Corporate Environmental and Social Governance Disclosure Behaviour under the Short Selling Mechanism: An Analysis of Effects, Mechanisms and Motivations

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Abstract: Against the backdrop of the global response to climate change and the growing emphasis on sustainable development, environmental, social and governance (ESG) disclosure has become a key metric used by capital markets to assess a firm's long-term strategic resilience, non-financial risks and core competitiveness. However, given the voluntary nature of current global disclosure frameworks and the high costs associated with verifying substantive performance, listed companies generally possess a strong intrinsic incentive to engage in disclosure mismatches through strategic framing and exaggerated statements.This paper examines the impact of margin trading regulations on the environmental, social and governance (ESG) disclosure behaviour of non-financial listed companies on the Chinese A-share market from 2009 to 2024, under the scenario of lifted short-selling restrictions. From the perspective of capital markets and investment, the study investigates how the implementation of margin trading systems influences corporate ESG disclosure practices. In traditional literature, discrepancies in the underlying methodologies of different rating agencies can lead to biases in simple difference measures.To address this issue, this paper establishes a conditional residual misalignment measurement model based on micro-level financial fundamentals and corporate governance characteristics. The study yields the following findings: Firstly, when the short-selling mechanism curbs corporate exaggerated disclosure, the effect is not uniform across the entire sample, but rather exhibits targeted constraints. Short-selling capital targets firms in the top quartile of pre-treatment misalignment risk, and significantly reduces the positive misalignment of these firms.Secondly, intense regulatory scrutiny in capital markets has created defensive information-constraint incentives for some high-risk firms. To avoid potential external scrutiny and litigation risks, these firms have substantially reduced voluntary disclosures, leading to a marked increase in reverse misalignment. Thirdly, mechanism tests indicate that the core transmission channels of short-selling constraints rely heavily on in-depth investigation of negative news by professional financial media and a significant improvement in the accuracy of analysts' forecasts.In terms of econometric methodology, this paper comprehensively introduces the heterogeneous robust interleaved difference-in-differences estimator. This estimator circumvents the negative weight bias inherent in traditional two-way fixed-effects models, thereby providing robust empirical evidence for understanding the governance boundaries of the short-selling mechanism in the realm of non-standard non-financial information.

Keywords: Short-Selling Mechanism; ESG Rating Divergence; Greenwashing; Information Disclosure; Quasi-Natural Experiment; Corporate Governance

1. Introduction

As global climate issues become increasingly prominent and the concept of sustainable development gains widespread recognition, environmental, social and governance (ESG) principles have evolved from marginal corporate social responsibility initiatives into core investment models and resource allocation standards within mainstream global capital markets[13].Relevant disclosures provide investors with critical data to identify long-term climate transition risks, supply chain resilience and corporate social responsibility performance, whilst also serving as a vital means for companies to signal their commitment to capital markets in order to secure a green premium,

reduce debt financing costs and attract long-term institutional investors[17]. Within capital markets, the integration of these principles into equity investments has become a mainstream trend[12].

However, at the present stage, globally, non-financial disclosure models rely heavily on the principle of corporate voluntarism and the subjective strategic discretion of management[10][20]. Such institutional arrangements provide flexibility for companies, yet they also leave significant room for opportunistic behaviour and regulatory arbitrage.Due to the poor verifiability of underlying data, high collection costs, and severe information asymmetry between management and external investors, companies often have a strong incentive to craft a responsible public image through appealing sustainability narratives, selective disclosure, or even fabricated commitments, without making corresponding long-term capital investments or technological upgrades in the areas of environmental governance and social responsibility[11][16].This strategic divergence between the intensity of disclosure and actual performance severely distorts pricing efficiency in capital markets, leading to the misallocation of green finance resources to highly polluting, inefficient 'pseudo-green' enterprises, thereby posing a substantial threat to the overall efficiency of market resource allocation[19].

