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The Impact of Short Selling Mechanism on Enterprise Internal Control

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Abstract

This paper, according to data of Chinese A-share listed companies from 2014 to 2023, the effect of short selling mechanisms on the quality of internal control of the company is studied by using the DID method. The study finds that short selling significantly enhances corporate internal control levels, a finding that remains robust after controlling for endogeneity, changing the measurement method of variables, and considering firm heterogeneity. Heterogeneity analysis shows that short-selling is more effective in improving internal control of state-owned enterprises and low-risk industries. This research offers theoretical and practical insights for capital market opening policies and corporate internal control construction, supporting the orderly expansion of short selling targets to enhance governance effects.

Keywords

Short Selling Mechanism; Internal Control; Corporate Governance; Double Difference Model; Heterogeneity Analysis.

1. Introduction

1.1. Research Background

The short selling mechanism involves investors borrowing securities to sell and then buying them back at a lower price in anticipation of future price drops for profit. Corporate internal control refers to the systems, procedures, and measures established by companies to achieve their business objectives. As a key tool in capital markets, the economic consequences of the short selling mechanism have been a focal point of academic research. Current literature primarily examines how the short selling mechanism impacts market efficiency, corporate governance, and corporate behavior. In terms of market efficiency, Diamond and Verrecchia argued that the short selling mechanism enhances market pricing efficiency by reducing information asymmetry, and short sellers promote the disclosure of true information by companies by uncovering negative information[1]. Subsequent studies have shown that the short selling mechanism can accelerate the integration of negative information into stock prices and curb market bubbles[2,3]. Beber and Pagano found that while the short selling mechanism improves price efficiency, it may also increase short-term market volatility, although it contributes to market stability in the long run[4]. In terms of corporate governance, the short selling mechanism increases market supervision pressure, which helps to curb earnings management by management and excessive investment[5,6]. Grullon et al. discovered that short selling pressure leads companies to improve audit quality (such as by increasing audit fees), indirectly strengthening corporate governance[7].

In recent years, scholars have begun to focus on the direct and indirect impacts of short selling mechanisms on corporate internal controls, although this research is still in its exploratory phase. The direct impact of short selling mechanisms on internal controls is evident through the pressure of short selling, which drives companies to optimize their internal controls and

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enhances external oversight, leading to improvements in risk management systems[8]. Wang Lixin and Chen Siyuan found that the internal control index of companies listed as margin trading targets in Chinas A-share market increased by 9%, indicating a governance effect of short selling mechanisms[9]. Zhang Mingyuan and Li Jingyi further confirmed that short selling pressure enhances internal controls by increasing transparency in information disclosure, such as by adding risk warnings[10]. Indirectly, short selling mechanisms also improve internal control levels through intermediary mechanisms and pathways, as they compel companies to enhance the quality of information disclosure, which is closely linked to the effectiveness of internal controls[11,12]. To mitigate the risks associated with short selling, companies may increase their investment in internal control resources, such as by establishing audit committees and optimizing process design[13].

Previous studies have shown the positive effect of short selling mechanisms on internal control, but the discussion of heterogeneity is not enough. This study censors out the heterogeneity of short selling mechanisms from aspects such as the nature of corporate property rights and industry risk characteristics, and integrates multi-dimensional pathways and the institutional background of emerging markets for empirical research. The aim is to deepen the theoretical connection between short selling mechanisms and internal control quality, thereby providing a scientific basis for policy optimization and corporate practices.

1.2. Research Significance

Theoretical significance:(1) the existing literature is insufficient to study the mechanism of the impact of short selling mechanism on enterprise internal control. This study reveals the path through which it affects the quality of internal control through external supervision pressure, filling the gap in related research.

(2) Traditional internal control research rarely involves the short selling mechanism. This study constructs a theoretical chain of "external pressure--enterprise behavior--internal control optimization" to enrich the theoretical framework of driving factors of enterprise internal control.

Practical significance:(1) to provide a basis for regulatory authorities to improve the short selling mechanism policy, reasonably relax restrictions to play its supervisory and governance role, and promote the healthy development of the capital market.

(2) Enterprises can transform short selling pressure into internal control optimization power, improve the level of operation and management and anti-risk ability, and achieve sustainable development.

(3) Investors can incorporate the internal control quality of enterprises into the investment evaluation system, identify risky enterprises through tools such as Dibone Internal Control Index, and avoid financial fraud and operational risks.

