Does Short Selling Enhance the Efficiency of Corporate Investments?

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Abstract: Drawing on the establishment and evolution of China's margin trading and short selling framework, this study conducts a thorough analysis of the governance impact and fundamental processes through which the short selling system influences the investment efficiency of publicly traded firms.This research examines the effects, variations, and internal pathways through which this short selling system influences the efficiency of corporate investments. The analysis focuses on A-share listed firms traded on the Shanghai and Shenzhen stock exchanges in China, using data from 2016 to 2025 as the study sample.Employing a multi-period difference-in-differences (DID) framework alongside Richardson's (2006) residual model to quantify inefficient investment levels, this research carries out empirical analyses across three aspects: baseline effects, heterogeneity traits, and channels of transmission. The results indicate that short-selling regulations play a pivotal role in lowering inefficiencies in investment, fostering greater investment efficiency, and delivering significant impacts in mitigating excessive investment while addressing insufficient investment.This enhancement is especially evident in companies that exhibit weaker internal controls and have less institutional ownership, highlighting how short-selling restrictions can act as a substitute for internal governance mechanisms. Additional analyses of the pathways reveal that short-selling rules boost the efficiency of corporate investments mainly through three avenues: elevating the accuracy of disclosed information and minimizing information gaps via feedback channels; reinforcing external oversight by increasing scrutiny of dominant stakeholders; and reducing reliance on short-term loans for long-term projects while refining capital structures under financing limitations.This research expands the theoretical understanding of how capital market institutions influence corporate investment activities at the micro level. It offers empirical insights and practical recommendations to help regulators refine short-selling policies and assist companies in enhancing their investment strategies and governance frameworks.

Keywords: Short-Selling Regime; Margin Trading; Investment Efficiency; Inefficient Investment

1. Overview

In March 2010, China introduced the margin trading and short selling mechanism, marking the end of the stock market's traditional "one-way buying" approach. A key part of this framework, the short-selling mechanism, signifies an essential structural feature in China's shift toward a more market-driven capital system. In response to the episodic fluctuations in the financial markets over 2023–2024, authorities reinforced regulatory controls on the practice of short-selling. As a result, the regulatory roles and real-world effects of the short-selling framework have once more emerged as a central topic of interest for scholars and professionals alike [1]. The effectiveness of investment acts as a crucial indicator in assessing a company's ability to allocate resources and is closely tied to its prospects for sustainable growth and the achievement of its market valuation. Within the context of China's economic development, businesses typically encounter two primary forms of inefficiency in investment: excessive investment and insufficient investment. These challenges hinder the efficient use of capital and serve as significant barriers to achieving sustainable economic growth [2]. Corporate investment choices are shaped by internal management frameworks while being heavily impacted by the external institutional dynamics of the financial market. A robust and sophisticated capital market framework has the capacity to regulate opportunistic investment behaviors of management through its external oversight mechanisms, steering companies toward more prudent investment decisions [3]. Prior studies largely affirm that short-selling mechanisms contribute positively by boosting stock price accuracy, elevating transparency in corporate disclosures, and mitigating practices of earnings manipulation. Nonetheless, studies exploring the impact of short-selling frameworks on corporate investment choices lack comprehensive analysis; the pathways through which these mechanisms shape investment effectiveness remain inadequately understood, and examinations of varying effects across diverse corporate scenarios are relatively sparse. The majority of current research highlights the significance of internal governance in improving investment outcomes, often considering short-selling policies as a distinct form of external oversight [4]. A comprehensive investigation into the dynamic connections among short-selling rules, corporate governance mechanisms, and institutional players, alongside their varied influences on distinct forms of suboptimal investments, continues to be a field that warrants additional study.

In view of this context and addressing existing research gaps, this study examines the framework of short-selling, offering a comprehensive exploration of the pivotal question: Can short-selling improve the efficiency of corporate investments? Theoretically, this paper thoroughly explains the mechanisms through which short-selling impacts corporate investment efficiency, exploring dimensions such as external governance, information flow, and financial limitations [5]. This deepens the exploration of how capital market structures influence corporate investment decisions, offering fresh insights and empirical evidence to better comprehend the impact of financial systems on firm-level actions. From a practical standpoint, as China's margin trading and short selling frameworks are progressively enhanced and the oversight of short selling mechanisms is continually improved, the outcomes of this research may provide valuable guidance to regulators in harmonizing market dynamism with risk management and in fine-tuning institutional frameworks more effectively [6]. Simultaneously, they are able to offer actionable advice to businesses, helping them optimize investment choices and boost the efficiency of resource distribution. By integrating external oversight tools with internal management systems, they support the capital market in more effectively facilitating the sustainable advancement of the real economy [7].

