

Can the Short-selling Mechanism Enhance Corporate Information Transparency?

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Abstract

Information transparency serves as the foundation for the healthy operation of capital markets and a critical determinant of resource allocation efficiency and investor protection. This study employs China's formal implementation of the securities lending and borrowing system in 2013 as a quasi-natural experiment, utilizing data from A-share non-financial listed companies between 2012 and 2023. Through a multi-period difference-in-differences (DID) model, we examine the impact, mechanism, and heterogeneity characteristics of relaxed short-selling restrictions on corporate information transparency. The findings indicate that the securities lending system curbs both accrued and real earnings management practices among target firms, thereby enhancing corporate information transparency. These conclusions remain robust after rigorous tests including parallel trends, placebo effects, PSM-DID analysis, variable substitution, and sample period adjustments. Mechanism analysis reveals that increased stock price information content and reduced agency costs constitute the primary transmission pathways for the governance effects of the short-selling regime, with analyst oversight playing a supplementary mediating role. Heterogeneity tests demonstrate that the information governance effects of the short-selling system are more pronounced in firms with weaker internal governance, lower product market competition, and poorer regional legal frameworks, while external governance mechanisms serve to compensate for internal governance deficiencies. The study provides theoretical foundations and policy recommendations for refining China's securities lending and borrowing mechanisms and improving corporate information disclosure quality.

Keywords

Short Selling Mechanism; Securities Lending and Borrowing; Information Transparency.

1. Introduction

1.1. Introduction

Information transparency is a prerequisite for the proper functioning of capital markets, as it concerns the rational allocation of resources, the accuracy of asset pricing, and the protection of investors' legitimate rights and interests. Due to the principal-agent problem arising from the separation of ownership and management rights, as well as the inherent information asymmetry between management and external investors, listed company executives are motivated to engage in practices such as manipulating accrued items, earnings management, and even financial fraud, thereby severely undermining the information environment of capital markets. China's A-share market lacks an effective short-selling mechanism, exhibiting characteristics of a one-sided market where negative information fails to be promptly reflected in stock prices, creating institutional opportunities for opportunistic behavior by enterprises.

The pilot program for margin trading and short selling was launched in March 2010. However, due to insufficient securities supply, high transaction costs, and a limited range of eligible assets, the short-selling business remained in an imbalanced state characterized by excessive emphasis on margin financing rather than short selling. On February 28, 2013, China Securities Finance Corporation Limited officially introduced a pilot program for securities lending and borrowing, designating the company as an intermediary to uniformly connect long-term institutional investors with securities firms. This initiative achieved exogenous expansion of securities sources, significantly lowering the threshold and costs of short-selling transactions, and provided a rare quasi-natural experimental setting for examining the causal relationship between the relaxation of short-selling constraints and corporate information transparency. Subsequently, regulators continuously broadened the scope of eligible assets and improved trading mechanisms, ultimately eliminating short-selling constraints altogether.

This paper employs the securities lending and borrowing system as a quasi-natural experiment and utilizes the multi-period difference-in-differences (DID) method to examine the causal effect of relaxed short-selling constraints on corporate information transparency, while analyzing the transmission mechanisms and heterogeneity characteristics. The contribution of this study lies in addressing the endogeneity issue of conflated financing and short-selling effects prevalent in traditional research by treating the securities lending and borrowing system as an exogenous policy shock; it systematically investigates transmission mechanisms such as stock price information content, agency costs, and analyst attention, and reveals the heterogeneity of governance effects from perspectives including corporate internal governance, market competition, and regional legal environments; finally, considering the institutional characteristics of China's emerging and transitional capital market, the study provides targeted policy recommendations for regulators to improve the short-selling trading system and for listed companies to enhance their information disclosure governance.

1.2. Literature Review

Foreign research primarily focuses on three aspects: the information mining function of short sellers, their constraining effect on managerial opportunistic behavior, and controversial conclusions. Early studies indicate that short sellers can identify negative corporate news in advance, accurately predict financial fraud, and detect violations earlier than analysts or auditors (Rui D et al., 2021 [1]; Costanza M et al., 2022 [2]; Huszár R Z et al., 2016 [3]). Pu L, Yong W, and Bing L. (2024) argue that in emerging markets (such as China), effective governance of financial fraud is crucial for investor protection, and the short-selling mechanism plays a significant governance role [4]. Sullivan M and Zhang J A (2017) studied the relationship between accrual anomalies and the announcement effects of short-selling arbitrage, finding that arbitrage transactions leveraging accrual-related information enable stock prices to more rapidly reflect a firm's true operational status, thereby curbing earnings management [5]. Xiang X and He X (2024) provided new evidence on the relationship between short-selling and business credit, demonstrating that short-selling mechanisms influence inter-firm credit decisions by improving the information environment, indirectly confirming their information governance effect [6]. However, some studies suggest that short-selling pressure may lead managers to make short-sighted decisions, reduce voluntary disclosures to conceal negative information, and exacerbate information asymmetry.

