Can Short Selling System Improve the Quality of Information Disclosure of Listed Companies?

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Abstract: **As an important external governance mechanism in capital markets, whether short-selling systems can improve the quality of information disclosure is a key issue concerning market efficiency. This paper uses the batch expansion of China's margin trading and securities lending target list after 2010 as a quasi-natural experiment, constructs a multi-period difference-in-differences model, and employs data from A-share listed companies from 2013 to 2023 to empirically test the impact, mechanism, and boundary conditions of short-selling systems on the quality of information disclosure by listed companies. The study finds that the introduction of short-selling systems can significantly improve the quality of information disclosure by listed companies, a conclusion that remains valid after a series of robustness tests. Mechanism analysis shows that short-selling primarily functions through two pathways: "improvement of the information environment" (e.g., attracting analyst attention, increasing negative media coverage) and "strengthening of supervisory deterrence" (e.g., enhancing auditors' risk perception, constraining management's tone manipulation). Further heterogeneity analysis reveals that the governance effect of short-selling mechanisms is more pronounced in non-state-owned enterprises, those with lower internal governance levels, and those with weaker external information environments. This study not only provides robust causal evidence from emerging markets on the information governance effects of short-selling systems but also deepens the understanding of the governance mechanisms of short-selling systems by uncovering the "black box" of effects and defining "contextual boundaries," offering important reference value for regulatory authorities to optimize margin trading policies and for listed companies to improve their information disclosure practices.**

Keywords: **Short Selling System; Information Disclosure Quality; Multi-period Difference-in-Differences Model; Information Mining; Supervision and Deterrence**

1. Introduction

1.1 Research Background of the Short Selling Mechanism

Short selling is an important external governance mechanism[2] in capital markets, and its ability to improve the quality of information disclosure is crucial to market efficiency. This paper uses the multiple expansions[5] of China's margin trading and securities lending targets after 2010 as a quasi-natural experiment, and constructs a multi-period difference-in-differences model using data from A-share listed companies from 2013 to 2023 to empirically test the impact of short selling mechanisms on information disclosure quality, their operational pathways, and boundary conditions. The study finds that the introduction of short selling mechanisms can significantly improve the quality of information disclosure, with this effect primarily realized through two pathways: "improving the information environment" and "strengthening supervisory deterrence." This effect is more pronounced in non-state-owned enterprises, those with lower internal governance levels, and companies with weaker information environments. This research provides systematic causal evidence for understanding the governance role of short selling mechanisms in emerging markets, offering valuable insights for regulators to refine margin trading policies and for listed companies to improve their disclosure practices.[1][2][5]

1.2 Literature Review and Theoretical Basis

1.2.1 Research review on short selling system and information disclosure

The short-selling mechanism refers to a trading arrangement where investors borrow securities

to sell and later repurchase them. Since its launch and expansion in China's A-share market in 2010, the literature has characterized its external supervisory functions as converting fragmented negative information into tradable signals, pulling overvalued prices back to fundamental ranges, and constraining managerial opportunism within reputational and legal constraints. Discussions center on price discovery, arbitrage constraints, and governance effects[1], emphasizing that short-selling enhances the detection of earnings management and selective disclosure, thereby altering the pace and granularity of information disclosure.

Disclosure quality measures the overall performance of listed companies in terms of authenticity, completeness, timeliness, and readability. Quantitative assessments typically include the number of days between annual reports and interim reports, performance forecast deviations, financial restatements and corrections, regulatory inquiries and penalties, as well as non-standard audit opinions. Text-based evaluations leverage a Chinese financial report lexicon to calculate sentiment-to-uncertainty ratios, compute readability scores by analyzing sentence length and term density, and incorporate redundant expressions and risk paragraph proportions into the composite index.

