance. All other variables have the same statistical properties as expected and appropriate.

Table 2. Descriptive Statistics

Variable	Sample Size	Mean	Standard Deviation	Minimum	Maximum
ESG	46483	4.1371	1.0823	1.0000	9.0000
did	46483	0.3795	0.4853	0.0000	1.0000
ASY	46483	-0.2632	0.6094	-2.5264	2.8506
CorpGov	46483	0.1078	0.9886	-2.8012	3.5801
Size	46483	22.1509	1.2797	19.4149	26.4523
Lev	46483	0.4111	0.2060	0.0278	0.9104
ROA	46483	0.0343	0.0653	-0.5562	0.2223
Fixed	46483	0.2051	0.1541	0.0015	0.7722
Board	46483	2.1119	0.1979	1.6094	2.7081
Top1	46483	0.3348	0.1475	0.0749	0.7579
FirmAge	46483	2.9496	0.3528	0.0000	4.3041

4.2. Baseline Regression Results

The results of the basic regression estimate are presented in table 3. Column (1) shows the estimations from the specification without the check variables. Columns (2) to (4) gradually introduce control variables, starting with Size and Line, then adding ROA and Constant, and eventually integrating a complete set of control variables such as Panel, Top1, and Firmage. Both annual and stable fixed effects are included in all models. The results show consistently that for all parameters, the coefficient on the interaction term (did) is positive and statistically significant at the 1% level. These results strongly support H1 hypothesis and demonstrate that short sales can greatly improve ESG ratings of companies.

Table 3. Baseline Regression Results

Variables	*(1)*	*(2)*	*(3)*	*(4)*
	ESG	*ESG*	*ESG*	*ESG*
did	*0.1750****	*0.0706****	*0.0706****	*0.0772****
	(0.0223)	*(0.0216)*	*(0.0215)*	*(0.0215)*
Size		*0.3411****	*0.3282****	*0.3301****
		(0.0172)	*(0.0173)*	*(0.0175)*
Lev		*-1.2999****	*-1.1911****	*-1.1901****
		(0.0613)	*(0.0638)*	*(0.0639)*
ROA			*0.5769****	*0.5144****
			(0.1110)	*(0.1109)*
Fixed			*-0.1192*	*-0.1210*
			(0.0826)	*(0.0829)*
Board				*-0.1046**
				(0.0584)
Top1				*0.5474****
				(0.1126)
FirmAge				*0.0172*
				(0.1060)
Constant	*4.0706****	*-2.9105****	*-2.6659****	*-2.7220****
	(0.0085)	*(0.3725)*	*(0.3741)*	*(0.4836)*
Year FE	*YES*	*YES*	*YES*	*YES*
Firm FE	*YES*	*YES*	*YES*	*YES*
N	*46,483*	*46,483*	*46,483*	*46,483*
R2	*0.438*	*0.458*	*0.459*	*0.460*

Remarks: Reliable standard errors are shown in brackets. ***,**, and* indicate the values of the values of 1, 5, and 10 per cent, respectively. All models include year and firm fixed effects.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

4.3. Parallel Trends Test

The key identification hypothesis for the effectiveness of the staggered DID design is the parallel trends assumption, which demands that ESG scores for both the therapy and the control group show a similar pattern before the policy intervention. Following the methodology of Jacobson et al. (1993)[42], we estimate the following event study specification to test this assumption:

$$ESG_{it} = \beta_0 + \sum_{k=-6}^{k=6} \beta_k D_{it} + \tau Control_{it} + \mu_i + \nu_t + \varepsilon_{it}$$

Where Ditk represents a set of indicator variables denoting the time relative to the event (designation as a short-selling eligible security). The coefficients βk capture the difference in ESG performance between treatment and control firms in each period relative to the baseline period (k=-1). Figure 5.1 plots the estimated coefficients βk along with their 95% confidence intervals. The horizontal axis indicates time relative to policy implementation, and the vertical axis represents the magnitude of the coefficient. The results reveal that for the six periods preceding policy implementation, the estimated coefficients on the leads (Ditk for k<0) are statistically indistinguishable from zero. This indicates the absence of significant pre-existing differential trends in ESG ratings between the treatment and control groups, thereby satisfying the parallel trends assumption. Furthermore, in the periods following policy implementation, the estimated coefficients on the lags (Ditk for k>0) become positive and statistically significant, with the magnitude of the effect appearing to increase over time. This preliminary evidence suggests that following designation as a short-selling eligible security, the ESG ratings of treatment firms surpass those of control firms, and the policy effect strengthens with time.