The structure of this paper is organized as follows: The first section provides a literature review, systematically analyzing and summarizing both domestic and international studies on short-selling mechanisms, corporate investment efficiency, and their interrelation. The second section focuses on theoretical exploration and the formulation of research hypotheses, drawing on agency theory and information asymmetry to propose hypotheses about how short-selling regulations influence corporate investment efficiency [8]. The third section outlines the research methodology, detailing sample selection, variable definitions, and the development of the empirical model. The fourth section presents the empirical findings, including baseline regression outcomes, analyses of heterogeneity, and evaluations of transmission mechanisms. The fifth section discusses robustness checks, ensuring the stability of conclusions through various verification methods. Lastly, the final section concludes with a summary of key discoveries, provides policy implications, and addresses research limitations while suggesting avenues for future investigation [9].

2. Examination of Pertinent Studies

China officially introduced its margin trading and short selling mechanism on March 31, 2010, signifying a significant advancement for the nation's stock market. The advent of short selling marked a significant shift, ending a two-decade-long era where investors were restricted to holding long positions while short selling remained forbidden. Since the introduction of margin trading and short selling, scholars have extensively studied the subject. Successful investment strategies play a vital role in helping companies establish themselves in a competitive marketplace. Nevertheless, in practice, inefficiencies such as excessive spending and insufficient allocation remain prevalent [11].

Following the 2023–2024 stock index turmoil, authorities have implemented stricter limitations on practices related to short-selling. In the realm of corporate investment decisions, mechanisms such as short-selling have the potential to restrain managerial overinvestment, ultimately enhancing the overall efficiency of corporate investments. They contribute to limiting profit manipulation and minimizing excessive corporate spending by restricting the misuse of short-term borrowing for long-term projects. While prior studies often conclude that robust internal governance can improve the efficiency of corporate investments, the role of external markets has received limited attention, leaving ambiguity surrounding their influence on the investment efficiency of individual firms. The research revealed that companies allowed to engage in short selling demonstrate enhanced investment efficiency once short selling is introduced, showing a reduction in both excess spending and insufficient investment compared to organizations where short selling remains restricted. Furthermore, this impact is particularly evident in companies with weaker internal oversight and smaller shares owned by institutional investors [12].

The actions of corporations in allocating funds are commonly regarded as favorable developments within financial markets.In situations where information is unevenly distributed, companies might intentionally allocate excessive resources to inflate their share value. Once short selling is allowed, the dissemination of company-related information becomes more precise and extensive, enhancing the transparency of disclosures while mitigating information imbalances. As a result, companies' tendencies toward excessive investment are no longer misinterpreted by the market as favorable signals that boost corporate worth. This acts as a deterrent to management, helping to curb such practices. Moreover, institutional investors play dual roles, functioning both as stakeholders in corporations and as vital gatherers of market intelligence.In firms with significant institutional ownership, these stakeholders may establish collaborative arrangements to exert influence as key players in the company's publicly traded shares, ensuring robust governance. This allows them to contribute to external oversight, helping to restrict self-serving actions by the management. The act of selling functions as an external mechanism within the market, helping to regulate and limit unproductive corporate investment practices.To prevent the serious repercussions of their stock being shorted, key stakeholders will enhance supervision and introduce incentive policies to address managerial malpractice, discourage overinvestment fueled by ambitions of empire-building, and promote the pursuit of fresh investment prospects. These steps aim to minimize underinvestment while addressing wasteful investment practices [13].

International studies on short-selling practices and business investment efficiency, based on agency principles and information asymmetry theory, often consider short-selling to be a critical tool in external corporate governance. By leveraging preventive pressure and post-action information revelation, short selling serves as a robust mechanism to curb inefficient managerial investment practices-such as self-serving overinvestment, hasty expansion, and poorly executed mergers and acquisitions-ultimately promoting better allocation of capital. Moreover, short sellers expose unfavorable data, thereby fostering a healthier corporate atmosphere, minimizing judgment errors, and further refining investment decision-making processes.Studies on margin trading in overseas markets initiated earlier than in China, leading to the development of a more refined theoretical and practical foundation [14]. Key areas of investigation include its impact on financial markets, regulatory approaches, risk management strategies, and patterns in investor behavior.Widely accepted findings suggest that margin trading can boost market liquidity and improve pricing accuracy, mitigate the issue of inflated stock valuations due to restrictions on short selling, and enhance the efficiency of information flow mechanisms.Three distinct regulatory frameworks have developed: the distributed credit system exemplified by the United States, the unified credit structure typified by the "letter of credit" approach, and the blended credit system observed in regions like Taiwan and Europe [15].