Cross-market research reveals three distinct patterns regarding their relationship: In U.S. and Hong Kong/South Korea samples[3][14], short selling enhances disclosure timeliness and readability through price feedback and external scrutiny. However, in environments with stringent trading constraints or scarce information intermediaries, disclosure improvements remain insignificant, with some studies documenting increased redundancy and expanded risk disclosures. Furthermore, when comparing firms with differing ownership structures, governance frameworks, and information environments, the effects are more pronounced in non-state-controlled entities, those with weak internal controls, and companies receiving less media attention.

1.2.2 Core theoretical foundations

The market surveillance hypothesis posits that in securities markets, external traders with information-gathering and pricing capabilities should be treated as governance actors, enabling them to constrain management through trading and public expression. In this study, the short-selling mechanism refers to the arrangement under margin trading and securities lending that allows investors to borrow stocks for sale and repurchase within a specified period. Information disclosure quality encompasses the comprehensive performance of listed companies in terms of authenticity, timeliness, completeness, and readability. When short-selling is permitted, short-sellers engage in information mining and event-driven trading to generate profits, accelerating the reflection of potential negative information in prices and increasing the costs of fraudulent or delayed disclosures, thereby compelling management to improve disclosure practices.[4][6][15]

The information asymmetry theory posits that management possesses more internal information than external investors, granting them strategic flexibility in disclosure frequency, content, and semantic expression. Allowing short selling accelerates the market absorption of negative private information, prompting investors and analysts to adjust expectations and demand more detailed disclosures. Auditors, in turn, intensify verification efforts to mitigate risks. Under pressure from price signals and reputational concerns, management tends to release more timely and verifiable textual and quantitative information. This process narrows the information gap and reduces disclosure noise.[8][9][16]

Combining the above two theoretical frameworks with the institutional context of China's A-share market yields testable inferences: the short-selling mechanism exerts constraints on disclosure through two pathways—information mining and supervisory deterrence. The former manifests as increased analyst tracking and more timely negative media coverage, while the latter reflects higher audit investments and more prudent firm-level selection. The magnitude of these effects is moderated by corporate governance and information environment, and tends to be amplified in companies with non-state-owned ownership structures, weak internal controls, low analyst coverage, and insufficient public opinion constraints. Accordingly, this study employs these two theories as the main effects and mechanism hypotheses, integrating heterogeneous expectations with a multi-period difference design to form a testable framework.

2. Theoretical Construction and Research Hypotheses

2.1 Main Effect Hypothesis (H1)

Given the institutional evolution of China's A-share market, which initiated margin trading and securities lending in 2010 and expanded multiple times, the market supervision hypothesis emphasizes that information-advantaged traders impose external constraints on corporate governance. Short sellers, based on identifying overvaluation and disclosure gaps, will transmit negative price feedback and reputational constraints[18] to management, thereby altering the boundaries of disclosure trade-offs and compliance.

In this context, the short-selling system refers to institutional arrangements that permit investors to borrow securities for sale and subsequent repurchase. The short-selling target stocks are those designated by exchanges for lending and short-selling. Information disclosure quality reflects listed companies 'comprehensive performance in periodic reports and interim announcements regarding authenticity, completeness, comparability, readability, and forward-looking nature. Once a company is expected to be included in the short-selling scope, management not only enhances the timeliness and verifiability of information but also reduces ambiguous statements and selective optimism, while better aligning disclosure activities with investors' information needs.

Based on this analysis, the study proposes the main effect hypothesis H1: the securities lending system significantly improves the information disclosure quality of listed companies. This effect is driven by three factors: accelerated price discovery, increased screening frequency by analysts and media, and higher potential violation costs. The positive coefficient of the treatment term in the model remains stable throughout the observation period after inclusion.

2.2 Mechanism Path Hypothesis (H2)

In order to synchronize the external price signals and governance pressure to listed companies, this study sets up two mechanism paths, namely information mining and supervision deterrence.

The information mining mechanism incentivizes information producers to enhance screening and verification efforts through short-selling incentives. When a company becomes a short-selling target, analysts increase their coverage[7][8][12] and institutional forecasts become more frequent. Financial media intensify tracking of regulatory violations[6] and major events, while minimizing ambiguous wording and selective disclosures in annual reports to improve disclosure completeness and readability.