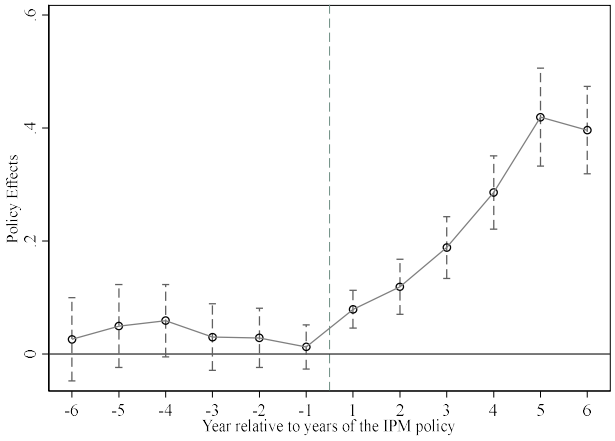

Figure 1. Parallel Trends Test Results

4.4. Robustness Checks

1) Exclusion of COVID-19 Pandemic Period

To mitigate concerns that the structural economic and capital market disruptions caused by the COVID-19 pandemic (specifically 2020-2021) might confound the estimated relationship between short selling and ESG performance, we re-estimate the baseline model after excluding observations from these years. The results, presented in Column (1) of Table 4, show that the coefficient on did remains positive (0.0974) and statistically significant at the 1% level. The magnitude and significance align with the baseline finding (0.0772), confirming that the documented positive effect is not an artifact of the extraordinary market conditions during the pandemic and underscores the temporal robustness of the conclusion.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

2) Exclusion of Municipalities

Given the unique economic structures, regulatory intensity, and heightened market scrutiny associated with firms headquartered in municipalities directly under the central government (Beijing, Shanghai, Tianjin, Chongqing), their inclusion could potentially exert disproportionate influence on the aggregate estimates. To address this, we exclude these observations and re-estimate the model. As reported in Column (2) of Table 4, within the subsample of firms located in other provinces, the coefficient on did is 0.0804 and remains statistically significant at the 1% level. This finding reinforces that the positive influence of short selling on ESG performance is pervasive across a broader cross-section of firms and is not driven exclusively by a subset of firms in these unique locales.

3) Propensity Score Matching-Difference-in-Differences (PSM-DID) Estimation

To alleviate concerns regarding potential sample selection bias arising from systematic differences in observable characteristics between treatment (short-selling eligible) and control firms, we employ a PSM-DID approach. We estimate a probit model predicting treatment status (short-selling eligibility) using the full set of baseline control variables as covariates. Using the estimated propensity scores, we perform one-to-two nearest-neighbor matching with a caliper restriction of 0.05, constructing a more balanced comparison sample. The regression results based on this matched sample are presented in Column (3) of Table 4. The coefficient on did is 0.0577 and is statistically significant at the 5% level. While the coefficient magnitude is slightly attenuated compared to the baseline, reflecting the enhanced comparability of the matched sample, the positive and significant relationship persists. Notably, the model's explanatory power (R-squared) increases to 0.502. This provides further reassurance that, even after accounting for systematic differences in observable firm characteristics, the positive effect of the short-selling mechanism on ESG performance remains robust.