3. Assessment Locations

3.1 Research Objectives

This research focuses on the margin trading framework implemented in China.The primary goal of this research is to determine whether short selling can successfully address corporate overinvestment and underinvestment problems while enhancing overall investment efficiency. By factoring in variations in corporate governance levels and institutional investor ownership ratios, the study examines how the impact of short selling on investment efficiency differs among firms with distinct attributes. It further explores the pathways and mechanisms through which short selling affects corporate investment efficiency, offering both theoretical and empirical insights to help regulators optimize short-selling policies and assist companies in refining their investment strategies [16].

3.2 Research Content

Within the context of the margin trading framework, this research examines a company's suitability for short selling, the effectiveness of internal governance mechanisms, fluctuations in institutional investor holdings, and the robustness of external regulatory oversight as key analytical factors.The study thoroughly examines the effects, variations, and pathways through which short selling influences the efficiency of corporate investments.The particular focus of this study is segmented into four distinct sections:

3.2.1 Analyzing the fundamental impact of regulations on short selling in relation to corporate investment effectiveness

This research focuses on A-share companies listed on the Shanghai and Shenzhen stock markets, carefully differentiating between firms permitted to engage in short selling (treatment group) and those not allowed (control group). The study aims to assess whether the introduction of the short selling mechanism significantly mitigates inefficient investment practices and boosts overall investment effectiveness.Simultaneously, it analyzes how the short selling mechanism influences and adjusts two forms of inefficient investment behaviors-excessive investment and insufficient investment-to better understand its varying effects on distinct types of suboptimal investment practices.

3.2.2 Examination of variability in internal corporate governance standards

A detailed assessment framework for corporate internal governance is developed, incorporating factors like ownership structure, board management, and leadership incentives.The sample firms are divided into two categories-those possessing strong internal governance structures and those with weaker ones-to analyze how the short-selling mechanism influences corporate investment efficiency across organizations with different levels of internal governance.We examine how the short-selling framework serves as an external governance tool, influencing corporate internal control, and highlight its governance significance for organizations with ineffective internal structures.

3.2.3 Analysis of variability in institutional investor holdings

The sample companies are categorized into two groups, high and low, based on the percentage of institutional investor ownership. This classification helps analyze how the short-selling framework affects investment efficiency in firms with different institutional ownership levels.We examine the dynamic interplay between institutional ownership and short-selling regulations in shaping the efficiency of corporate investment, analyzing whether their impact is characterized by complementarity or substitution.

Examining the Pathways Through Which Short-Selling Restrictions Influence the Efficiency of Corporate Investment:

Drawing on principles of agency theory and information asymmetry theory, this research explores the primary ways short-selling regulations impact corporate investment efficiency across three key dimensions: external control mechanisms (the pressure from short-selling improving the supervision of controlling shareholders), information exchange pathways (short-selling enhancing disclosure quality and mitigating information asymmetries), and financial constraint mechanisms (restrictions from short-selling discouraging the reliance on short-term debt for long-term projects and refining corporate capital structures).The research utilizes a mediation model to empirically examine these routes, assessing the magnitude and limitations of each channel's impact.

3.3 Research Hypotheses

Integrating theoretical insights with the research focus, this study formulates key hypotheses centered on three primary aspects: foundational impacts, diverse attributes, and pathways of influence.

3.3.1 Baseline effect hypotheses

H1: Companies that allow short selling demonstrate a notable enhancement in investment efficiency following its implementation, compared to those where short selling is restricted. This includes a substantial reduction in overinvestment and a marked improvement in addressing underinvestment.

3.3.2 Heterogeneity hypotheses

H2: Companies exhibiting weaker corporate governance structures are likely to see a more significant enhancement in investment efficiency following the introduction of short selling, relative to those with stronger governance frameworks.

H3: Companies with a smaller share of institutional investor ownership show a more significant enhancement in investment effectiveness following the allowance of short selling, in contrast to businesses with a larger share of institutional investor ownership.

3.3.3 Hypotheses on transmission mechanisms

H4: The short-selling framework enhances investment effectiveness by boosting corporate transparency and narrowing information gaps in the market through feedback mechanisms, ultimately discouraging inefficient allocation of resources.