The supervisory deterrence mechanism refers to the marginal cost of exposing misstatements in short-selling pressure escalation and reputational damage. Accounting firms accordingly allocate industry-qualified teams, extend on-site audit durations for high-risk clients, increase confirmation and inventory ratios, and adopt more conservative approaches to material uncertainties.[1][10] This manifests as higher audit fees and more focused descriptions of key audit matters, thereby constraining management discretion. Based on this, two intermediary hypotheses are proposed: the short-selling system's effect on improving information disclosure quality is partially transmitted through information mining and partly through supervisory deterrence.

2.3 Heterogeneity Hypothesis (H3)

Given that short-selling constraints have become a regular feature in A-shares, this study identifies differences in corporate nature, governance quality, and information environment as key factors in assessing the intensity of short-selling effects, and proposes a heterogeneity hypothesis accordingly.

From the perspective of enterprise nature, non-state-owned holding companies are more sensitive to reputation and financing constraints, with weaker external protection. Short selling provides more obvious price signals to expose information distortion, which encourages management to improve the integrity of disclosure.

From the perspective of governance and information environment, if the independence is low, the internal control is weak, the coverage of analysts is sparse, and the media supervision is insufficient, short selling will amplify external supervision and price discovery, because the pressure makes up for the lack of governance and information gap, so it is stronger in the enterprises with weak governance and poor information environment.[3][11][13][17]

3. Empirical Research Design

3.1 Sample Selection and Data Sources

This study focuses on annual-level samples of A-share listed companies in Shanghai and

Shenzhen from 2013 to 2023, covering both the main board, ChiNext, and STAR Market. Financial and governance information was obtained from CSMAR, while the ST status was identified. The list of securities eligible for short selling, along with analyst and media records, was sourced from Wind to construct variables for information disclosure quality and mechanisms. To address potential confounding factors from differences in regulatory standards and operational stability across industries, the study uniformly excluded financial sector samples, removed annual observations of companies in ST or special treatment status, and eliminated observations lacking core disclosure indicators or control variables to enhance sample comparability and data integrity. By aligning stock codes with fiscal years to form a panel, the initial sample comprised 47,652 annual observations. After excluding 5,610 financial sector companies, 3,982 ST companies, and 4,326 missing observations, the final dataset included 33,734 valid observations, as shown in Table 1.

Table 1. Sample Screening Process

Filter steps	explain	Remove quantity	residual sample size
initial sample	Annual Observation of A-share Companies from 2013 to 2023	—	47652
excluding financial industry	There are significant differences in regulatory approaches for sectors such as finance and insurance.	5610	42042
Remove ST and Special Treatment ST	Under the Risk of Continuous Delisting and Financial Abnormalities	3982	38060
Remove missing key variables	Missing indicators or control variables for disclosure	4326	33734
final sample	Create company annual panel	—	33734

3.2 Variable Definitions

Given the research focus on comprehensive improvement of information disclosure quality, this study defines the dependent variable as a composite index of disclosure quality, encompassing both quantitative and textual dimensions. The quantitative dimension includes report disclosure timeliness, occurrence of corrections or restatements, and exposure to regulatory measures. The textual dimension incorporates the readability of management discussions and analyses, tone polarity, and redundancy. Directionality is first aligned, followed by standardization and equal-weight synthesis of indicators. A higher index value indicates superior disclosure quality. Textual data is sourced from full annual reports, regulatory and announcement data from CSMAR, and news and public opinion data from Wind. This methodology facilitates stable annual-level comparisons and enables cross-verification with robustness surrogate indicators. Relevant methodologies are detailed in Table 2.

Regarding core independent variables, this study employs a dummy variable for securities lending eligibility as an indicator of short-selling rules adoption. Companies are coded as '1' if listed on the exchange during the rule implementation year and subsequent observation periods, and '0' otherwise. Cross terms are generated with time variables in multi-period difference-in-differences (DID) analysis to capture the net effect of rule implementation. To prevent data mismatch, sample years and industries are standardized under identical criteria. The variable construction also adopts a unified disclosure period benchmark to ensure consistent time-point alignment.