4) Placebo Test (Staggered DID Randomization)

Table 4. Robustness Check Regression Results

Variables	(1) Excl. COVID-19	(2) Excl. Municipalities	(3) PSM-DID
	ESG	ESG	ESG
did	0.0974***	0.0804***	0.0577**
	(0.0240)	(0.0242)	(0.0292)
Size	0.3510***	0.3399***	0.2882***
	(0.0187)	(0.0198)	(0.0223)
Lev	-1.2130***	-1.2113***	-1.1861***
	(0.0686)	(0.0717)	(0.0784)
ROA	0.5854***	0.4949***	0.5095***
	(0.1260)	(0.1227)	(0.1379)
Fixed	-0.0637	-0.0617	-0.1929*
	(0.0885)	(0.0890)	(0.1019)
Board	-0.1073*	-0.0959	-0.0968
	(0.0623)	(0.0654)	(0.0706)
Top1	0.5661***	0.5685***	0.6557***
	(0.1210)	(0.1230)	(0.1390)
FirmAge	0.0325	-0.0984	-0.0393
	(0.1091)	(0.1158)	(0.1328)
Constant	-3.2393***	-2.6318***	-1.6420***
	(0.5074)	(0.5402)	(0.6127)
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
N	39,024	37,472	27,119
R2	0.474	0.460	0.502

Notes: Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. All models include year and firm fixed effects.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

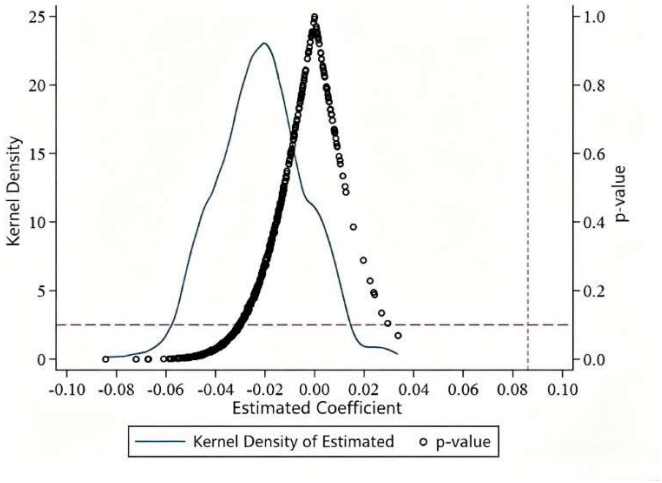

Figure 2. Placebo Test Figure

To rule out the possibility that our findings are driven by unobserved confounding factors or random statistical artifacts, we conduct a placebo test. We randomly assign treatment status (short-selling eligibility) and treatment timing across the full sample, repeating this randomization process 500 times. For each iteration, we re-estimate the baseline model and record the coefficient on the falsely assigned treatment variable (did_fake). The results of this simulation are depicted in the accompanying figure. The kernel density plot (blue curve) of the estimated did_fake coefficients is centered around zero and exhibits a symmetric distribution, with its peak proximate to zero. Furthermore, the vast majority of the associated p-values (black scatter points) lie above the 0.10 significance threshold (red dashed line). This distribution stands in stark contrast to the actual estimated coefficient of 0.0772 (represented by the vertical line) from the baseline regression. This exercise provides compelling evidence that the baseline result is highly unlikely to be attributable to random chance, thereby bolstering confidence in the causal interpretation of our findings.

4.5. Heterogeneity Analysis

The baseline regression establishes the average treatment effect of short-selling eligibility (did) on corporate ESG performance. However, firms exhibit systematic heterogeneity across dimensions such as ownership structure, size, and the competitive dynamics of their operating environment. These differences are likely to engender variation in firms' behavioral responses and adaptive capacities when confronted with the disciplinary threat of short selling. To investigate the boundary conditions governing the impact of short selling on ESG, we conduct subsample analyses across three dimensions: ownership structure, firm size, and industry competition. The results are presented in Table 5.