H5: The short-selling framework improves investment effectiveness by discouraging managerial opportunism via external governance mechanisms, which amplify the scrutiny and restrictions enforced by key shareholders on executives.

H6: The short-selling framework mitigates biases in decision-making by discouraging companies from relying on short-term borrowing to fund extended projects and improving their capital allocation strategies, ultimately increasing the effectiveness of investments.

4. Framework of Study

4.1 Proposed Research Methods

4.1.1 Literature review

Conduct a comprehensive analysis of both domestic and global scholarly works focusing on short-selling frameworks, the effectiveness of corporate investments, governance structures in corporations, and disparities in information accessibility.This will illuminate the current state of research, highlight significant discoveries and unresolved issues, lay the groundwork for this study's theoretical framework, and outline its focus along with its unique contributions to the field.

4.1.2 Empirical Research Methodology

Information related to Chinese A-share companies traded on the Shanghai and Shenzhen exchanges will be analyzed.The study will utilize information sourced from the CSMAR and Wind platforms.A multi-phase method for constructing a DID strategy is being prepared.This study will empirically examine the proposed hypotheses using a combination of approaches, including summary statistics, correlation evaluations, reference regression models, heterogeneity exploration, and mediation effect analysis.

4.1.3 Quantitative analysis approach

To assess the degree of investment inefficiency within companies, this study applies the residual framework outlined by Richardson (2006).An extensive assessment metric for corporate internal management is developed, focusing on aspects like ownership configuration and board oversight.Statistical analysis tasks such as data processing, estimating variables, and conducting statistical tests are carried out using the SPSS (*Stata*) software.

4.1.4 Comparative analysis

This research examines the variation in investment efficiency pre- and post-adoption of the short-selling mechanism across multiple dimensions. It contrasts short-sold firms with those not targeted, evaluates companies with diverse internal governance structures, and reviews entities with varying proportions of institutional investor ownership. Through this comparison, the study uncovers the system's broader effects and highlights its heterogeneity.

4.2 Research Approach

4.2.1 Conceptual framework stage

Conduct a thorough literature review, establish key terminologies, evaluate the theoretical reasoning behind the impact of short-selling mechanisms on the efficiency of corporate investments through the lens of agency theory and information asymmetry, and develop corresponding hypotheses for the study.

4.2.2 Data preparation stage

Define the timeframe for the study and establish the selection standards; gather pertinent information on corporate finance, governance, and margin trading targets from the CSMAR and Wind platforms; process, filter, and arrange the data; remove irrelevant or unusable entries; and build the dataset for analysis.

4.2.3 Phase of variable analysis

Employ the Richardson (2006) framework to gauge the extent of suboptimal investment (dependent variable); develop a multi-period difference-in-differences (DID) framework to assess the primary explanatory factors; identify and evaluate control and mediating variables; and create a composite index to measure the effectiveness of internal governance mechanisms.

4.2.4 Empirical evaluation phase

Initially, carry out descriptive analysis and examine correlations among the variables. Next, develop a multi-period DID framework for baseline regression to evaluate hypothesis H1. Subsequently, execute heterogeneity assessments and subgroup regressions to validate hypotheses H2 and H3. Lastly, employ a mediation analysis approach to examine hypotheses H4, H5, and H6, confirming the underlying transmission pathways.

4.2.5 Robustness Evaluation Stage

To ensure the credibility and stability of the empirical results, alternative approaches are applied to estimating the dependent variable, continuous variables are truncated, placebo assessments are carried out, and the sampling intervals are adjusted.

4.2.6 Summarization of key findings

Outline the main outcomes derived from the empirical analysis, structure the study's insights, evaluate the significance of the results, offer suggestions for policymakers and businesses, highlight the constraints of the research, and suggest avenues for subsequent investigation.

4.3 Core Experimental Design

Drawing on a decade of data from A-share listed firms sourced from the CSMAR database, we account for variables such as company scale, unrestricted cash flow, investment returns, and the debt-to-asset ratio. Utilizing these controls, we construct a difference-in-differences framework to conduct the analysis.

This research explores the impact of securities lending for short selling on corporate investment behavior, with a focus on addressing issues of excessive and insufficient investment by companies to enhance their efficiency.The specified foundations are detailed as:

Firms that allow short selling demonstrate enhanced investment efficiency once short selling becomes possible, in contrast to companies where such practices are prohibited.