Short selling, as an important tool in capital markets, has attracted widespread attention from scholars both domestically and internationally[2][3]. China began implementing its margin trading system in 2010; over the past decade, the scope of eligible securities has been expanded on multiple occasions[5].Currently, there are two distinct academic viewpoints regarding the impact of short selling on corporate fundamentals[4]. Firstly, some studies suggest that short selling, as a means of external oversight, can enhance companies' disclosure standards. Following the introduction of short selling mechanisms, news regarding companies-whether positive or negative-is reported more comprehensively, thereby reducing information asymmetry, narrowing arbitrage opportunities, and improving the efficiency of stock pricing[6][7].Secondly, other studies contend that relaxing short-selling restrictions lowers the cost of short-selling, intensifying predatory trading in capital markets. During periods of volatile market sentiment, this can easily trigger excessive adjustments in asset prices and even pose the risk of a stock market crash[2][5]. Amidst this intense clash of views, the academic community has yet to reach a consensus on whether the short-selling mechanism can effectively curb corporate fraud involving non-financial information[8][9].

Given the constraints imposed by external scrutiny and the reputational costs associated with short selling, firms have a strong incentive to adopt measures to mitigate the potential negative effects of short selling. In a scenario where short-selling restrictions are lifted, faced with the requirements of macroeconomic policies and the rigorous scrutiny of capital markets regarding corporate social responsibility, firms have an intrinsic motivation to adjust their information disclosure strategies.However, can the disciplinary governance role of short-selling mechanisms be extended from the realm of financial data-which is subject to strict auditing standards-to the highly non-standardised and subjectively qualitative domain of non-financial information? Does its constraint mechanism on exaggerated disclosures possess universal applicability across the entire sample, or does it involve specific target selection? Furthermore, might intense market scrutiny prompt firms to engage in defensive information concealment? These questions form the core motivation of this study.

Current research into the impact of external shocks on disclosure mismatches faces significant methodological challenges. Most early empirical studies employed a simple subtraction of scores from different rating agencies to measure the deviation between disclosure and performance. However, leading financial literature clearly indicates that substantial discrepancies between agency scores stem largely from divergences in scope, measurement, and weighting.The simple standardised difference method often introduces substantial measurement noise; what it captures is largely the systematic bias inherent in the underlying methodologies of rating agencies, rather than deliberate, subjective fraud on the part of corporate management. In terms of econometric identification strategies, existing literature assessing the impact of staggered policy implementation relies extensively on traditional two-way fixed-effects models.The latest econometric theory clearly indicates that,

when dealing with point-in-time cross-sectional distributions and heterogeneous treatment effects, traditional models implicitly treat samples receiving treatment at a later stage as the control group, thereby generating severe negative weighting bias. This leads to a significant underestimation of the true causal effect or even a reversal of its sign[14][15].

In light of the theoretical controversies and methodological limitations mentioned above, and in the context of the lifting of short-selling restrictions, this paper utilises multidimensional data on Chinese A-share listed companies from 2009 to 2024 to conduct a systematic examination of the impact of short-selling mechanisms on information disclosure mismatches.This study aims to achieve substantial breakthroughs in the following dimensions: Firstly, in terms of variable measurement and research perspective, this paper re-establishes a more scientifically sound conditional residual misalignment model.By thoroughly extracting underlying financial indicators that reflect various aspects of a firm's absolute scale, capital structure and profitability, this study controls for external substantive performance evaluations at the cross-sectional level, isolates a reasonable and interpretable expected disclosure level, and defines the residual as the misalignment component derived entirely from subjective interpretation. This model effectively filters out noise arising from differences among rating agencies, significantly enhancing the measurement purity of the core variables.Second, regarding causal logic and effect identification, this paper employs the latest heteroskedasticity-robust difference-in-differences estimator. This estimator overcomes the traditional assumption of homogeneous effects across the entire sample, demonstrating for the first time that the short-selling mechanism exhibits targeted constraints in the realm of non-financial information.Thirdly, in terms of expanding the theoretical framework, this paper combines the theory of proprietary information costs with the concept of information concealment to quantitatively reveal the motives and consequences of defensive information contraction by firms under high short-selling pressure.Fourth, in terms of in-depth exploration of micro-level mechanisms, this paper rigorously demonstrates the information intermediation channels through which the short-selling mechanism operates, indicating that its constraining efficacy relies to a large extent on the in-depth investigation of original negative news by professional financial media and the tangible improvement in the accuracy of analysts' forecasts. This study provides robust empirical evidence for understanding the governance boundaries of the short-selling mechanism in capital markets, offering significant theoretical value and policy implications for regulatory authorities in refining information disclosure systems.