1) Ownership Heterogeneity: SOEs vs. Non-SOEs

State-owned enterprises and their non-state counterparts differ considerably in goals, governance frameworks, and the severity of soft budget constraints. To assess whether these differences influence the governance role of short selling, we categorize the overall sample according to the nature of ultimate ownership. Regression outcomes are presented in Columns (1) and (2) of Table 5. For both the state-owned and non-state-owned subsamples, the estimated coefficient on the key explanatory variable (did) is positive and statistically significant at the 5% level, with values of 0.0737 and 0.0675, respectively. A formal equality test of the coefficients across groups produces a p-value of 0.000, indicating that the difference is statistically significant. These findings imply that although the introduction of short selling enhances ESG performance in all firms, the magnitude of this improvement is significantly larger in state-owned enterprises.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

2) Firm Size Heterogeneity: Large vs. Small Firms

Firm size serves as a proxy for resource endowments, information transparency, and resilience to external shocks. The subsample regression results, presented in Columns (3) and (4), reveal pronounced heterogeneity related to firm size. Within the subsample of small firms, the coefficient on did is 0.0823 and is statistically significant at the 5% level. Conversely, within the subsample of large firms, the coefficient is negative (-0.0104) and fails to attain statistical significance. The test for inter-group coefficient differences strongly rejects the null hypothesis of equality (p=0.000). This pattern indicates that the positive effect of short selling on ESG performance is predominantly concentrated among smaller firms.

3) Industry Competition Heterogeneity: Competitive vs. Non-Competitive Industries

Table 5. Heterogeneity Analysis Regression Results

Variables	(1) SOE	(2) Non-SOE	(3) Large Firms	(4) Small Firms	(5) Competitive Ind	(6) Non-Competitive Ind
	ESG	ESG	ESG	ESG	ESG	ESG
did	0.0737**	0.0675**	-0.0104	0.0823**	0.1123***	-0.0360
	(0.0372)	(0.0267)	(0.0294)	(0.0375)	(0.0248)	(0.0452)
Size	0.3183***	0.3589***	0.5068***	0.2266***	0.3556***	0.2806***
	(0.0313)	(0.0231)	(0.0326)	(0.0316)	(0.0210)	(0.0380)
Lev	-0.9524***	-1.1586***	-1.2288***	-1.0511***	-1.2267***	-1.0097***
	(0.1214)	(0.0777)	(0.1153)	(0.0868)	(0.0737)	(0.1434)
ROA	0.2444	0.4312***	0.1414	0.4209***	0.4396***	0.5312**
	(0.2579)	(0.1242)	(0.1919)	(0.1361)	(0.1245)	(0.2519)
Fixed	0.0317	-0.0811	0.0179	-0.2746**	-0.0341	-0.3351*
	(0.1454)	(0.1019)	(0.1434)	(0.1096)	(0.0924)	(0.1813)
Board	-0.0828	-0.0971	-0.2779***	0.0795	-0.0634	-0.3181***
	(0.1012)	(0.0709)	(0.0907)	(0.0777)	(0.0670)	(0.1186)
Top1	-0.2042	0.7457***	0.0859	0.8584***	0.6221***	0.2377
	(0.1826)	(0.1503)	(0.1745)	(0.1809)	(0.1307)	(0.2364)
Firm Age	0.6050***	-0.1364	0.5876***	-0.3888**	-0.1085	0.2923
	(0.1567)	(0.1354)	(0.1712)	(0.1630)	(0.1251)	(0.2297)
Constant	-4.1826***	-2.9689***	-8.0524***	0.2464	-2.9840***	-2.0006*
	(0.8429)	(0.6237)	(0.9048)	(0.7869)	(0.5619)	(1.1239)
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
N	14,476	31,933	23,082	22,943	36,019	10,379
R2	0.478	0.474	0.481	0.525	0.460	0.510
Coeff. Diff. Test (p-value)	0.000	0.000	0.000			

Notes: Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. All models include year and firm fixed effects. "Coeff. Diff. Test (p-value)" reports the p-value from a Chow-type test for the equality of the did coefficients across the respective subsamples.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