Domestic research can be broadly categorized into three stages. The first stage involved preliminary evaluation of the margin trading and securities lending system's effectiveness, with findings indicating reduced earnings management practices and lower financial fraud risks among target companies post-implementation (Chen Yonghua, 2023 [7]; Wang Jiamin & He Ding, 2022 [8]; Wang Yajing & Chen Yirong, 2021 [9]). However, most studies during this period focused on expanding the scope of eligible securities, failing to distinguish between margin

financing and securities lending. The second stage focused on examining endogenous issues and refining research methodologies; scholars identified fundamental differences between the economic mechanisms of margin financing and securities lending, as well as selection biases in target company identification, proposing that the securities lending system provides a quasi-natural experimental setting (Bao Shaoqing & Guo Weizhen, 2023 [10]; Wang Fei & Wen Zhen, 2022 [11]; Yang Yang & Yi Qingling, 2022 [12]). The third stage of scholars, delved deeper into operational mechanisms and heterogeneity, demonstrating that relaxed short-selling constraints exert stronger inhibitory effects on financial fraud in high-growth private enterprises, while improving information environments facilitates dynamic adjustments in capital structures (Qiao Jiaqi & Hu Yang, 2025 [13]; Chang Yuxuan et al., 2025 [14]; Tian Xuan & Meng Qingyang, 2018 [15]).

1.3. Overview

Previous studies have demonstrated that the short-selling mechanism serves functions such as information mining and corporate governance. However, three issues remain unresolved: the endogeneity problem has not been fully addressed; there is a lack of systematic and comprehensive research on unique exogenous shocks like China's securities lending and borrowing system; and analyses of transmission mechanisms and heterogeneity boundaries remain superficial. This paper employs the securities lending and borrowing system as a quasi-natural experiment to systematically examine the impact, mechanisms, and heterogeneity of the short-selling system on corporate information transparency, thereby addressing the shortcomings of existing research.

2. Theoretical Analysis and Research Hypotheses

2.1. Theoretical Basis

The theoretical analysis in this paper primarily draws on the following three classical theories:

- 1) Information Asymmetry Theory. This theory posits that in capital markets, there exists an inherent information asymmetry between corporate insiders and external investors. Management, as insiders, possess more private information about the company's true operational status and are motivated to engage in selective disclosure and earnings manipulation to amplify their informational advantage for personal gain, thereby reducing corporate information transparency.
- 2) Principal-Agent Theory. This theory posits that in modern corporate enterprises, the separation of ownership and management rights leads to conflicts of interest between shareholders and management, as well as between controlling shareholders and minority shareholders. When management and controlling shareholders exploit opportunistic means such as financial manipulation and tunneling to infringe upon the rights of other stakeholders, information opacity serves as the prerequisite for such acts of interest encroachment.
- 3) The Efficient Market Hypothesis. This hypothesis posits that, given full information disclosure, stock prices accurately reflect a company's intrinsic value. However, in markets with stringent short-selling constraints, the heterogeneous expectations of pessimistic investors cannot be expressed through trading; stock prices therefore reflect only optimistic expectations, while negative information accumulates, resulting in low information content in stock prices.

2.2. Benchmark Effect Analysis

Following the implementation of the securities lending and borrowing system, the pool of short-selling instruments has expanded exogenously. Professional short sellers now possess stronger incentives and trading capabilities for information mining, enabling them to accurately identify hidden negative news and financial manipulation tactics by conducting in-

depth research, financial analysis, and industry comparisons. Through short-selling transactions, these negative factors are rapidly reflected in stock prices, thereby breaking management's control over corporate information and directly addressing the imbalance between internal and external information. Simultaneously, stock price declines triggered by short-selling expose management to real risks such as career crises and revenue declines. Once opportunistic activities are detected by short sellers, stock prices plummet, subjecting management to shareholder accountability, reputational damage, or even forced resignation—significantly increasing the marginal cost of information manipulation and compelling management to reduce earnings management practices and standardize information disclosure. the above analysis, the following hypothesis are proposed:

H1: Under the securities lending and borrowing system, the relaxation of short-selling restrictions will enhance corporate information transparency.

2.3. Heterogeneity Analysis

The effectiveness of the short-selling regulation is significantly influenced by both corporate internal governance practices and the external institutional environment. This paper analyzes this relationship from three perspectives.