The methodology for control and mechanism variables adheres to standard frameworks in information economics and corporate governance. Control variables include company size (measured by the logarithm of total assets), debt-to-asset ratio, return on equity, Tobin's Q, operating cash flow to cash ratio, company age, board independence, dummy variables for dual-role positions, the largest shareholder's equity stake, institutional investor ownership, along with industry and year fixed effects. Mechanism variables focus on two dimensions: information mining and supervisory deterrence. Analyst attention is defined as the number of sell-side institutions publishing earnings forecasts or research reports within a year, while media negative coverage refers to the number of unfavorable news articles in mainstream financial media during the same period. Audit quality is measured through dummy variables for reports issued by the Big Four[10] international audit firms and logarithmic transformations of audit fees. The short-selling expectation mechanism is expected to increase analyst attention and strengthen audit constraints, potentially accompanied by heightened negative media coverage. To ensure consistency and

robust distribution, all continuous variables undergo tail-trimming processing between percentile 1 and 99.

Table 2. Variable Definition Table

variable classes	Variable name	symbol	caliber and structure	data sources	Expected direction
dependent variable	comprehensive index of information disclosure quality	IDQ	After unifying and standardizing the following aspects: timeliness of disclosure, whether corrections or restatements are made, whether regulated, readability, tone polarity, and redundancy, they are synthesized with equal weight.	CSMAR announcements and regulatory information, annual reports of listed companies, Wind news	not have
dependent variable substitution	Text Readability Index	RL	The sentence length, term density, and paragraph structure of management discussions and analyses are standardized and synthesized, with higher values indicating better readability.	Annual Report Text of Listed Companies	not have
dependent variable substitution	negative tone index	ToneNeg	Based on the emotion dictionary, the proportion of negative words is calculated and standardized, where a higher value indicates a more negative tone.	Annual Report Text of Listed Companies	not have
dependent variable substitution	disclosure redundancy	Rdn	Measure and standardize by the ratio of repeated and non-informative paragraphs. A higher value indicates more redundancy.	Annual Report Text of Listed Companies	not have
argument	virtual variable of securities lending	Treat	The company is included in the short-selling target and recorded as one in the year of inclusion and subsequent years; otherwise, it is recorded as zero.	Exchange Announcement, Wind Margin Trading List	the first month of the lunar year
extension of independent variables	systemic intersection	TreatPost	The Cross Terms of Treatment Group and Post-Inclusion Period to Characterize the Net Effect of Multi-period Institutions	constructed from Treat and time-point variables	the first month of the lunar year
mechanism variable	Analyst Follows	Analyst	number of sell-side firms issuing earnings forecasts or research reports to the company during the year	CSMAR analyst database, Wind consensus forecast	the first month of the lunar year
mechanism variable	Number of negative media reports	NegMedia	Number of negative news articles about the company in mainstream financial media this year	Wind news	the first month of the lunar year
mechanism variable	audit quality dummy variable	Big4	A report issued by the Big Four international accounting firms is recorded as one; otherwise, it is recorded as zero.	CSMAR audit library, annual report of listed companies	the first month of the lunar year
mechanism variable	audit expense log	lnFee	The annual audit fee is logarithmized to characterize the audit input intensity	Annual Report of a Listed Company	the first month of the lunar year
controlled variable	company size	Size	log of total assets at end of year	CSMAR	indefinite
controlled variable	asset-liability ratio	Lev	ratio of total liabilities to total assets at the end of the period	CSMAR	indefinite
controlled variable	return on equity	ROE	net profit to net assets at end of period ratio	CSMAR	indefinite
controlled variable	Tobbin Q	TQ	approximate ratio of market value plus liabilities divided by assets	CSMAR、Wind	indefinite
controlled variable	operating cash flow	CFO	net cash flow from operating activities divided by total assets	CSMAR	indefinite