The intensity of competition within a firm's product market profoundly shapes its strategic posture and responsiveness to market pressures. The results in Columns (5) and (6) of Table 5 unveil stark heterogeneity related to industry competition. In the subsample of firms operating in competitive industries, the coefficient on did is substantial (0.1123) and statistically significant at the 1% level. In stark contrast, for firms in non-competitive industries (e.g., those characterized by monopolistic or heavily regulated structures), the coefficient on did is negative (-0.0360) and statistically insignificant. The difference between the coefficients across the two groups is highly significant (p=0.000). This suggests that the efficacy of short selling as a governance mechanism for enhancing ESG is contingent upon a competitive market environment.

5. Conclusion and Policy Implications

This study utilizes a sample of Chinese A-share listed companies from 2010 to 2024, leveraging the introduction and expansion of the securities lending (short-selling) program as a quasi-natural experiment. Employing a staggered Difference-in-Differences (DID) approach, we investigate the impact of the short-selling mechanism on corporate ESG performance, its underlying transmission channels, and associated economic consequences. The primary findings are summarized as follows:

1) The short-selling mechanism exerts a significant positive effect on corporate ESG performance. This indicates that short selling, as a market-based external monitoring force, heightens corporate sensitivity to negative information and incentivizes improvements in environmental, social, and governance practices. The baseline regression results, robust to the inclusion of firm and year fixed effects, substantiate the governance and information effects associated with the short-selling mechanism.

2) The findings withstand a comprehensive suite of robustness checks, including parallel trend tests, exclusion of the COVID-19 period and municipalities, PSM-DID estimation, and placebo tests. These procedures collectively mitigate concerns related to endogeneity and reaffirm the robustness and reliability of the conclusions.

3) The impact of deregulating short selling on listed firms' ESG performance exhibits significant heterogeneity based on ownership structure, firm size, and industry characteristics.

Based on these empirical findings, we offer the following policy recommendations:

First, the baseline results confirm that the short-selling mechanism significantly enhances corporate ESG performance. Therefore, policymakers should consider further refining the margin trading and securities lending framework and steadily expanding the universe of securities eligible for short selling. By enhancing the efficiency of market pricing and information transmission, this would expose a broader set of firms to market-based disciplinary forces, thereby incentivizing substantive improvements in ESG performance. Concurrently, it is imperative to strengthen risk monitoring and early warning systems to prudently manage potential market volatility associated with short-selling activities.

Second, the heterogeneity analysis underscores the need for differentiated regulatory and guidance policies. For smaller firms and non-SOEs-entities often characterized by weaker governance foundations and heightened sensitivity to competitive pressures-regulators should actively guide them to leverage the market discipline imposed by short selling to improve their ESG practices. For state-owned enterprises, policy should further harness their inherent policy-oriented functions, facilitating the transformation of short-selling pressure into intrinsic motivation for ESG enhancement. In industries with limited competition or strong regulatory oversight, it may be necessary to explore complementary regulatory tools to compensate for the potentially diminished efficacy of the short-selling mechanism.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

Third, efforts should be directed towards optimizing the overall information environment and reducing informational frictions between firms and investors. This entails promoting the establishment of unified and standardized ESG disclosure frameworks to enhance the comparability, verifiability, and timeliness of ESG data, thereby reducing the scope for "greenwashing." Furthermore, fostering the role of market-based information intermediaries-including third-party assurance providers, media monitoring, and analyst coverage-can serve as an effective complement to the information channel of the short-selling mechanism.

References

[1] Xu, L., & Feng, S. R. (2025). How does the independence of independent directors enhance corporate ESG performance? Rural Finance Research, (11), 68–80.

[2] Li, C. X., & Chen, H. (Forthcoming). The impact of low-carbon city pilot policies on corporate ESG performance: Evidence from strategic emerging enterprises. Journal of South-Central Minzu University (Humanities and Social Sciences Edition).

[3] Dong, M. F., Zhao, L. Q., & Liu, T. L. (2026). Social credit and corporate ESG performance: A quasi-natural experiment based on the social credit system reform pilot. Technology Economics, 45(2), 121–137.