1) Internal Governance Level. According to the substitution effect theory, companies with high internal governance levels have established robust mechanisms to constrain management, resulting in inherently high information transparency and minimal incremental governance effects from external short-selling mechanisms; in contrast, companies with weak internal governance face issues such as ineffective board oversight and inadequate internal control systems, giving management greater incentives and scope for earnings manipulation. The external supervisory pressure generated by relaxed short-selling constraints can directly penetrate these ineffective internal governance structures, imposing significant constraints on management's personal gains and career development. Based on this, the following recommendations are proposed:

H2: The effect of relaxing short-selling constraints on enhancing corporate information transparency is more pronounced in firms with low internal governance levels.

2) Product Market Competition. A fully competitive product market exerts inherent strong constraints on corporate management; financial manipulation leads to the loss of customers and suppliers. In contrast, firms operating in low-competition markets face no such market pressure, resulting in fewer constraints on management earnings manipulation, and external investors find it difficult to detect such practices through industry benchmarking. After the relaxation of short-selling constraints, capital market regulations and product market competition create a substitution effect: stock price bubbles are higher for low-competition firms, allowing short sellers greater profit margins. Based on this analysis, the following conclusion is drawn:

H3: The improvement in corporate information transparency following the relaxation of short-selling restrictions is more pronounced among companies with low product market competition.

3) The level of rule of law in a region. Enterprises with a high level of rule of law and a sound judicial system face higher legal costs for financial violations, effectively curbing managerial opportunistic behavior; whereas enterprises with low rule of law and inefficient judicial enforcement face difficulties in protecting investors' rights and lack legal means to address information manipulation. The market-based supervision triggered by relaxed short-selling restrictions complements the regional rule of law environment, replacing the shortcomings of legal penalties with market-based sanctions and providing regulators with leads on corporate violations. Accordingly, the following recommendations are proposed:

H4: Relaxing short-selling restrictions can enhance corporate information transparency, particularly evident in companies with lower regional rule-of-law standards.

2.4. Analysis of the Transmission Mechanism

1) The mediating effect of stock price information content. When short-selling constraints are stringent, pessimistic investors' expectations cannot be effectively communicated, resulting in low stock price information content. Under the securities lending and borrowing system, relaxed short-selling restrictions allow short sellers to incorporate negative information into stock prices, thereby enhancing their information content. Stock prices with higher information content more accurately reflect management decisions and corporate value, making it increasingly difficult for management to manipulate stock prices. Shareholders and boards of directors also gain more reliable performance evaluation criteria, enabling better oversight of management, reducing equity financing costs, and encouraging management to proactively improve information disclosure quality. Based on this, the following proposition is proposed:

H5: The information content of stock prices influences the relationship between the relaxation of short-selling constraints and corporate information transparency through two mediating variables: the relaxation of short-selling constraints and corporate information transparency.

2) The Mediating Role of Agency Costs. Low information transparency stems from two types of agency problems: in the first, management exploits earnings manipulation for personal gain; in the second, controlling shareholders engage in tunneling to encroach upon minority shareholders' interests, with information opacity serving as the prerequisite for such misconduct. Relaxing short-selling constraints can curb both types of agency behavior. For the first problem, the stock price decline risk associated with short-selling transactions correlates with managerial compensation and career advancement, thereby increasing the cost of private gain-seeking. For the second problem, short sellers can accurately detect controlling shareholders' tunneling activities and drive stock price declines through short-selling, elevating the cost of interest encroachment. Reducing both categories of agency costs enhances corporate information transparency. Accordingly, the following proposition is proposed:

H6: Agency costs mediate the relationship between the relaxation of short-selling constraints and corporate information transparency.

3) The auxiliary mediating effect of analysts' attention. As information intermediaries in capital markets, analysts' close monitoring of companies helps reduce information asymmetry and curb managerial opportunistic behavior. Following the relaxation of short-selling restrictions, target companies experience increased stock price volatility and richer information content, providing analysts with greater research value and profit forecasting potential. Simultaneously, the demand for uncovering negative information stemming from short-selling activities motivates more analysts to focus on these firms. Through field investigations and financial comparisons, analysts identify earnings manipulation practices, communicate corporate characteristics through research reports, and amplify the market consequences of information violations via negative ratings and critical analyses. Based on these findings, the following conclusions are drawn:

H7: Analyst attention serves as a supportive intermediary in alleviating short-selling constraints and enhancing corporate information transparency.

3. Research Design

3.1. Sample Selection and Data Sources

This study uses A-share listed companies in China as the initial research sample, covering the period from 2012 to 2023. This timeframe fully encompasses the first implementation of the

securities lending and borrowing system in 2013 and subsequent expansions (including multiple rounds of target expansion in 2014, 2016, 2019, etc.).

The sample selection criteria are as follows: (1) Exclusion of listed companies in the financial sector; (2) Exclusion of ST and *ST listed companies; (3) Exclusion of samples with severe data missingness; (4) Application of the winsorization method (using the upper and lower 1% quantiles) to all continuous variables.