2. Research Hypothesis and Design

2.1. Research Hypotheses

Short sellers, in pursuit of profit, actively gather and analyze negative information about companies. If they discover internal control flaws that could lead to financial fraud or operational risks, they will use this information to engage in short selling. Under the short selling mechanism, companies face increased market pressure and short-selling risks, which motivates them to strengthen their internal controls to address potential operational and financial risks.

The short selling mechanism enhances external oversight. It introduces a unique group of short sellers, free from the constraints of internal corporate interests, who, driven by stronger motivation and professional skills, can uncover issues within companies. This external

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oversight pressure compels companies to strengthen their internal controls, thereby reducing the likelihood of being targeted by short sellers. Moreover, the presence of the short selling mechanism optimizes market supervision, enhancing market pricing efficiency. To achieve better pricing and reputation, companies will actively improve their internal controls to meet market and investor expectations.

The short-selling mechanism also enhances corporate governance. It encourages major shareholders and management to closely monitor stock performance, aiming to prevent the stock price from being suppressed by short selling due to internal control issues. To achieve this, companies may adjust their equity structures to include more investors with supervisory capabilities and motivation, thereby establishing a more balanced equity structure and improving internal controls. Additionally, the pressure of short selling makes the board of directors and the board of supervisors more aware of their supervisory responsibilities, leading them to perform their duties more actively, strengthen oversight and constraints on management, and ensure the effective implementation of internal control systems.

Hypothesis H 1 is proposedaThe introduction of short selling mechanism has significantly improved the quality of enterprise internal control.

While the short-selling mechanism theoretically encourages companies to enhance their internal controls, in practice, it can lead to short-sighted behavior. Short sellers make stock prices highly sensitive to negative news, leading management to focus more on short-term performance improvements to avoid stock price drops. While this may stabilize stock prices in the short term, it can undermine the effectiveness of internal controls and hinder their improvement in the long run. The potential threat of short selling can lead management to adopt an overly defensive stance. To prevent being shorted, companies might focus more on the form of information disclosure rather than its substance, spending significant resources on potential short-selling risks instead of improving their internal control systems.

Hypothesis H1 is proposedbShort selling mechanism will reduce the quality of internal control to some extent.

2.2. Research Design

2.2.1. Data Sources

Chinas capital market officially introduced margin trading and short selling in 2010, and began expanding the scope of eligible securities for margin trading and short selling in 20 14. Therefore, this study selects Chinese A-share listed companies from 20 14 to 2023 as samples, constructs a difference-in-differences model, and empirically examines the impact of selling control on corporate internal control. The sample is excluded based on the following criteria: (1) samples belonging to the financial industry; (2) samples marked as ST; (3) samples with missing relevant variables. To control for the impact of extreme values on the results, a 1% Winsorization process is applied to continuous variables in the sample. Information regarding margin trading, short selling, and financial records are obtained from the CSMAR database and the data on internal control quality is from the Dibao Internal Control and Risk Management Database.

2.2.2. Model Design and Variable Selection

This paper refers to the research methods of exogenous events in the past and adopts the double difference model for empirical experiments. Using the internal control index data from the Dibo database and financial data from the Guotai An database, relevant internal control variables, short selling variables and control variables are constructed, and the following regression model is established:

$$IC_{it}=\alpha_0+\alpha_1 Short_{it}+\sum_{j=1}^{n}\boldsymbol{\alpha}_j Control_{jit}+\mu_i+\lambda_t+\varepsilon_{it}$$

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The specific definitions of all variables involved in this study are shown in Table 1.

Table 1. Variable definition table

type	name	symbol	definition
explained variable	Internal control quality	IC	Dibao internal control information disclosure index
explanatory variable	Short selling mechanism	S hort	If the stock of the enterprise is included in the list of securities for financing and short selling, take 1, otherwise take 0
regulated variable	nature of stock rights	SOE	If the property right of the enterprise is state-owned, the value is 1, otherwise it is 0
	high-risk industry	High_Risk	If the enterprise belongs to a high-risk industry (such as science and technology, medicine), the value is 1, otherwise it is 0
controlled variable	scale	Size	Natural logarithmic of total assets at the end of the year
	asset-liability ratio	Lev	Total liabilities/total assets
	profitability	ROA	Net profit/total assets
	Equity concentration	Top1	The shareholding ratio of the largest shareholder (%)
	increase rate of business revenue	Growth	(Operating revenue of this year-operating revenue of last year)/ operating revenue of last year
	cash flow	CFO	Net cash flow from operating activities/total assets
	Two jobs in one	Dual	If the chairman and general manager are occupy identical roles: the value is 1; otherwise, the value is 0
	The proportion of independent directors	Indep	The ratio of the number of independent directors to the number of directors this year
	Size of the board	Board	The number of directors is taken logarithmically
	Size of the audit team	BIG 4	If the auditor is one of the Big Four, it is 1; otherwise, it is 0