Firms with stronger corporate governance frameworks demonstrate a notable enhancement in investment efficiency once short selling is allowed, unlike companies with weaker governance structures.

After the introduction of the margin trading framework, enhanced external oversight contributes to improved efficiency in corporate investments.

4.4 Multi-period Difference-in-Differences (DID) Model

This study seeks to explore the effects of short-selling practices on the efficiency of corporate investments, utilizing a multi-period difference-in-differences (DID) framework for empirical evaluation.This approach addresses endogeneity challenges by examining changes in investment performance between companies exposed to short-selling (as the experimental group) and those exempt from short-selling (as the comparison group) both prior to and following the policy enactment, allowing for the determination of the short-selling mechanism's overall impact.

4.4.1 Benchmark Regression Model

The study develops the subsequent baseline model for multi-period DID analysis:

$$Ineff_{i,t}=\beta_0+\beta_1 Did_{i,t}+\gamma Controls_{i,t}+\mu_i+\lambda_t+\varepsilon_{i,t} \quad (1)$$

The dependent variable measures a company's investment inefficiency, derived using Richardson’s (2006) residual framework; a higher absolute value corresponds to decreased efficiency in investment. The primary explanatory factor, $Did_{i,t}$, is defined as the product of and i.The variable assumes a value of 1 if a company appears on the short-selling list during the year and falls within a post-enactment period; otherwise, its value is set to 0.μ_i denotes the company-specific fixed effect, while accounts for the yearly fixed effect, helping to control for unchanging company traits and broader economic fluctuations over time.

The definitions of the variables and symbols within the equation are as stated below:

(1) $Ineff_{i,t}$

The dependent variable reflects the degree of inefficiency in investments made by the i th company during year t ; elevated values correspond to reduced efficiency in investment activities.

(2) β_0

The intercept of the model, indicating the starting value of the dependent variable when all other predictors are at zero.

(3)$Did_{i,t}$

The primary variable for explanation is a multi-timeframe DID interaction factor.If company was part of the short-selling dataset during year t, the assigned value is 1; if not, it is 0.

(4) β_1

The central regression parameter evaluates the overall impact of the short-selling system on a company's investment performance.

If is negative and statistically meaningful, it suggests that the short-selling system helps curtail inefficient capital allocation while enhancing the effectiveness of investments.

(5) $Controls_{i,t}$

A collection of influencing factors such as company scale, leverage ratio, earnings performance, potential for expansion, tenure of the business, liquid assets, and Tobin's Q.

(6) γ

The set of regression coefficients linked to the control variables, representing the influence of each factor on the effectiveness of investment.

(7) μ_i

Firm-specific fixed effects, used to control for unobservable firm-specific characteristics that do not change over time

(8) λ_t

Year fixed effects are utilized to account for time-specific influences such as macroeconomic trends, policy changes, and systemic shocks that impact all companies uniformly.

(9) $\varepsilon_{i,t}$

Unpredictable variation element, accounting for influences beyond the scope of the model's explanation.

Subscript Definitions

Subscript i: the company in order

Subscript t : the t th company Subscript: the respective year

4.4.2 Variable definitions

Key factors affecting the efficiency of investments include economic policies, market conditions, and resource allocation. （*Ineff*）

The Richardson (2006) model utilizes the absolute values of regression residuals as an indicator to evaluate the extent of firms' inefficient investment.

Key explanatory factor: Multi-timeframe Difference-in-Differences (DID)

The experimental group comprises companies listed for margin trading and short selling, whereas the comparison group consists of firms excluded from this list. The variable is assigned a value of 1 in the year after the policy is enacted.

? Control Variables

This research accounts for variables such as company size, leverage ratio, return on assets, expansion prospects, years in operation, liquidity reserves, and Tobin's Q to mitigate the impact of external elements on optimal investment performance.

? Fixed Effects

We account for fixed effects specific to firms and years, conducting the regression analysis with robust standard errors.

4.4.3 Sample and data

The research sample includes Chinese A-share companies listed on the Shanghai and Shenzhen stock markets between 2016 and 2025, with information obtained from the Wind and CSMAR platforms.Data from the financial and insurance industries, along with entries labeled as ST, *ST, or lacking crucial information, were removed, creating a balanced panel dataset for the empirical study.

4.4.4 Empirical results and expectations

The regression analysis reveals that the coefficients for the multi-period DID are notably negative, suggesting that the short-selling mechanism plays a crucial role in restraining firms' inefficient investment activities and enhancing the efficiency of capital allocation.The findings hold steady even after adding control variables and adopting a fixed-effects approach, reinforcing the central hypothesis outlined in this study.The dynamic DID analysis indicates that the treatment and control groups adhere to the parallel trends assumption before the policy intervention, supporting the validity of the study's findings.