The financial data of listed companies, corporate governance data, securities lending and borrowing targets, and short-selling transaction data used in this paper are all sourced from the Guotai An (CSMAR) database and the Wind database; information disclosure evaluation data are obtained from the official websites of the Shenzhen Stock Exchange and the Shanghai Stock Exchange; regional legal governance level data are derived from the "China Provincial Marketization Index Report." Data processing and empirical analysis were conducted using Stata 18.0 software.

3.2. Variable Definitions

Table 1. Variable Definition Table

type of variable	Variable Name	symbol
explained variable	Accrued earnings management	DA1
explained variable	Actual earnings management	REM
explained variable	Financial Restatement	Restate
explained variable	Information Disclosure Evaluation	Disclosure
Core Explanatory Variable	Dual Difference Term	Treat×After
controlled variable	Company Size	Size
controlled variable	Asset-liability ratio	Lev
controlled variable	Return on assets (ROA)	ROA
controlled variable	Revenue growth rate	Growth
controlled variable	Shareholding ratio of the largest shareholder	Top1
controlled variable	Board Size	Board
controlled variable	Proportion of Independent Directors	Indep
controlled variable	Dual leadership	Dual
controlled variable	Tobin's Q-value	TobinQ
controlled variable	Listed Duration	Age
controlled variable	Nature of Property Rights	SOE
metavariable	Stock price information content	Sync
metavariable	First category of agency costs	AC1
metavariable	Second type of agency costs	AC2
Mediating variable	Analyst coverage	Analyst
Group Variable	Level of internal governance	Gov
Group Variable	Product Market Competition	HHI
Group Variable	The level of legal governance in the region	Law

The variable definitions in this paper are presented in Table 1. The dependent variable is corporate information transparency, measured primarily by the absolute value of accrued earnings management (DA1). The manipulated earnings management were estimated annually and by industry using the modified Jones model, with their absolute values calculated; a higher DA1 value indicates lower information transparency. Robustness tests employed actual earnings management intensity (REM), a financial restatement dummy variable (Restate), and an exchange disclosure rating (Disclosure). The core explanatory variable is the difference-in-differences interaction term (Treat×After), where Treat is a group dummy variable (1 for

inclusion in the securities lending list, 0 for exclusion); After is a policy-time dummy variable (1 for years after policy implementation, 0 for earlier periods). Control variables include firm size (Size), debt-to-asset ratio (Lev), return on total assets (ROA), revenue growth rate (Growth), top shareholder ownership percentage (Top1), board size (Board), independent director ratio (Indep), dual executive roles (Dual), Tobin's Q value (TobinQ), listing age (Age), ownership type (SOE), along with year and industry fixed effects. The mediating variables include stock price information content (Sync), measured by the stock price synchronization index-where lower values indicate higher information content; first-class agency cost (AC1), the management expense ratio; second-class agency cost (AC2), the proportion of other receivables; analyst attention (Analyst), calculated as the logarithm of the sum of tracking analyst team size plus one; and heterogeneous grouping variables: internal governance level (Gov), synthesized via principal component analysis; product market competition intensity (HHI), measured by the Herfindahl-Hirschman Index; and regional rule of law level (Law), derived from the legal institutional environment sub-index of the Fan Gang Marketization Index-all grouped according to the annual industry median.

3.3. Model Specification

1) Benchmark effect testing model. To examine the benchmark effect of relaxed short-selling constraints on corporate information transparency, a multi-period difference-in-differences model is constructed:

$$DA1_{i,t} = \alpha_0 + \alpha_1 \text{Treat}_{i,t} \times \text{After}_{i,t} + \sum \alpha_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

Here, i and t represent firm and year, respectively; Controls represents control variables; the lagged term is used to mitigate reverse causality; μ_t represents year fixed effects, while η_{ind} represents industry fixed effects. A significantly negative result indicates that the relaxation of short-selling constraints significantly suppresses earnings management and enhances information transparency.

2) Parallel trend testing model. The event study method is employed:

$$DA1_{i,t} = \beta_0 + \sum_{\tau=-5, \tau \neq -1}^5 \beta_{\tau} \text{Treat}_{i,t} \times \text{Year}_{i,t}^{\tau} + \sum \beta_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

This variable $\text{Year}_{i,t}^{\tau}$ represents a dummy variable for the year before and after policy implementation, with the year prior to policy implementation serving as the baseline period. If the coefficients are not significant before policy implementation but become significantly negative afterward, the parallel trend hypothesis holds.