3. Research Results and Analysis

3.1. Descriptive Statistics

Table 2 presents the descriptive statistical analysis of the variables. For the internal control variables, short selling variables and all the variables used in the model, the statistics such as sample size, mean, standard deviation, minimum value and maximum value are reported respectively.

After removing the sample data of the financial industry and those with special treatment (ST), as well as samples with missing variables, a total of 29,433 samples were collected. As shown in the table above, the mean value of the Short variable is 0.46, indicating that in Chinas capital market, about half of the companies engage in short selling, meaning that one out of every two listed companies is affected by the short-selling mechanism. The mean value of the IC variable is 628.06, with a standard deviation of 133.42, suggesting significant dispersion among the samples and highlighting the substantial differences in internal control quality among companies. The distribution of company characteristics (Size, Lev, ROA, CFO, Growth), governance structure (TOP1, Dual, Board, Indep, High Risk), and external factors (Big4, SOE) aligns with real economic logic and meets the requirements for empirical analysis of control variables.

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Table 2. Descriptive statistical analysis

Variable name	sample capacity	mean	standard error	least value	crest value
Short	29433	0.46	0.50	0.00	1.00
IC	29433	628.06	133.42	0.00	941.31
Size	29433	22.36	1.30	19.85	26.38
Lev	29433	0.42	0.20	0.06	0.95
ROA	29433	0.03	0.07	-0.36	0.20
CFO	29433	0.05	0.07	-0.16	0.25
Growth	29433	0.15	0.40	-0.63	2.61
Top1	29433	32.96	14.53	8.23	72.88
Dual	29433	0.30	0.46	0.00	1.00
Big4	29433	0.06	0.24	0.00	1.00
Board	29433	8.34	1.60	5.00	14.00
Indep	29433	0.38	0.05	0.33	0.57
SOE	29433	0.32	0.47	0.00	1.00
High Risk	29433	0.05	0.21	0.00	1.00

3.2. Correlation Test

This paper conducts an initial analysis of the correlation between the short-selling mechanism and the quality of corporate internal control, with the test variables primarily derived from the benchmark regression model. As shown in Table 3, Short is significantly positively correlated with IC, which preliminarily supports the research hypothesis. Additionally, Size, ROA, Top1, Growth, CFO, Dual, Indep, Board, Big4 are positively correlated with IC, while Lev is negatively correlated with IC. This finding aligns with the theoretical mechanism that the introduction of the short-selling mechanism enhances corporate governance, and the signs of the control variables are consistent with theoretical expectations. To further analyze the multicollinearity among the model variables,

The VIF test (Table 3) was carried out in this paper, and the VIF value of the model was 1.42.

Table 3. Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) IC	1											
(2) Short	0.105*	1										
(3) Size	0.152*	0.489*	1									
(4) Lev	-0.112*	0.076*	0.468*	1								
(5) ROA	0.375*	0.069*	0.070*	-0.338*	1							
(6) CFO	0.151*	0.073*	0.090*	-0.161*	0.423*	1						
(7) Growth	0.142*	-0.045*	0.050*	0.031*	0.243*	0.037*	1					
(8) Top1	0.130*	0.045*	0.200*	0.029*	0.165*	0.124*	0.007	1				
(9) Board	0.035*	0.139*	0.287*	0.130*	0.037*	0.047*	0.004	0.025*	1			
(10) Dual	0.016*	-0.068*	-0.187*	-0.125*	0.017*	-0.010	0.015	-0.065*	-0.187*	1		
(11) Big4	0.091*	0.158*	0.326*	0.091*	0.042*	0.074*	0.002	0.138*	0.088*	-0.050*	1	
(12) Indep	0.002	0.007	-0.016*	-0.009	-0.027*	-0.002	-0.015*	0.037*	-0.553*	0.108*	0.032*	1
*** p<0.01, ** p<0.05, * p<0.1												