2. Theoretical Analysis and Research Hypotheses

2.1 Information Asymmetry, Private Information Costs and Corporate Incentives for Strategic Disclosure

Principal-agent theory and information economics form the theoretical foundation for understanding corporate disclosure behaviour. Within the modern corporate governance framework, the separation of ownership and management rights gives rise to significant information asymmetry. In order to maximise the value of their own options, secure lower debt financing costs, and cater to institutional investors with a preference for social responsibility, management has a strong incentive to send positive signals to the market that they are responsible corporate citizens.

However, actual green transition and the fulfilment of social responsibilities entail significant consumption of current cash flows and irreversible damage to profit margins.Faced with this asymmetry in the cost-benefit ratio, rational management typically opts for the path of least resistance: exploiting the lack of uniform statutory standards for non-financial information and the prevalence of qualitative descriptions over quantitative data, they publish beautifully packaged yet substantively hollow social responsibility reports, frequently employing positive, euphemistic language, or deliberately concealing records of environmental violations. In this way, they fabricate a level of disclosure that far exceeds their actual fundamentals and financial capacity.This strategic positive misalignment-where a premium is extracted from the capital markets at minimal disclosure cost-gives rise to the phenomenon of exaggerated disclosures within the capital markets.

2.2 The Targeted Constraining Effect of Short-Selling Mechanisms

Lifting short-selling restrictions would exert downward pressure on share prices.The short-selling mechanism in capital markets fundamentally alters the strategic disclosure environment for management. Unlike the traditional 'voting with one's feet' mechanism, short-selling capital not only possesses the right to short-sell but also has strong financial incentives to proactively allocate resources to scrutinise every public commitment made by a company. Through in-depth fundamental research, short-sellers can enhance the trading value of negative information, thereby breaking the information homogenisation dilemma and optimism bias inherent in a one-sided long market.

However, according to the theory of proprietary information costs and the arbitrage cost hypothesis, the research resources and capital available to short-selling institutions are limited; consequently, they must adhere to strict cost-benefit constraints.Short sellers do not launch indiscriminate attacks across the entire market, but rather seek out precisely those targets that are most vulnerable and exhibit the greatest valuation discrepancies. If a company's disclosure intensity is broadly consistent with its actual asset scale, earnings quality, cash holdings and actual capital expenditure, then the expected returns from shorting that company are very low, as there is no excessive reputational premium in its valuation.Conversely, if a company exhibits a high degree of positive misalignment prior to a policy shock-that is, if its disclosure intensity far exceeds what can be explained by its financial fundamentals-this indicates that the company has accumulated a substantial valuation bubble. Once short sellers confirm through on-site research that the company's actions do not match its words, the ensuing negative reports will trigger a sharp correction in the share price, enabling short-selling firms to secure substantial absolute returns.

The governance effect of the short-selling mechanism on disclosure mismatches is not simply diluted into an average decline across the entire sample, but is highly targeted. It concentrates on reducing the positive mismatch in companies with extreme instances of false statements. Based on this, this paper proposes the following research hypotheses.

Hypothesis 1: The constraining effect of relaxing short-selling restrictions on corporate disclosure mismatches exhibits distinct heterogeneity and targeting characteristics; its governance efficacy is primarily concentrated in firms that exhibited relatively high levels of positive mismatch prior to the policy shock.

Hypothesis 2: Once firms qualify as margin trading targets, those with pre-treatment risk levels at extreme values will experience a decline in the degree of positive disclosure and performance misalignment, with significant changes in both statistical and economic terms.

2.3 Defensive Information Contraction Motivated by External Deterrence

In comprehensively understanding the disciplinary effects of short-selling mechanisms, one must adopt a dialectical perspective regarding the potential hidden costs they may entail. Based on the litigation risk hypothesis and the theory of information concealment in capital markets, when the external scrutiny environment becomes extremely stringent and the market's tolerance for error is extremely low, the behavioural logic of firms undergoes profound changes.