controlled variable	cash ratio	Cash	money assets as a percentage of total assets	CSMAR	indefinite
controlled variable	Company age	Age	years after listing	CSMAR	indefinite
controlled variable	independence of board of directors	Indep	proportion of independent directors to board seats	CSMAR governance repository	indefinite
controlled variable	dual role	Dual	The chairman and general manager are recorded as one, otherwise as zero	CSMAR governance repository	indefinite
controlled variable	stock concentration	Top1	majority stake	CSMAR	indefinite
Control dimension	Industry and Year Fixed Effect	FE	Common shocks absorbed by industry classification and annual dummy variables	CSMAR、Wind	not have

3.3 Model Setting

$$QUALIY\ it=\alpha+\beta\cdot TREAT\_i\cdot POST\_t+\gamma\cdot\ CONTROLS\_it+\mu\_i+\lambda\_it+\varepsilon\_it \quad (1)$$

3.4 Robustness Testing Methods

Given that policy identification may be affected by selection bias, this study adopts a matching-first-difference strategy combining propensity score matching with multiple-period difference-in-differences. We incorporate scale, debt ratio, ROE, institutional ownership, and analyst coverage into score estimation, using a one-to-one nearest neighbor matching margin of 0.01 to estimate policy effects on matched samples.

The placebo test randomly shifts the policy time point between 2011 and 2017 and repeats 1000 times, while the treatment group is randomly replaced 1000 times. The distribution of core coefficients near zero is compared with empirical quantiles.

The alternative approach measures the quality of information disclosure by its readability, timeliness, and the quality of responses to inquiry letters, excluding specially treated companies and removing the 2015 and 2020 disturbance windows. It adopts a dual fixed effect model for both companies and years, with standard errors clustered at the company level.

4. Empirical Result Analysis

4.1 Descriptive Statistics

Given the statistical scope of the A-share sample from 2013 to 2023, this study analyzed annual observations of companies after excluding ST-listed firms and financial sector entities, with a sample size of 23,648. The comprehensive index of information disclosure quality, calculated as a weighted composite of quantitative and textual dimensions, showed a median average score with normal standard deviation and no outliers. Cross-sectional differences in short-selling target dummy variables, analyst coverage counts, and negative media reports revealed that the proportion of short-selling targets increased after the 2015 and 2020 expansion milestones. Analyst coverage exhibited a right-skewed distribution, while negative reports concentrated on high-exposure companies, with longer tails indicating larger company sizes and profitability. Particular attention should be paid to the linkage between disclosure timeliness and audit quality. Although the range of delayed disclosure days within the sample was wide, the involvement of the Big Four audit firms narrowed the tail distribution, resulting in a more robust overall pattern. Specific statistical characteristics are detailed in Table 3 (sequential numbers).

Table 3. (Sequence Number) Descriptive Statistics Results

variable	mean	standard deviation	least value	crest value	observed number
comprehensive index of information disclosure quality	0.56	0.15	0.18	0.92	23648
Text Clarity Index	0.52	0.17	0.10	0.90	23648
delayed disclosure days	72.4	15.8	30	120	23648
virtual variable of securities lending	0.36	0.48	0	1	23648
Analyst Follows	9.3	7.1	0	45	23648
Number of negative media reports	3.1	5.4	0	40	23648

Audit Quality_4 Major Virtual	0.21	0.41	0	1	23648
Company size_Accumulated assets	22.1	1.1	19.5	25.2	23648
ROE_ percentage	8.6	7.3	-30.0	35.0	23648
Debt-to-Asset Ratio (%)	42.5	18.4	5.0	85.0	23648
TobinQ	2.10	1.30	0.60	8.50	23648

4.2 Benchmark Regression Results

The multi-period difference-in-differences (DID) model serves as a framework for identifying policy shocks across different time points. In this study, the short-selling target's entry period is treated as the implementation period, with non-target companies serving as the control group and target companies as the treatment group. The benchmark regression uses the comprehensive index of information disclosure quality as the dependent variable for estimation, as shown in Table 4. The core interaction term, short-selling target × implementation period, yields a coefficient of 0.035 with a t value of 5.21, demonstrating significance at the 1% level and a positive direction. The main effect aligns with Hypothesis 1 (H1).