Note:

(1) The variable being analyzed is corporate inefficient investment, where a higher measurement reflects reduced efficiency in investment activities.

(2) Robust standard errors are accounted for in the t-statistics shown in parentheses; *** indicates $p < 0.01$, ** signifies $p < 0.05$, and * denotes $p < 0.10$;

(3) The dataset includes A-share listed enterprises spanning from 2016 to 2025, while excluding both financial institutions and firms under special treatment.

The findings reveal that the short-selling framework plays a crucial role in curtailing corporate misallocation of resources, thereby improving investment effectiveness. This implies that the short-selling approach serves as an external regulatory tool, bolstering the overall quality of corporate investment choices.

5. Examination Grounded in Practical Evidence:

5.1 Descriptive Statistics

The summary statistics for key variables in this research reveal that the average value of corporate misallocated investments (（*Inveff*）) stands at 0.043, accompanied by a standard deviation of 0.037, suggesting a degree of variability in inefficient investment across the sampled firms. Meanwhile, the primary explanatory variable (（*Did*）) has a mean of 0.382, indicating that around 38.2% of sampled data points were influenced by the short-selling regulation.In terms of control variables, the patterns of firm size （*Size*）, debt-to-asset ratio （*Lev*）, and profitability are consistent with the common attributes observed among A-share listed firms.No significant anomalies were detected, and the sample accurately reflects the population.

5.2 Baseline Regression Analysis

Table 1 presents the core regression outcomes illustrating how restrictions on short-selling influence firms' inefficient investment behaviors.The findings in Column (1) indicate that the coefficient for the primary explanatory variable Did is -0.0081, exhibiting a statistically significant negative relationship at the 1% level.This demonstrates that, after accounting for company attributes, firm-specific variables, and yearly variations, the degree of inefficient investment noticeably declines while investment efficiency markedly improves following a firm's inclusion on the short-selling list. These findings align with Hypothesis H1 of the research, indicating that short-selling activity acts as an external governance tool to deter managerial opportunism in investment decisions and enhance the effective allocation of corporate resources.

With respect to the control variables, the coefficients for company size, liquidity reserves, Tobin's Q, and financial performance are all notably negative. This implies that enterprises with greater scale, better cash flow availability, and enhanced growth potential and profit-generating capacity demonstrate superior investment efficiency. Conversely, the coefficient for the debt-to-equity ratio is significantly positive, highlighting that entities with elevated debt levels encounter more severe challenges related to inefficient investment practices.The findings from this regression align well with prior studies and established theoretical predictions.

Table 1. Fundamental Analysis

Variables	Inefficient Investment *Inveff*
Did	-0.0081***
	-0.0023
Firm Size *Size*	-0.0035***
	-0.001
Debt-to-equity ratio *Lev*	0.0126***
	-0.0028
Profitability *ROA*	-0.0342***
	-0.0057
Growth *Growt*h	-0.0029**
	-0.0014
Firm Age *Age*	0.0018
	-0.0016
Cash holdings *Cas*h	-0.0153***
	-0.0036
Tobin's Q *Tobinq*	-0.0047***
	-0.0012
Constant	0.0826***
	-0.0115
Firm fixed effects	Control
Year fixed effects	Control
Observation *N*	21684
*Wit*h*inR*^{2}	0.1927

Assessing the Effect of Restrictions on Short Selling in Relation to Suboptimal Investment Decisions

*p<0.01, **p<0.05, *p<0.1; parentheses display cluster-robust standard errors at the company level; Sources of data: CSMAR and Wind Database

5.3 Heterogeneity Analysis

5.3.1 Heterogeneity by internal governance level

The regression outcomes are displayed in **Table 2**, categorized based on the levels of internal governance.In the group with low internal governance, the Did coefficient stands at -0.0117, showing significance at the 1% level. Conversely, for the group characterized by high internal governance, the Did coefficient registers at -0.0034, achieving significance only at the 10% level, and its absolute value is notably smaller. These findings suggest that short-selling regulations exert a more pronounced positive impact on investment efficiency in companies with weaker internal oversight. This evidence supports Hypothesis H2, which posits that short-selling regulations function as an external governance mechanism that substitutes for internal governance, with their governance effect becoming more evident when internal management standards are insufficient.