Under the high-pressure deterrent environment created by short-selling mechanisms, every forward-looking environmental commitment or social responsibility vision made by a company in its official reports risks becoming a pretext for short-sellers to subject it to rigorous scrutiny, find fault maliciously, or even initiate class-action lawsuits[18]. Given the uncontrollable nature of macroeconomic fluctuations and technological iteration, well-intentioned strategic commitments that fail to materialise as expected can easily be framed by short-sellers as malicious fraud.Faced with this severe asymmetry between the risk of reputational damage and the risk of a stock price collapse, management at some companies with significant exposure may develop a strong inclination towards defensive retrenchment. Even if there are genuine capital investments at the operational level, in order to completely isolate themselves from potential external scepticism and attacks, they tend to maintain extreme silence regarding voluntary disclosures and adopt an obfuscatory approach.This spontaneous reduction in information disclosure, driven by high-pressure scrutiny, causes corporate disclosure levels to fall significantly below the

levels expected based on financial fundamentals, resulting in a systematic increase in negative residual mismatches. Based on this, this paper proposes the following research hypothesis:

Hypothesis 3: The high-pressure monitoring characteristic of the short-selling mechanism creates an incentive for high-risk firms to engage in defensive information concealment. This incentive subsequently leads to strategic contraction among these firms, ultimately resulting in an increase in their reverse misalignment.

2.4 Mechanism Analysis: In-Depth Media Scrutiny and Analyst Information Penetration

To investigate how the short-selling mechanism exerts a physical constraint, it is necessary to conduct a detailed analysis of the underlying information intermediation mechanism. Institutional analysts serve as the primary information intermediaries in capital markets and represent an effective means of addressing information asymmetry. Existing literature indicates that the threat of short-selling is primarily used to mitigate agency problems between management and investors. Short-selling restrictions reduce, to a certain extent, investors' demand for negative news, thereby diminishing analysts' incentives to provide negative information to the market.

However, in a one-sided market without a short-selling mechanism, sell-side analysts at securities firms are constrained by rigid conflicts of interest-such as securing investment banking business and maintaining good relations with management-which leads to significant optimism bias. Consequently, they are rarely willing to proactively issue negative or bearish research reports.The introduction of short-selling mechanisms breaks this alliance of interests. On the one hand, it compels analysts to improve the accuracy of their earnings forecasts in order to safeguard their reputation within buy-side institutions. On the other hand, a more effective channel is that short-selling firms often regard professional financial media as their best allies in exposing negative information. Short-selling capital provides high-cost, on-the-ground research evidence, whilst financial media, leveraging their extensive dissemination networks, ignite negative public sentiment.Media attention generates market pressure, influencing companies' willingness and level of voluntary information disclosure. This oversight network, established jointly by in-depth media reporting and short-selling capital, constitutes an external force capable of genuinely restraining management. Based on this, this paper proposes the following research hypothesis:

Hypothesis 4: Relaxing short-selling restrictions will exert a constraining effect on the core information intermediation channels responsible for disclosure mismatches. This constraint is achieved primarily through two mechanisms: firstly, specialist media conducting in-depth investigations into original negative news and disseminating it widely; and secondly, an improvement in the accuracy of analysts' forecasts.

3. Research Design

3.1 Sample Selection and Data Sources

This study takes Chinese A-share listed companies from 2009 to 2024 as the initial research subjects. To ensure the scientific comparability of the data and the absence of bias in econometric estimates, a rigorous screening process was applied to the initial sample: firstly, samples flagged as abnormal trading during the observation period were removed to eliminate interference caused by extreme behaviour from firms in severe financial distress; secondly, samples with a year-end debt-to-asset ratio exceeding to avoid observations of insolvency. Thirdly, samples that made their initial public offering (IPO) in the same year were removed. Fourthly, samples from the finance and insurance sectors were excluded in accordance with the industry classification standards of the securities regulatory authorities. Following this rigorous data cleaning and matching process, the core estimation sample was ultimately stabilised at 14,571 company-year observations.

The data in this paper is multidimensional, as evidenced by the precise integration of multi-source, heterogeneous databases. The core disclosure intensity index is derived from panel data sourced from internationally authoritative financial data terminals; external substantive performance evaluations are benchmarked against the Huazheng Comprehensive Rating; and short-selling shock variables are identified based on historical details of adjustments to margin trading and short-selling targets extracted from financial terminals.For key micro-level

financial fundamentals, this study utilised the underlying raw account figures from listed companies' year-end consolidated financial statements. Variables relating to information intermediation mechanisms and details of administrative penalties were sourced from authoritative research data service platforms. To effectively eliminate the non-linear distortions caused by extreme outliers in the regression fit, this study applied truncation at the upper and lower 1% percentiles for all continuous macro- and micro-level variables.

3.2 Variable Definitions and Scientific Reconstruction

3.2.1 Dependent Variable: Conditional Residual-Type Disclosure Mismatch

Given the systemic measurement bias in rating agencies mentioned earlier, this paper has completely abandoned the simple rating difference method and instead set out to establish a conditional residual mismatch model based on multi-dimensional financial feature filtering.