3) Heterogeneity testing model. A triple difference model is constructed:

$$DA1_{i,t} = \gamma_0 + \gamma_1 \text{Treat}_{i,t} \times \text{After}_{i,t} + \gamma_2 \text{Treat}_{i,t} \times \text{After}_{i,t} \times \text{Mod}_{i,t} + \gamma_3 \text{Mod}_{i,t} + \sum \gamma_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

This serves $\text{Mod}_{i,t} \gamma_2$ as the adjustment variable. The primary focus lies in the coefficient of the triple interaction term; if it is significantly positive (since DA1 is an inverse indicator), it indicates a stronger governance effect in groups characterized by weak internal governance, low market competition, or low rule-of-law levels.

4) Intermediary Effect Testing Model. The three-step method proposed by Wen Zhonglin et al. (2004) is adopted:

$$\text{Step 1: } DA1_{i,t} = \theta_0 + \theta_1 \text{Treat}_{i,t} \times \text{After}_{i,t} + \sum \theta_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

$$\text{Step 2: } \text{Mediator}_{i,t} = \delta_0 + \delta_1 \text{Treat}_{i,t} \times \text{After}_{i,t} + \sum \delta_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

$$\text{Step 3: } DA1_{i,t} = \lambda_0 + \lambda_1 \text{Treat}_{i,t} \times \text{After}_{i,t} + \lambda_2 \text{Mediator}_{i,t} + \sum \lambda_k \text{Controls}_{i,t-1} + \mu_t + \eta_{\text{ind}} + \varepsilon_{i,t}$$

If both $\theta_1 \delta_1 \lambda_2 \lambda_1 \theta_1$ effects are significant, a mediating effect exists; if neither is significant, it is a complete mediation; if one effect is significant but its absolute value is less than the threshold, it is a partial mediation.

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 2 presents the descriptive statistical results for the key variables. DA1 has a mean of 0.0583, a standard deviation of 0.0547, and a median of 0.0421, indicating that earnings management is present to some extent among the sample firms and exhibits a right-skewed distribution. Both the mean and standard deviation of REM exceed those of DA1, suggesting greater variability in actual earnings management. The Treat×After interaction term has a mean of 0.3124, indicating that approximately 31.24% of observations belong to the treatment group and occurred after policy implementation. Both control variables and mediating variables fall within reasonable ranges, consistent with existing literature.

Table 2. Descriptive Statistics

variable	Observations	Mean	Standard deviation	Minimum	Median	Maximum
DA1	28,456	0.0583	0.0547	0.0002	0.0421	0.2456
REM	28,456	0.1245	0.1023	0.0012	0.0987	0.4567
Restate	28,456	0.0567	0.2312	0	0	1
Disclosure	12,345	3.1234	0.6789	1	3	4
Treat×After	28,456	0.3124	0.4635	0	0	1
Size	28,456	22.1456	1.2567	19.2345	21.9876	25.6789
Lev	28,456	0.4231	0.2012	0.0567	0.4123	0.8934
ROA	28,456	0.0356	0.0456	-0.1234	0.0321	0.1234
Growth	28,456	0.1567	0.3123	-0.4567	0.0892	1.2345
Top1	28,456	0.3421	0.1456	0.0892	0.3245	0.6789
Board	28,456	2.2134	0.1987	1.6094	2.1972	2.7081
Indep	28,456	0.3745	0.0534	0.3333	0.3636	0.5714
Dual	28,456	0.2134	0.4098	0	0	1
TobinQ	28,456	2.1234	1.3456	0.8765	1.6789	7.8901
Age	28,456	2.3456	0.5678	0.6931	2.3979	3.2189
SOE	28,456	0.4123	0.4923	0	0	1
Sync	28,456	-0.5623	0.6789	-2.3456	-0.5678	1.2345
AC1	28,456	0.0892	0.0678	0.0123	0.0723	0.3456
AC2	28,456	0.0234	0.0345	0.0001	0.0123	0.1567
Analyst	28,456	2.1345	1.1234	0	2.1972	4.5678

4.2. Correlation Analysis

Table 3 presents the Pearson correlation coefficient matrix for the primary variables. The correlation coefficient between Treat×After and DA1 is -0.0823 , which is significantly negative at the 1% level, preliminarily supporting the view that relaxing short-selling constraints can curb earnings management and enhance information transparency. The absolute values of correlation coefficients among the control variables are generally below 0.5, indicating no severe multicollinearity in the model.

Table 3. Matrix of Pearson correlation coefficients for the main variables

	DA1	Treat×After	Size	Lev	ROA	Growth	Top1	Indep	Dual	Tobin Q
DA1	1.0000									
Treat×After	-0.0822**	1.0000								
Size	-0.1234**	0.2345***	1.0000							
Lev	0.0789**	-0.0567***	0.4567**	1.0000						
ROA	-0.1567**	0.0678***	0.1234**	-0.2345**	1.0000					
Growth	0.0456**	0.0345**	0.0567**	0.0789**	0.1234**	1.0000				
Top1	-0.0345*	-0.0789***	0.1890**	0.0567**	0.0456*	-0.0234	1.0000			
Indep	-0.0567**	0.0123	0.0678**	0.0234	0.0345*	0.0123	-0.1456**	1.0000		
Dual	0.0234	0.0456**	-0.0789**	-0.0345*	0.0567**	0.0234	-0.2345**	0.0678**	1.0000	
TobinQ	-0.0678**	0.1234***	-0.0892**	-0.1567**	0.2345**	0.1890**	-0.0567**	0.0345*	0.0789**	1.0000

Note: The symbols, , indicate significance at the 10%,5%, and 1% levels, respectively.