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Table 4. Variable VIF test

	VIF	1/VIF
Size	2.23	0.45
Lev	1.66	0.60
Board	1.64	0.61
ROA	1.55	0.65
Indep	1.50	0.67
Short	1.39	0.72
CFO	1.24	0.81
Big4	1.14	0.88
Growth	1.09	0.91
Top1	1.09	0.92
Dual	1.06	0.94
Mean VIF	1.42	

3.3. Regression Analysis

This paper takes the short-selling mechanism policy gradually introduced in China as the experimental object and uses the double differential model to make an empirical study.The regression results of the research hypothesis are illustrated in Table 5:

Table 5. Regression results of the introduction of short selling mechanism and internal control quality

	(1)	(2)	(3)	(4)
	IC	IC	IC	IC
Short	17.41***	8.727***	12.45***	12.52***
	(9.31)	(4.60)	(4.85)	(4.64)
Size		14.21***	13.15***	19.65***
		(13.71)	(6.64)	(8.85)
Lev		-60.24***	-63.96***	-64.71***
		(-10.89)	(-7.68)	(-7.77)
ROA		529.6***	461.3***	451.4***
		(42.82)	(33.45)	(32.59)
CFO		-11.02	2.089	3.963
		(-0.94)	(0.16)	(0.30)
Growth		23.72***	27.21***	27.27***
		(13.69)	(15.02)	(14.85)
Top1		0.561***	0.835***	0.656***
		(8.25)	(5.83)	(4.46)
Board		-0.206	0.788	0.451
		(-0.29)	(0.73)	(0.42)
Dual		9.569***	9.669***	9.402***
		(5.20)	(3.90)	(3.80)
Big4		12.81**	-0.845	-0.932
		(3.17)	(-0.12)	(-0.13)
Indep		-0.961	-10.26	-7.296
		(-0.05)	(-0.39)	(-0.28)
_cons	618.4***	290.8***	304.0***	181.9***
	(407.56)	(12.90)	(6.63)	(3.66)
Y ear	No	No	No	Yes
Firm	No	No	Yes	Yes
N	29433	29433	29433	29433
t statistics in parentheses				
* p < 0.05, ** p < 0.01, *** p < 0.001				

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Table 5 shows the regression of hypothesis 1 in this study. From the above regression results, it can be seen that the Short coefficient is stable in column (1) to column (4) with the gradual increase of control variables and fixed effects, and the direction and significance of the coefficient do not reverse, which is in line with the expectation of hypothesis.

3.4. Robust Test

3.4.1. Parallel Trend Test

Although the expansion policy of margin financing and short selling is determined by external factors, its possible internal impact still needs to be considered. Therefore, this study takes the double difference method as the core logic, takes causal inference as the reliable basis, and carries out parallel trend test, as shown in Figure 1:

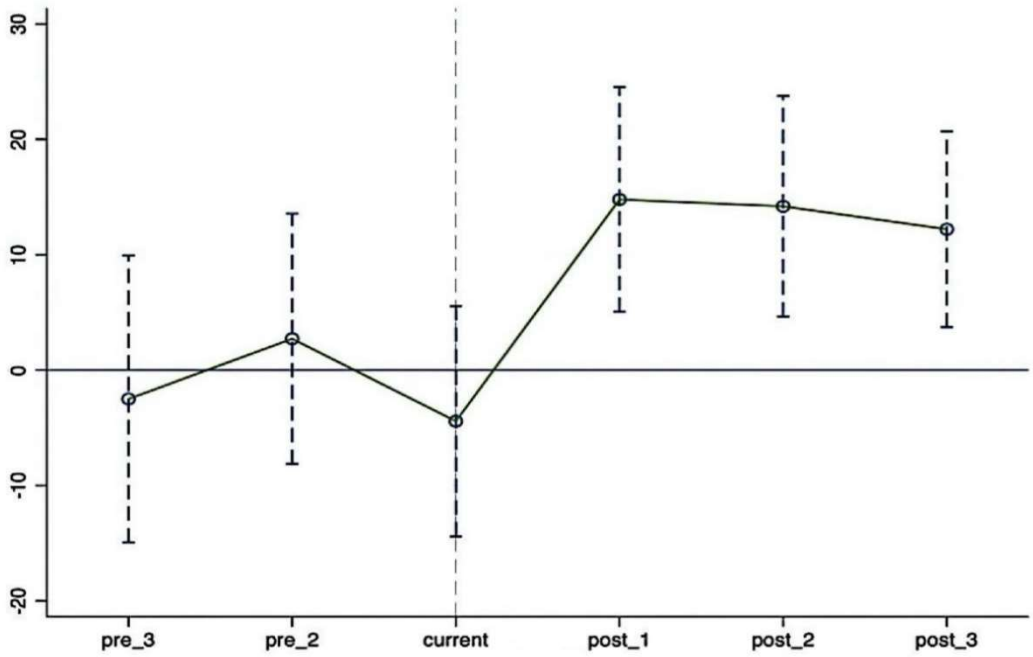

Figure 1. Parallel trend test

Findings indicate that the fluctuating impacts of each phase preceding the introduction of margin trading and short selling expansion policies show no notable differences, exhibiting similar patterns. However, after the policy is implemented, the effects surge sharply. Therefore, our experiment meets the DID parallel trend hypothesis, and the model estimation is valid, proving that the short selling mechanism indeed has a significant and sustained positive impact on corporate internal control.

3.4.2. Placebo Test

This study employed a time placebo test. The core logic is to examine whether the significance of the key variable (Short) is driven by random factors by using a fictional treatment group or a fictional policy timeline. If the Short coefficient is not significant in the fictional experiment, it enhances the robustness of the original results. This paper advances the expansion time of margin trading and short selling by two years, assuming the policys implementation time, and conducts regression analysis on the benchmark model. Results of the regression analysis are displayed in Table 6:

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Table 6. Placebo test

	(1)
	IC
Short	0.20
	(0.09)
Size	21.70***
	(5.86)
Lev	-66.69***
	(-5.08)
ROA	449.8***
	(18.52)
CFO	4.65
	(0.28)
Growth	26.81***
	(9.89)
Top1	0.605**
	(2.91)
Board	0.46
	(0.31)
Dual	9.465**
	(3.26)
Big4	(1.16)
	(-0.13)
Indep	(6.10)
	(-0.17)
cons	128.60
	(1.55)
N	29433
t statistics in parentheses	
* p < 0.05, ** p < 0.01, *** p < 0.001	

Findings reveal the insignificance of the Short coefficient, suggesting that false short selling's influence does not alter the internal control and successfully clears the placebo test. This indicates that the significant effect of short selling mechanism in this study is not accidental, but a real causal relationship.

3.4.3. Alternative Variable Method

In order to verify the robustness of the results of this study, internal control defects were used to replace internal control quality, and the regression of research hypotheses was carried out. The results are shown in Table 7:

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Table 7. Method of substitution variables

	(1)
	Internal control deficiencies
Short	-0.00475
	(-0.56)
Size	0.00625
	-0.68
Lev	0.0580*
	-2
ROA	-0.390***
	(-8.35)
Top1	-0.000201
	(-0.35)
Growth	-0.00803
	(-1.58)
CFO	0.021
	-0.6
Dual	-0.0179*
	(-2.37)
Indep	0.136
	-1.69
Board	0.00158
	-0.45
Big4	0.0265
	-0.98
cons	0.145
	-0.68
N	29433
t statistics in parentheses	
* p < 0.05, ** p < 0.01, *** p < 0.001	

Findings indicate a notable inverse relationship between internal control flaws and ROA, and a direct correlation with Lev, aligning with the theoretical anticipation of superior internal control quality. This implies that effective internal control results in robust profits and consistent leverage, underscoring the efficacy of the alternative variable approach.

3.4.4. Instrumental Variable Method

To address potential endogeneity issues, this paper employs the two-stage least squares (2SLS) method for estimation. The instrumental variable is the mean of industry short-selling pressure (IV_industry), which represents the proportion of companies in the industry included in the short-selling list each year. As shown in Table 8, initial regression analysis shows a notable positive link between the instrumental and endogenous variables (Short). The second-stage results indicate that, after controlling for endogeneity, the short-selling mechanism still significantly enhances performance, demonstrating that short-selling pressure compels companies to improve their internal controls, thereby validating the governance role of short-selling.