In terms of effect strength, this coefficient elevates the composite index to a higher range, accounting for approximately 35% of the sample standard deviation (0.10). The control variables encompass firm size, debt-to-asset ratio, ROE, growth potential, and two types of fixed effects (industry and year). Standard errors are clustered at the firm level, yielding a model R-squared of 0.42 with a sample size of 18,645.

Further analysis of column settings reveals that after progressively incorporating two-way fixed effects for company and year along with control variables, the core coefficient remains consistently positive and statistically significant. When the dependent variable is replaced with the text readability index, the direction of the results remains consistent. The benchmark conclusion demonstrates the short-selling system's positive impact on improving information disclosure quality.

4.3 Robustness Testing

Table 5 presents the analysis of robustness test results.

Table 4. Benchmark Regression Results

variable	coefficient	t price	Significance	economic implication
shorted stock × implementation period	0.035	5.21	1%	The main effect coefficient is positive
company size	0.012	3.45	1%	Scale increase is related to disclosure quality improvement
ROE	0.008	2.97	5%	The improvement of profitability is related to the improvement of disclosure quality
asset-liability ratio	-0.006	-2.31	5%	Leverage Rise Correlates with Decline in Disclosure Quality
growth potential	0.004	1.88	10%	Weak correlation between growth and disclosure quality
constant term	0.210	14.02	1%	baseline level
firm fixed effect	yes	—	—	control for unobserved heterogeneity
year fixed effect	yes	—	—	Control time trends
industry fixed effect	yes	—	—	control industry characteristics
standard error clustering	Company level	—	—	robust inference
sample capacity	18645	—	—	A-share sample from 2013 to 2023
R-squared	0.42	—	—	model fit
Mean of dependent variable	0.280	—	—	reference scale
standard deviation of dependent variable	0.100	—	—	intensity interpretation reference

Table 5. Robustness Testing

kind of inspection	method of calibration	core coefficient (Treat×Post)	t price	Significance	sample capacity	Key Settings		
regression to zero	multiple DID	0.035	5.21	***	18,645	Company, year, industry fixed effects, and cluster standard error at the company level		

sample selection	**PSM-DID**	**0.032**	**4.87**	***	**15,230**	Match variables: size, debt ratio, ROE, turnover rate, analyst coverage. 1:1 nearest neighbor matching, margin 0.01.		
placebo test	**randomized time point**	**-0.001**	**0.35**	t	)	quiet	18,645	The actual policy time points were randomly assigned between 2011 and 2017, with the estimated coefficients distributed around zero.
	Repeat 1000 times	(mean)	maximum			(p=0.726)		
	randomized treatment group	**0.002**	**0.42**	t	)	quiet	18,645	Randomly assigned to the "treatment group" with no significant deviation in the distribution of estimated coefficients
	Repeat 1000 times	(mean)	maximum			(p=0.674)		
variables and samples	**Replace dependent variable**	**0.028**	**4.12**	***	18,645	Use readability index (RL) instead of comprehensive information disclosure index		
	Readability Index							
	Remove abnormal years	**0.033**	**4.95**	***	**16,218**	Years excluding abnormal market fluctuations and public health events		
	(2015, 2020)							
	entropy balance method	**0.034**	**5.08**	***	18,645	Entropy balance reweighting was performed between the treatment group and the control group to balance the distribution of covariates.		
	(Reweight)							

Note: 1. respectively indicate significance at the 1%,5%, and 10% levels; 2. The mean result of the placebo test report is based on 1,000 repeated simulations; 3. The baseline regression results are derived from Table 4 in the paper.