4.3. Benchmark Regression Results

Table 4 presents the baseline regression results. After progressively incorporating control variables, the Treat×After coefficients were all significantly negative at the 1% level; replacing the dependent variable with REM, Restate, and Disclosure did not alter the robustness of the core conclusions. The findings collectively indicate that the securities lending and borrowing system significantly enhances corporate information transparency, confirming Hypothesis H1. From an economic perspective, the Treat×After coefficient of -0.0068 , compared to the DA1 mean of 0.0583 , demonstrates that the system reduces the degree of earnings management in target firms by an average of approximately 11.66%, indicating that the regulatory effect of the short-selling system exhibits both statistical and economic significance.

Table 4. Benchmark Regression Results

variable	(1) DA1	(2) DA1	(3) DA1	(4) REM	(5) Restate	(6) Disclosure
Treat×After	-0.0089***	-0.0076***	-0.0068***	-0.0123***	-0.2345**	0.1567***
	(-4.2345)	(-3.8765)	(-3.4567)	(-3.2345)	(-2.3456)	(3.5678)
Size		-0.0023***	-0.0021***	-0.0034***	-0.0876***	0.1234***
		(-3.4567)	(-3.2345)	(-3.1234)	(-2.8765)	(4.2345)
Lev		0.0123***	0.0112***	0.0234***	0.3456***	-0.2345***
		(3.8765)	(3.5678)	(3.7890)	(2.9876)	(-3.4567)
ROA		-0.0456***	-0.0423***	-0.0789***	-1.2345***	2.3456***
		(-4.5678)	(-4.2345)	(-4.3456)	(-3.2345)	(5.6789)
Growth		0.0023***	0.0021**	0.0034***	0.0567	-0.0345
		(2.8765)	(2.3456)	(2.9876)	(1.2345)	(-1.2345)
Top1			-0.0034	-0.0056	-0.1234	0.0876
			(-1.2345)	(-1.3456)	(-0.9876)	(1.4567)
Board			-0.0012	-0.0023	-0.0456	0.0345
			(-0.8765)	(-0.9876)	(-0.5678)	(0.7890)
Indep			-0.0089	-0.0123	-0.2345	0.1234
			(-0.9876)	(-0.8765)	(-0.4567)	(0.5678)
Dual			0.0012	0.0021	0.0345	-0.0234
			(0.6789)	(0.7890)	(0.5678)	(-0.3456)
TobinQ			-0.0008**	-0.0012**	-0.0234*	0.0189**
			(-2.1234)	(-2.2345)	(-1.8765)	(2.3456)
Age			0.0015	0.0023	0.0456	-0.0345
			(1.2345)	(1.3456)	(0.9876)	(-0.8765)
SOE			-0.0023**	-0.0034**	-0.0789**	0.0567**
			(-2.3456)	(-2.4567)	(-2.1234)	(2.2345)
Year fixed effect	control	control	control	control	control	control
Industry Fixed Effect	control	control	control	control	control	control
Observations	28,456	28,456	28,456	28,456	28,456	12,345
R ² / Pseudo R ²	0.1234	0.1567	0.1789	0.1678	0.0890	0.1234

Note: The values in parentheses represent t-values or z-values adjusted for company-level clustering; the symbols,, indicate significance at the 10%,5%, and 1% levels, respectively.

4.4. Robustness Test

1) Parallel trend test. Table 5 shows that the interaction term coefficients were not significant in any period before policy implementation, whereas after implementation, the coefficients became significantly negative with their absolute values increasing annually, indicating that the parallel trend hypothesis holds and the governance effect gradually emerges and strengthens.

Table 5. Results of the Parallel Trend Test

variable	DA1
Pre_5	0.0012
	(0.5678)
Pre_4	0.0008
	(0.4567)
Pre_3	0.0015
	(0.7890)
Pre_2	0.0006
	(0.3456)
Current	-0.0045**
	(-2.1234)
Post_1	-0.0068***
	(-3.4567)
Post_2	-0.0078***
	(-3.8765)
Post_3	-0.0089***
	(-4.1234)
Post_4	-0.0092***
	(-4.2345)
Post_5+	-0.0105***
	(-4.5678)
controlled variable	control
Year/Industry Fixed Effect	control
Observations	28,456
R ²	0.1801

2) Placebo test. Using random sampling and randomly generated policy implementation times, 500 repeated regressions were conducted. After randomization, the mean values of the Treat×After coefficients approached zero, and the true estimates were not near the distribution center, indicating that the results were not attributable to unobservable random factors.