[4] Pan, C., Liu, L. J., & Zhang, Y. F. (2025). How do green finance pilot policies enhance corporate ESG performance? Rural Finance Research, (12), 33–48.

[5] Li, X. R., & Xu, T. C. (2026). The effectiveness of environmental attention in government work reports: From the perspective of corporate ESG. Journal of Central University of Finance and Economics, (3), 35–48.

[6] Chopra, S., Senadheera, S., Dissanayake, P., et al. (2024). Navigating the challenges of environmental, social, and governance (ESG) reporting: The path to broader sustainable development. Sustainability, 16(2).

[7] Wang, Y. Q., & Xie, M. (2022). The impact of ESG information disclosure on corporate financing costs: Empirical evidence from Chinese A-share listed companies. Nankai Economic Studies, (11), 75–94.

[8] Li, Z. B., Shao, Y. M., Li, Z. Z., et al. (2022). ESG information disclosure, media monitoring, and corporate financing constraints. Scientific Decision Making, (7), 1–26.

[9] Han, G. Q., & Tang, S. X. (2025). Media attention and corporate ESG "greenwashing" behavior: Mechanism analysis based on carbon information disclosure and patient capital. Financial Theory & Practice, (10), 53–66.

[10] Chen, L., Yang, C. M., & Wang, C. X. (Forthcoming). Does media ESG attention exacerbate corporate rating divergence? Journal of Xi'an University of Technology.

[11] Erzurumlu, Y., Gozgor, G., Lau, C., et al. (2025). The effects of geopolitical and political risks on corporate ESG practices. Journal of Environmental Management, 386.

[12] Tan, W., Yan, E., & Chen, X. (2025). Positive press, greener progress: The role of ESG media reputation in corporate energy innovation. Sustainable Development, 33(4), 5162–5184.

[13] Lu, Y. Z., Li, L., & Zhou, K. G. (2025). The impact of ESG performance on corporate leverage manipulation: Evidence from A-share listed companies. International Finance Research, (11), 92–107.

[14] Mao, Q. L., & Wang, Y. Q. (2023). The employment effects of ESG: Evidence from Chinese listed companies. Economic Research Journal, 58(7), 86–103.

[15] Krueger, P., Sautner, Z., Tang, D., et al. (2024). The effects of mandatory ESG disclosure around the world. Journal of Accounting Research, 62(5), 1795–1847.

[16] Li, J. L., Yang, Z., Chen, J., et al. (2021). The mechanism of ESG promoting corporate performance: From the perspective of corporate innovation. Science of Science and Management of S.& T., 42(9), 71–89.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

[17] Wang, X. H., Luan, X. Y., & Zhang, S. P. (2023). Corporate R&D investment, ESG performance, and market value: The moderating effect of corporate digitalization level. Studies in Science of Science, 41(5), 896–904, 915.

[18] Huang, S. Z. (2021). Three theoretical pillars supporting ESG. Finance and Accounting Monthly, (19), 3–10.

[19] Tang, X. L., Wang, Q., Zhang, H. S., et al. (2025). Can open public data reduce ESG rating divergence? Analysis based on information and monitoring effects. Journal of Financial Development Research, (10), 3–15.

[20] Zhu, S. L., Liu, C. L., & Shi, R. (2026). The innovation-driven effect of customer ESG performance: A supply chain diffusion perspective. Science of Science and Management of S.& T., 47(3), 162–178.

[21] Yang, H. X., Pan, H. B., & Chen, S. D. (Forthcoming). Research on the spillover effect of ESG performance on green innovation from the perspective of business group networks. Systems Engineering - Theory & Practice.

[22] Lei, L., Zhang, D. Y., & Ji, Q. (2023). Common institutional ownership and corporate ESG performance. Economic Research Journal, 58(4), 133–151.

[23] Bai, X. L., Liu, L., & He, M. (2024). Can the short-selling mechanism curb corporate leverage manipulation? Modern Finance Research, 29(11), 47–57.