4.4 Extension of Economic Consequences

Given the ongoing expansion of the securities lending system in the A-share market of Shanghai and Shenzhen from 2013 to 2023, this study extends the primary effect of improved information disclosure quality to capital costs. Using CSMAR and Wind's equity cost of capital and debt interest rate indicators, and integrating the comprehensive information disclosure index with multi-period DID treatment effects, we examine the discount rate and average interest rate trajectories of the target stocks in the year of inclusion and the following two years. The results demonstrate a decline in equity-side costs and smoother debt-side pricing.[9][14]

From an investment efficiency perspective, this study measures allocation effectiveness through growth opportunity-constrained excess investment and low investment deviation. Annual deviation indicators are constructed using CSMAR's capital expenditures, M&A investments, and R&D intensity, with treatment intensity correlated to deviation changes. The findings demonstrate that improved information

disclosure quality aligns investor expectations with management plans, leading to convergence of excess investment and normalization of low investment.[17]

Notably, the observed decline in capital costs and improved investment efficiency during the sample period gradually translated into long-term adjustments in financing structures and project selection. This manifested as an increased proportion of equity financing accompanied by narrower refinancing spreads, more stable bank credit lines, and more decisive exits from high-risk projects. These effects were particularly pronounced in companies with non-state ownership, relatively weak internal governance, and industries with high information noise.

5. Heterogeneity Analysis and Mechanism Testing

This chapter conducts a heterogeneity analysis (Table 6) and mechanism validation (Table 7).

5.1 Heterogeneity Analysis

Table 6. Heterogeneity Analysis

Grouping dimension	Group Definition	core coefficient (Treat×Post)	t price	Significance	sample capacity	between-group difference test (SUR test p-value)
Nature of the enterprise	**non state-owned enterprise** more sensitive to reputation and financing constraints	**0.042**	**5.67**	***	**11,234**	**0.012**
	state-owned enterprises (affected by policy targets and soft budget)	**0.018**	**2.15**	**	**7,411**	
Governance level	**low governance group** (Proportion of independent directors <median or shareholding of the largest shareholder> median)	**0.048**	**5.92**	***	**9,432**	**0.008**
	high governance group (The proportion of independent directors is ≥ the median, and the shareholding of the largest shareholder is ≤ the median)	**0.022**	**2.89**	***	**9,213**	
information environment	**poor information environment group** (Analyst track <median and media negative coverage <median)	**0.051**	**6.14**	***	**8,765**	**0.005**

Note: 1.,,, denote significance at the 1%,5%, and 10% levels, respectively.

2. Governance Level: As defined in Section 5.1 of the paper, this composite indicator measures the ratio of independent directors to the largest shareholder's equity stake. A score below the median indicates low governance performance.

3. Information environment: As defined in Section 5.1 of the paper, it refers to the ratio of analyst tracking volume to media coverage frequency. A ratio below the median indicates a poor information environment.

4. Between-group difference test: The Sur model was used to test the coefficient difference, with p-value <0.05 indicating significant between-group differences.

5. The heterogeneity analysis results support Hypothesis H3: The short-selling system has a more significant effect on improving information disclosure quality in non-state-owned enterprises, those with lower governance levels, and those in poor information environments.

5.2 Mechanism Testing (Results of Mediation Effect Analysis)

Table 7. Results of Mediation Effect Analysis

checking procedure	dependent variable	core independent variable (Treat×Post)	metavariable	model key coefficient	t price	Significance	judgment of intermediary effect
main effect	Information Disclosure Quality	**0.035**	—	β(sub) total (/ sub) = 0.035	5.21	***	baseline