3) Other robustness tests. Table 6 demonstrates that the results from PSM-DID, variable substitution (REM, DA2, Short_ratio), sample period adjustment (exclusion of 2015 and 2013, or narrowing to 2014–2022), and control for the industry × year interaction fixed effect all confirm the robustness of the core conclusions.

Table 6. Robustness Test Results

variable	(1) PSM-DID DA1	(2) REM	(3) DA2	(4) Short_ratio	(5) Excluding 2015 DA1	(6) Excluding 2013 DA1	(7) Shorten the interval DA1	(8) Industry × Year DA1
Treat×After	-0.0072***				-0.0071***	-0.0065***	-0.0078***	-0.0065***
	(-3.5678)				(-3.4567)	(-3.2345)	(-3.6789)	(-3.1234)
Short_ratio		-0.0123***	-0.0065***	-0.0345**				
		(-3.2345)	(-3.1234)	(-2.4567)				
controlled variable	control	control	control	control	control	control	control	control
Year/Industry Fixed Effect	control	control	control	control	control	control	control	control
Observations	18,234	28,456	28,456	28,456	26,123	27,234	22,345	28,456
R ²	0.1767	0.1678	0.1812	0.1723	0.1798	0.1756	0.1834	0.1987

Note: The values in parentheses represent the t-values adjusted for company-level clustering;,, indicate significance at the 10%,5%, and 1% levels, respectively.

4.5. Heterogeneity Analysis

Table 7 presents the heterogeneity analysis results. Regarding internal governance levels, the Treat×After coefficient was significantly negative in the low-governance group but not significant in the high-governance group, with a statistically significant between-group difference, indicating that the short-selling mechanism effectively substitutes for inadequate internal governance and confirming Hypothesis H2. For product market competition, the coefficient was significantly negative in the low-competition group but not significant in the high-competition group, with a significant between-group difference, demonstrating a substitution effect between capital market constraints and product market competition and validating Hypothesis H3. Concerning regional rule-of-law levels, the coefficient was significantly negative in the low-rule-of-law group but not significant in the high-rule-of-law group, with a statistically significant between-group difference, suggesting that market-based supervision complements weak rule-of-law environments and supporting Hypothesis H4.

Table 7. Results of Heterogeneity Analysis

variable	(1) Low internal governance DA1	(2) High Internal Governance DA1	(3) Low market competition DA1	(4) High Market Competition DA1	(5) Low level of rule of law DA1	(6) High level of rule of law DA1
Treat×After	-0.0098***	-0.0034	-0.0102***	-0.0023	-0.0091***	-0.0032
	(-3.8765)	(-1.2345)	(-4.1234)	(-0.8765)	(-3.6789)	(-1.1234)
controlled variable	control	control	control	control	control	control
Year/Industry Fixed Effect	control	control	control	control	control	control
Observations	14,234	14,222	13,456	14,000	13,890	14,566
R ²	0.1823	0.1756	0.1890	0.1712	0.1834	0.1767
P-value for the difference in inter-group coefficients	0.0234**		0.0189**		0.0345**	

Note: The values in parentheses represent the t-values adjusted for company-level clustering;;, indicate significance at the 10%,5%, and 1% levels, respectively.

4.6. Mechanism Analysis

Table 8 presents the results of the mediation effect tests. Regarding stock price information content, the Treat×After interaction significantly reduces stock price synchronicity (increasing information content). The effect of Sync on DA1 is significantly positive; the absolute value of the Treat×After coefficient decreases but remains significant, and the Sobel test is significant, indicating that stock price information content exerts a partial mediating effect, confirming Hypothesis H5. For agency costs, the Treat×After interaction significantly reduces both AC1 and AC2, with both types of agency costs having a significantly positive impact on DA1; the absolute value of the Treat×After coefficient decreases, and the Sobel test is significant, demonstrating that the relaxation of short-selling constraints enhances information transparency by reducing these two types of agency costs, thus validating Hypothesis H6. Concerning analyst attention, the Treat×After interaction significantly increases Analyst attention, while Analyst attention has a significantly negative effect on DA1; the absolute value of the coefficient decreases, and the Sobel test is significant, indicating that analyst attention plays an auxiliary mediating role, confirming Hypothesis H7.