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Table 8. Instrumental variable method

	(1)	(2)
	Short	IC
IV_industry	1.000***	
	(1.10E+17)	
Short		2.219
		(1.00)
Size	3.60e-17***	14.95***
	(8.95)	(10.72)
Lev	-9.89e-16***	--50.53***
	(-35.57)	(-6.15)
ROA	-5.72e-16***	602.3***
	(-12.97)	(25.66)
Top1	(0.00)	0.464***
	(-1.87)	(6.58)
Growth	4.34e-17***	21.22***
	(8.51)	(7.18)
CFO	-1.01e-15***	-48.28**
	(-23.46)	(-3.01)
Dual	-1.21e-16***	8.896***
	(-17.54)	(4.83)
Indep	0.00	11.84
	(1.76)	(0.52)
Board	0.00	(0.23)
	(0.41)	(-0.26)
Big4	2.35e-16***	16.87***
	(16.48)	(4.03)
cons	0.00	272.4***
	0.00	(9.27)
N	29433	29433
t statistics in parentheses		
* p < 0.05, ** p < 0.01, *** p < 0.001		

3.5. Heterogeneity Analysis

3.5.1. Analysis based on the Nature of Enterprise Property Rights

This paper examines how the nature of property rights influences the positive relationship between the short-selling mechanism and internal control quality. In the benchmark regression model, a moderating variable, the nature of equity (SOE), was included. The results, as shown in Table 9, indicate that the short-selling mechanism significantly enhances internal control in state-owned enterprises more than in non-state-owned enterprises, reflecting the differentiated effectiveness of external supervision based on the nature of property rights.

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Table 9. Analysis of the nature of enterprise property rights

	(1)	(2)
	state-owned enterprises	Non-state-owned enterprises
Short	37.01***	4.089
	-4.45	-1.03
Size	23.33**	18.13***
	-3.17	-4.36
Lev	-108.2***	-38.39**
	(-3.76)	(-2.62)
ROA	470.0***	429.4***
	-7.36	-16.56
CFO	15.5	3.656
	-0.47	-0.2
Growth	20.04***	29.25***
	-4.01	-8.96
Top1	0.214	0.578*
	-0.6	-2.04
Board	-2.228	2.897
	(-0.87)	--1.59
Dual	7.385	8.761**
	-1.21	-2.63
Big4	-3.951	1.922
	(-0.27)	-0.16
Indep	-38.6	11.1
	(-0.67)	-0.24
cons	139.5	171
	-0.85	-1.83
N	9334	19696
t statistics in parentheses		
* p < 0.05, ** p < 0.01, *** p < 0.001		

3.5.2. Industry Risk Analysis

To deepen the causal relationship between the short-selling mechanism and internal control quality, this paper introduces a moderating variable, high-risk industries (High_Risk), into the benchmark regression model. As shown in Table 10, the short-selling mechanism significantly enhances internal controls within low-risk industries, but not in high-risk industries, indicating that industry risk moderates the effectiveness of short-selling supervision.

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Table 10. Industry risk analysis

	(1)	(2)
	high-risk industry	Low risk industries
Short	-9.737	13.88***
	(-0.84)	-3.63
Size	26.96	19.57***
	-1.37	-5.15
Lev	-53.25	-65.12***
	(-0.89)	(-4.84)
ROA	346.5***	459.9***
	-3.71	-18.08
CFO	-102.3	8.618
	(-1.40)	-0.5
Growth	24.56	26.96***
	-1.33	-9.87
Top1	0.582	0.653**
	-0.47	-3.06
Board	5.932	0.317
	-0.7	-0.21
Dual	23.55*	8.933**
	-2.29	-2.94
Big4	-222.8*	3.127
	(-2.04)	-0.37
Indep	7.421	-6.669
	-0.04	(-0.18)
cons	-11.78	167.4*
	(-0.03)	-1.96
N	1360	27464
t statistics in parentheses		
* p < 0.05, ** p < 0.01, *** p < 0.001		

4. Research Conclusion and Suggestions

This study proves that short selling mechanism significantly improves the quality of internal control of enterprises, and state-owned enterprises and low-risk industries have more significant response to short selling pressure.

In terms of policy suggestions, the scope of short selling targets should be expanded in an orderly manner at the regulatory level, and the supervisory effect of information mining by short sellers should be strengthened. At the enterprise level, enterprises should take the initiative to transform short selling pressure into internal control optimization power and improve the risk early warning mechanism.

There are two aspects that need to be improved in this paper. First, the internal control quality index provided by the De Boer database is used in this paper, but this index does not fully consider the complexity and dynamism of corporate internal control work, and the impact of short selling mechanism needs further in-depth research. Second, although the DID design is adopted, the policy choice may not be completely exogenous.

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