[24] Li, X. F., & Cai, X. Y. (2024). Deregulating short selling and corporate R&D manipulation: A quasi-natural experiment based on the margin trading and securities lending program. Contemporary Finance & Economics, (7), 140–151.

[25] Wu, L. L., & Fan, J. L. (2024). Margin trading, securities lending, and corporate tax avoidance: From the perspectives of risk-taking and institutional investors. Communication of Finance and Accounting, (6), 64–68, 126.

[26] Duan, S. (2025). Corporate ESG behavior under the securities lending and short-selling mechanism: An analysis of effects, mechanisms, and motivations. Communication of Finance and Accounting, (24), 51–55.

[27] Chen, G. T., Zhu, S., & Wang, S. M. (2019). Short-selling mechanism and auditor choice: Evidence from the margin trading and securities lending program. Auditing Research, (5), 68–76.

[28] Yao, Y., Li, F. F., & Lu, P. (2025). Can the securities lending system improve the audit quality of large audit firms? Evidence from accounting fraud. Management Review, 37(9), 15–26.

[29] Xu, X. X., Zhan, H., & Li, W. L. (2021). Short-selling mechanism, dual governance, and corporate misconduct: An empirical test from the perspective of market-based governance. Journal of Financial Research, (10), 190–206.

[30] Xu, J. C., Leng, B. J., Wang, C. H., et al. (2025). Does securities lending and short selling really promote corporate dual innovation? Evidence from a quasi-natural experiment on margin trading and securities lending. Journal of Systems & Management, 34(4), 1155–1171.

[31] Lu, R., Zhang, R. R., & Min, S. K. (2025). The market value effect of quantitative trading: The role of information advantage. Management World, 41(6), 55–76, 157, 77–97.

[32] Xu, F., Lv, Q., & Qu, J. L. (2025). The effect of the short-selling system on alleviating corporate financing constraints. Financial Regulation Research, (1), 41–58.

[33] Duan, C. Y., Zhang, W. L., & Zheng, R. (2023). Short-selling mechanism and secondary allocation of trade credit: A quasi-natural experiment based on margin trading and securities lending. Securities Market Herald, (9), 56–67.

[34] Zhang, X. D., & Ba, W. X. (2024). How does margin trading and securities lending affect corporate maturity mismatch of investment and financing? Finance and Economy, (4), 51–65.

[35] Gong, R. (2020). Short selling threat and corporate financing decisions. Journal of Banking and Finance, 118, 105853.

[36] Jin, X., Si, H., Zhu, D., et al. (2025). Spillover effects of short selling on corporate bond financing costs: Evidence from Chinese listed firms. Emerging Markets Review, 66, 101285.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0019

[37] Xuan, Y., & Cheng, B. (2024). Research on the risk spillover effects and governance of the expansion of margin trading and securities lending. Financial Regulation Research, (4), 37–53.

[38] Xiong, X., Zhou, R. T., Cui, Y. A., et al. (2024). Research on the constraint of securities lending and short-selling scale in China's capital market: From the perspective of an artificial stock market. Systems Engineering - Theory & Practice, 44(10), 3261–3279.

[39] Zhou, R. T., Xiong, X., Cui, Y. A., et al. (2024). Research on the impact of the uptick rule for securities lending and short selling on market quality in China's capital market: A computational experiment perspective. Operations Research and Management Science, 33(2), 144–150.

[40] Tièche, S., & Cossin, D. (2025). Optimal portfolio choice in a general equilibrium model with portfolio frictions and short-selling constraint. Mathematics, 13(12).

[41] Stice-Lawrence, L., Wong, Y., & Zhao, W. (2025). Short squeezes after short-selling attacks. Journal of Accounting Research, 63(3), 1187–1236.

[42] Jacobson, L. S., LaLonde, R. J., & Sullivan, D. G. (1993). Earnings losses of displaced workers. The American Economic Review, 83(4), 685–709.