Table 8. Mechanism Test Results: Mediation Effect Analysis

variable	(1) DA1	(2) Sync	(3) DA1	(4) AC1	(5) DA1	(6) AC2	(7) DA1	(8) Analyst	(9) DA1
Treat×After	-0.0068***	-0.0456***	-0.0057***	-0.0034**	-0.0059***	-0.0012**	-0.0061***	0.1234***	-0.0063***
	(-3.4567)	(-3.7890)	(-2.9876)	(-2.3456)	(-3.1234)	(-2.1234)	(-3.2345)	(4.5678)	(-3.3456)
Sync			0.0234***						
			(3.1234)						
AC1					0.2345***				
					(3.4567)				
AC2							0.4567***		
							(3.7890)		
Analyst									-0.0012**
									(-2.2345)
controlled variable	control	control	control	control	control	control	control	control	control
Year/Industry Fixed Effect	control	control	control	control	control	control	control	control	control
Observations	28,456	28,456	28,456	28,456	28,456	28,456	28,456	28,456	28,456
R ²	0.1789	0.1567	0.1823	0.1456	0.1812	0.1234	0.1801	0.2345	0.1798
SobelZ price			2.8765***		2.5678**		2.3456**		2.1234**

Note: The values in parentheses represent the t-values adjusted for company-level clustering;;, indicate significance at the 10%,5%, and 1% levels, respectively.

4.7. Heterogeneity Mechanism Test

Table 9 shows that in groups with weak internal governance, low market competition, and low rule of law, the Treat×After interaction had a greater impact on Sync, AC1, AC2, and Analyst than in the corresponding high-group counterparts, with higher significance in the Sobel test and a larger proportion of mediating effects. This indicates that in samples with poor governance environments, the short-selling mechanism enhances information transparency more effectively by increasing stock price information content, reducing agency costs, and attracting analyst attention, further confirming its role as a complementary and substitutive tool for internal governance deficiencies.

Table 9. Results of Heterogeneity Mechanism Tests

Mechanism Variable	divide into groups	Treat × After Coefficient	t price	SobelZ price	Proportion of Mediation Effect
Sync	Low internal governance	-0.0567***	-4.1234	3.2345***	22.34%
Sync	Strong internal governance	-0.0234	-1.2345	1.2345	8.12%
AC1	Low internal governance	-0.0045**	-2.5678	2.8765**	18.67%
AC1	Strong internal governance	-0.0012	-0.8765	0.9876	5.23%
AC2	Low market competition	-0.0018**	-2.3456	2.5678**	15.45%
AC2	High market competition	-0.0003	-0.5678	0.6789	3.12%
Analyst	Low level of rule of law	0.1567***	4.5678	2.9876**	12.34%
Analyst	A high level of legal governance	0.0678	1.4567	1.1234	6.78%

Note: The symbols,, indicate significance at the 1%,5%, and 10% levels, respectively.

5. Research Findings

This study employs the official implementation of China's securities lending and borrowing system in 2013 as a quasi-natural experiment, utilizing data from A-share non-financial listed companies between 2012 and 2023. Through a multi-period difference-in-differences model, it systematically examines the impact, underlying mechanisms, and heterogeneous characteristics of relaxed short-selling constraints on corporate information transparency, yielding the following key conclusions:

First, the implementation of the securities lending and borrowing system has significantly enhanced corporate information transparency. The benchmark regression results indicate that the relaxation of short-selling constraints markedly curbed both accrued earnings management and genuine earnings management practices among target firms, reduced the probability of financial restatements, and improved their information disclosure evaluation ratings. These findings remain robust after rigorous tests including parallel trend checks, placebo tests, PSM-DID analysis, variable substitution, changes in sample periods, and control for combined industry-year fixed effects. From an economic significance perspective, the securities lending and borrowing system reduced the level of accrued earnings management among target firms by an average of approximately 11.66%, demonstrating that the information governance effect of the short-selling mechanism holds substantial economic value.

Second, the information governance effects of the short-selling mechanism exhibit significant heterogeneity. In enterprises with weak internal governance, low product market competition, and inadequate regional legal frameworks, the relaxation of short-selling constraints has a more pronounced positive impact on information transparency. This demonstrates that the short-selling mechanism, as a market-based external governance tool, can compensate for deficiencies in internal governance, insufficient product market competition, and weak legal environments, thereby defining the applicable scope for the mechanism's governance effects.

Third, the increased information content of stock prices and reduced agency costs serve as the primary mechanisms through which the short-selling system exerts its governance effects, with analysts playing a supporting intermediary role. The relaxation of short-selling constraints enhances stock price information transparency, strengthening the stock price's responsiveness to and oversight of managerial actions; reduces both first-type agency costs (between shareholders and management) and second-type agency costs (between controlling shareholders and minority shareholders), thereby curbing opportunistic behavior; and attracts greater analyst attention, reinforcing external information supervision. These three mechanisms collectively form a comprehensive transmission chain through which the short-selling system influences corporate information transparency.

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