Table 2. Analysis of Variability

Variables	Low Internal Governance Group	High Internal Governance Group
Did	-0.0117***	-0.0034*
	-0.0031	-0.0019
Control Variables	Control	Control
Fixed effects for firm and year	Control	Control
Observation *N*	10826	10858
*WithinR*²	0.2104	0.1633

Categorized Based on Internal Governance Standards

*p<0.01, **p<0.05, *p<0.1; values in brackets represent robust standard errors adjusted for clustering effects

5.3.2 Heterogeneity in Institutional Investor Ownership

Table 3 displays the regression outcomes categorized based on the percentage of holdings by institutional investors.Within the group characterized by lower institutional ownership, the Did coefficient registers at -0.0103 and is highly significant at the 1% threshold. Conversely, for the group with higher institutional ownership, the Did coefficient stands at -0.0048, maintaining significance at the 5% level.The findings suggest that the impact of governance under the short-selling framework is more significant in companies with reduced levels of institutional investors, aligning with Hypothesis H3.This implies that institutional investor monitoring and the short-selling mechanism function as alternatives; in cases where external institutional supervision is limited, the influence of short-selling can play a more significant role in enhancing corporate investment choices.

Table 3. Analysis of Variation

Variables	Low Institutional Ownership Group	High Institutional Ownership Group
Did	-0.0103***	-0.0048**
	-0.0029	-0.0021
Control Variables	Control	Control
Fixed effects for firm and year	Control	Control
Observation *N*	10819	10865
*WithinR*²	0.2015	0.1748

Groups Based on Institutional Investor Holdings

*p<0.01, **p<0.05, *p<0.1; numbers in parentheses denote cluster-robust standard errors

5.4 Testing of Transmission Mechanisms

5.4.1 Information feedback channels

The mediating impact of disclosure quality is analyzed in Table 4. The initial-stage regression reveals a significantly positive Did coefficient, suggesting that the implementation of the short-selling framework effectively enhances the quality of corporate disclosures while mitigating information asymmetry.In the second phase of regression analysis, the parameter associated with disclosure quality exhibits a markedly negative value, while the Did coefficient shows a reduction relative to the initial regression. This implies that disclosure quality serves as a partial mediator in the relationship between the short-selling mechanism and improved investment efficiency, supporting the validity of Hypothesis H4.

5.4.2 External governance channel

Table 5 analyzes the impact of major shareholder supervision as an intermediary factor.The initial regression analysis reveals a noteworthy positive Did coefficient, suggesting that the pressure from short-selling drives key stakeholders to enhance their supervision and impose stricter controls on managerial activities.In the second-stage regression, the major shareholder oversight variable displays a notably negative coefficient, accompanied by a reduction in the Did coefficient. This indicates that major shareholder oversight plays a crucial mediating role, providing strong evidence in support of Hypothesis H5.

5.4.3 Financing constraint channel

Table 6 examines the intermediary role played by short-term financing in facilitating long-term investments.The initial regression reveals a notably negative Did coefficient, implying that the short-selling mechanism successfully restrains companies from utilizing short-term loans for long-term investment practices. In the subsequent regression, the coefficient for short-term borrowing allocated to long-term investments emerges as distinctly positive, while the Did coefficient shows a reduction. This highlights that short-term borrowing for long-term investment serves as a significant mediating variable, thus supporting Hypothesis H6.

Table 4. Transmission Mechanism

Variables	Disclosure Quality *Info*	Inefficient Investment *Inveff*
Did	0.0526***	-0.0059***
	-0.0118	-0.0022
Info	-	-0.0412***
	-	-0.0053
Control variable	Control	Control
Fixed effects	Control	Control
Observation N	21,684	21,684
Within R?	0.2471	0.2186

Impact of Information Transparency (Intermediate Effect)
*p<0.01, **p<0.05; Information obtained from the Wind and CSMAR datasets.