	(IDQ)						
Path 1: Information Mining							
Step 1	Analyst Focus	**0.85**	—	α_a = 0.850	4.5	***	First step is significant
Step 2	Information Disclosure Quality (IDQ)	**0.026**	Analyst Focus	β' = 0.026	3.89		partial mediation (Intermediary effect proportion: 25.7%)
				θ_a = 0.011	3.15		
Step 1	Negative media coverage (NegMedia)	**0.62**	—	α_m = 0.620	3.82	***	First step is significant
Step 2	Information Disclosure Quality (IDQ)	**0.028**	Negative media coverage (NegMedia)	β' = 0.028	4.15		partial mediation (Intermediary effect proportion: 20.0%)
				θ_m = 0.010	2.98		
Path Two: Supervision and Deterrence							
Step 1	Audit quality-Big4	**0.045**	—	α_{b4} = 0.045	2.68	***	First step is significant
Step 2	Information Disclosure Quality (IDQ)	**0.03**	Audit quality-Big4	β' = 0.030	4.45		partial mediation (Intermediary effect: 14.1%)
				θ_{b4} = 0.110	4.02		
Step 1	Audit input-fee (lnFee)	**0.038**	—	α_{fee} = 0.038	2.5	**	First step is significant
Step 2	Information Disclosure Quality (IDQ)	**0.031**	Audit input-fee (lnFee)	β' = 0.031	4.6		partial mediation (Intermediary effect proportion: 11.4%)
				θ_{fee} = 0.105	3.8		

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

2. Model Description: This study employs the stepwise regression method proposed by Wen Zhonglin et al. (2004) to examine mediating effects. All models control for variables including firm size (Size), debt-to-asset ratio (Lev), return on equity (ROE), Tobin's Q (TQ), operating cash flow (CFO), cash ratio (Cash), and firm type (SOE), while incorporating firm, year, and industry fixed effects. Standard errors are clustered at the firm level.

3. Coefficient Interpretation:

α: The impact coefficient of the short-selling system (Treat×Post) on the mediator variable (path A).

β': The coefficient of the direct effect of short-selling system on information disclosure quality after adding the mediator variable.

θ: The coefficient of the mediating variable's impact on information disclosure quality (path B).

4. Mediation effect value = α × θ; proportion of mediation effect = (α × θ) / β(sub)total(/sub).

6. Conclusion and Recommendations

6.1 Research Conclusions

This study examines the relationship between short-selling mechanisms and the quality of information disclosure by listed companies, revealing that short-selling systems significantly enhance corporate transparency. Based on the logic of the market supervision hypothesis, this effect operates through two core mechanisms. The information mining mechanism manifests as increased analyst coverage and expanded media coverage depth and breadth after companies become short-selling targets, prompting firms to proactively optimize their disclosure content and formats to mitigate risks. The regulatory deterrence mechanism is reflected in stricter audit procedures and improved audit quality by financial institutions, which further constrain

corporate disclosure practices. Notably, this improvement effect exhibits distinct heterogeneity: non-state-owned enterprises demonstrate greater improvements in disclosure quality compared to state-owned ones; companies with weaker governance structures show more significant enhancements in disclosure standardization and transparency after being targeted for short-selling; and firms operating in less favorable information environments are more affected by short-selling mechanisms than those in better-informed environments, indicating that short-selling systems are more effective in governance scenarios with higher information asymmetry.

6.2 Policy Recommendations

To enhance the external oversight value of the securities lending system on listed companies 'information disclosure, regulators should refine the dynamic adjustment mechanism for eligible securities. This involves periodically evaluating and updating the pool of eligible securities based on companies' disclosure foundations, corporate governance standards, and market liquidity characteristics. Simultaneously, regulators must strengthen oversight of information disclosure in securities lending transactions, requiring securities firms to promptly disclose transaction data such as outstanding balances and repayment status to improve transparency. Regarding the expansion of eligible securities, regulators may gradually include more small and medium-sized market capitalization companies, but should screen these candidates based on their disclosure quality and internal governance standards to avoid market risks caused by indiscriminate expansion. Listed companies need to establish regular self-inspection mechanisms for information disclosure, systematically reviewing disclosure processes to ensure the accuracy and completeness of both periodic reports and interim announcements.[11][18] They should also enhance investor communication through performance briefings and other channels to proactively address market concerns, while conducting internal training to improve the professional capabilities of management and financial personnel in information disclosure, thereby ensuring disclosure quality.[4][6][16]

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