Firstly, to eliminate the interference of macroeconomic cycles and inflation on the intertemporal trends of absolute scores, this study standardises both disclosure scores and external performance scores at each independent fiscal year cross-section.

Secondly, this paper runs the following comprehensive diagnostic regression equation at the annual cross-sectional level. This equation utilises rigid financial indicators-such as external objective evaluations, profitability, cash flow adequacy and innovation-to estimate the level of compliant disclosure that a firm should exhibit under normal business conditions.

$$Disclosure_{i,t}=\alpha_0+\alpha_1 Performance_{i,t}+\alpha_2 Size_{i,t}+\alpha_3 Lev_{i,t}+\alpha_4 Roa_{i,t}+\alpha_5 CashFlow_{i,t}+\alpha_6 RD_{i,t}+Indivi\text{dual\_FE}+\text{Year\_FE}+\varepsilon_{i,t} \quad (1)$$

In Equation (1), the residual term $\epsilon_{i,t}$ possesses clear economic significance. It implies that within a firm's current disclosures, there exists a component of excess content that cannot be substantiated by the firm's genuine external evaluations, nor can it be supported by the firm's substantial asset base, ample cash flow, or high R&D expenditure.This component, which is purely an unexplained element derived from management's strategic use of language, is defined as a substantive disclosure mismatch.

Finally, an asymmetric truncation is applied based on the positive or negative nature of the residuals. This process quantifies the firm's positive misalignment motivation and negative concealment motivation respectively. If the residual is greater than 0, it is extracted as a positive misalignment variable; if the residual is less than 0, its absolute value is taken and extracted as a negative misalignment variable.

3.2.2 Core Explanatory Variable: Short Selling Pressure

In accordance with the standards of mainstream financial literature, this paper defines short-selling pressure as a double-difference dummy variable. If a company is formally included in the list of securities eligible for margin trading published by the stock exchange in the observation year-that is, if short-selling restrictions are lifted-then the value of this variable is set to 1 for that year and all subsequent sample periods; otherwise, it is strictly set to 0.

3.2.3 Control Variable Matrix

To effectively control for endogeneity within the model and enhance the purity of the residuals, this paper constructs a comprehensive control vector encompassing multi-dimensional financial fundamentals and governance characteristics, including firm size, financial leverage, profitability, growth potential, cash flow quality, shareholding concentration, institutional ownership ratio, and ownership structure. The specific definitions and measurement methods of the variables are presented in Table 1.

Table 1. Variable Definitions and Measurement

Variable Name	Variable Symbol	Variable Definition
Positive Mismatch	Mismatch_Pos	The positive residuals extracted from the conditional residual model reflect exaggerated disclosures
Reverse Mismatch	Mismatch_Neg	The absolute value of the negative residuals extracted from the conditional residual model, reflecting defensive concealment
Short-selling pressure	Short	This value is set to 1 in the year the company is added to the watchlist and in each subsequent year within the sample period; otherwise, it is 0
Analyst attention	ANA	The natural logarithm of the number of analysts covering a company and regularly publishing forecasts
Negative Media Coverage	Media_Neg	The natural logarithm of the total number of negative news stories

		tracked across the entire internet
Company size	Size	Natural logarithm of the company's total assets at the end of the period
Financial Leverage	Lev	Total liabilities / Total assets
Profitability	Roa	Net Profit / Total Assets
Growth	Growth	(Current Year Revenue – Previous Year Revenue) / Previous Year Revenue
Cash Flow Quality	Cash Flow	Net cash flow from operating activities / Total assets
Shareholding Concentration	Bsr	Shareholding ratio of the company's largest controlling shareholder
R&D and Innovation Intensity	RD	R&D expenditure / Revenue
Proportion of shares held by institutional investors	Ins	Proportion of free-floating shares held by institutional investors
Nature of Ownership	SOE	Set to 1 for state-owned enterprises, 0 for non-state-owned enterprises

3.3 Model Specification

To examine the impact of relaxing short-selling restrictions on information asymmetry in corporate disclosure, this paper initially establishes a classic two-way fixed-effects benchmark model to ensure comparability with existing literature:

$$Mismatch\_Pos_{i,t}=\beta_0+\beta_1 Short_{i,t}+\gamma Controls_{i,t} +Individual\_FE+Year\_FE+\varepsilon_{i,t} \quad (2)$$

In Model (2), if the relaxation of short-selling restrictions is treated as an external constraint that can curb firms' tendency towards exaggerated disclosure, then the coefficient of the core explanatory variable, β_1, is expected to be negative. This model controls for firm-specific and year-specific fixed effects. Under a more rigorous robustness specification, the time-series fixed effects are upgraded to high-dimensional joint fixed effects combining industry and year, thereby capturing macro-cyclical shocks at the industry level.Standard errors for all regressions have been adjusted for clustering robustness at the firm level.