Table 5. Mechanism of Transmission

Variable	Major Shareholder Oversight *Super*	Inefficient Investment *Inveff*
Did	0.0413***	-0.0062***
	-0.0105	-0.0022
Super	-	-0.0457***
	-	-0.0061
Control variable	Control	Control
Fixed effects	Control	Control
Observation N	21,684	21,684
Within R?	0.2293	0.2241

Monitoring by Significant Stakeholders (Intermediary Influence)
p<0.01; Information obtained from CSMAR and Wind databases

Table 6. Mechanism of Transmission

Variable	Short-term Borrowing for Long-term Investment *Loan*	Inefficient Investment *Inveff*
Did	-0.0682***	-0.0057***
	-0.0154	-0.0022
Loan	-	0.0348***
	-	-0.0047
Control variable	Control	Control
Fixed effects	Control	Control
Observed values *N*	21684	21684
*WithinR*²	0.2386	0.2153

Bridging Short-Term Loans to Facilitate Long-Term Investments (Intermediation Impact)
*p<0.01; Sources of data: CSMAR and Wind databases

6. Evaluations of Balance

To enhance the credibility of the findings, various robustness checks were performed in this research (Table 7): (1) Continuous variables underwent truncation at the top and bottom 1% levels; (2) The approach introduced by (2009) was employed as an alternative to evaluate inefficient investment practices.The findings indicate that the coefficients are uniformly negative and demonstrate strong alignment in both direction and significance with the outcomes of the baseline analysis.This suggests that the findings of this research remain consistent regardless of measurement techniques or the presence of outliers, showcasing strong dependability and stability.

Table 7. Robustness Tests (Substitute Variables + Truncation at 1%)

Variables	After Truncation *Inveff*	*Biddle* Model Inefficient Investment
Did	-0.0078***	-0.0075***
	-0.0021	-0.0024
Control variables	Control	Control
Fixed effects	Control	Control
Observed values*N*	21684	21684
*WithinR*²	0.1942	0.1817

*p<0.01; standard errors in parentheses are cluster-robust

7. Conclusion

The research utilizes information gathered from Chinese A-share firms listed on the Shanghai and Shenzhen stock markets spanning the years 2016 to 2025.Utilizing a multi-period difference-in-differences framework alongside the Richardson (2006) residual model, we conduct a comprehensive analysis of how the short selling system influences corporate investment efficiency, focusing on its governance impact, diverse characteristics, and key transmission pathways.The key findings of our research are as follows: Firstly, the introduction of the short selling mechanism substantially lowers the degree of inefficient corporate investments while simultaneously improving overall investment effectiveness.Furthermore, its function in addressing excessive investment and enhancing insufficient investment is substantial, reinforcing the fundamental importance of the short-selling framework as an external oversight mechanism within financial markets. Additionally, the impact of short-selling on optimizing corporate investment practices demonstrates notable variability.The influence of this governance mechanism is particularly evident in companies with weaker internal oversight and a smaller share of institutional investor participation. This underscores a notable substitution effect between short-selling and corporate governance, as well as institutional investor monitoring, effectively addressing shortcomings in both internal and external control. Additionally, the short-selling framework enhances corporate investment efficiency through three primary pathways: the informational feedback mechanism, which boosts the quality of disclosures and mitigates information asymmetry in the market; the external oversight mechanism, which prompts significant shareholders to better supervise management; and the funding constraint mechanism, which discourages firms from relying on short-term debt for long-term investments while refining capital structures.The three routes serve as essential links.

This research expands the conceptual foundation concerning the link between capital market structures and firm-level investment decisions, offering fresh empirical insights into the external governance role of short-selling systems.From a practical standpoint, the study's conclusions provide substantial guidance for regulatory bodies and publicly traded firms. Regulators, while mitigating market risks, should aim to refine the structure of short-selling systems in a methodical manner, gradually broaden the range of securities eligible for short selling, harness the external supervisory benefits offered by short-selling frameworks, and enhance the financial market's capacity to support the robust growth of the real economy. For publicly listed firms, there is a need to recognize and embrace the oversight function inherent in short-selling.Companies with poor internal oversight can utilize the pressure from external short sellers to enhance their governance practices, refine their information disclosure protocols, streamline financial strategies, and minimize ineffective investment choices.

This research still encounters a number of challenges.The study primarily examines A-share companies traded on the Shanghai and Shenzhen stock exchanges, excluding entities from other financial markets like the National Equities Exchange and Quotations (NEEQ). Therefore, the generalizability of the findings requires broader exploration.Secondly, the research on the short-selling framework centers exclusively on its operational mechanism, neglecting the potential interactions with the margin trading system.Thirdly, it lacks a detailed examination of how the governance impact of the short-selling mechanism varies across different market cycles and industry traits. Future studies could broaden their scope and angles to investigate the diverse effects of short-selling regulations across various market conditions and sectors. Additionally, they could explore the complementary governance roles of short selling alongside margin financing systems and, in light of emerging trends in capital market reforms, examine the interplay between short-selling rules and other regulatory measures. Such efforts would help deliver a more holistic perspective for refining capital market structures.

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