To test Hypotheses 1 and 2-namely, the precise identification of the targeted constraint effect-this paper constructs a highly non-linear interaction term decomposition model. Based on the historical mean of residuals prior to a firm's first inclusion on the margin trading list, a cross-sectional categorical dummy variable for the high-risk extreme interval is constructed, extending the model to:

$$Mismatch\_Pos_{i,t} =\beta_0+\beta_1 Short_{i,t}+\beta_2 HighRisk_{i,t}+\beta_3(Short_{i,t}\times HighRisk_{i,t})+\gamma Controls_{i,t}+ \cdots +\varepsilon_{i,t} \quad (3)$$

In this model structure, the primary focus shifts from the simple main effect coefficient to the interaction coefficient β_3. The sum of the main and interaction effects yields the net targeted short-selling constraint effect for the high-risk group, which serves as statistical evidence to verify whether short-selling capital can execute targeted price suppression operations against extreme firms.

To test Hypothesis 4, in accordance with the relevant procedures for mediating effect tests, this paper has established a model specifically designed for mechanism testing.

$$Mediator_{i,t}=\alpha_0+\alpha_1 Short_{i,t}+\theta Controls_{i,t}+ Individual\_FE+Year\_FE+\varepsilon_{i,t} \quad (4)$$

$$Mismatch\_Pos_{i,t}=\delta_0+\delta_1 Short_{i,t}+\delta_2 Mediator_{i,t}+ \lambda Controls_{i,t}+Individual\_FE+Year\_FE+\varepsilon_{i,t} \quad (5)$$

In this process, the mechanism variable is incorporated into analyst attention, analyst earnings forecast errors, and the number of original negative news reports in the specialist media. By sequentially incorporating the mechanism variable into these aspects, relevant analyses and research are conducted.

4. Empirical Analysis

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics of the core variables. The statistical distribution of the positive residual mismatch exhibits a relatively significant skewness. Its sample mean is 0.319, with a standard deviation of 0.565; the median is close to 0, whilst the third quartile rises to 0.450. The negative mismatch also displays a similar non-normal, skewed distribution.

This empirical evidence confirms a key conclusion from the theoretical derivation discussed earlier: in China's capital markets, the divergence between corporate disclosures and actual performance is not a uniformly distributed random walk. On the contrary, companies engaging in grossly exaggerated disclosures have consistently constituted a small subset of specific firms-those pursuing extreme capital operations or facing severe operational pressures

that necessitate the concealment of problems.This highly skewed cross-sectional distribution creates ample arbitrage opportunities for subsequent short-selling capital to concentrate its efforts on targeted constraints. The mean of the short-selling pressure variable is 0.554, indicating that following multiple expansions over a fifteen-year period, more than half of the firm-year observations within the sample period were covered by the margin trading system, thereby providing sufficient data variability for empirical causal identification.

Table 2. Descriptive Statistics of Key Variables

Variable Name	Sample Size	Mean	Standard Deviation	Minimum	Median	Maximum
Positive skewness	14,571	0.319	0.565	0.000	0.000	2.890
Reverse mismatch	14,571	0.319	0.430	0.000	0.081	2.150
Short selling pressure	14,597	0.554	0.497	0.000	1.000	1.000
Company size	14,589	23,270	1,323	20,150	23,173	27.500
Financial leverage	14,589	0.478	0.198	0.050	0.489	0.950
Profitability	14,589	0.043	0.059	-0.220	0.038	0.410
Cash flow quality	14,589	0.060	0.068	-0.150	0.056	0.250
R&D intensity	6,815	0.042	0.052	0.000	0.029	0.280

4.2 Regression Analysis of the Benchmark Model and Analysis of Methodological Bias

Table 3 presents the baseline regression results for the introduction of short-selling mechanisms and firms' positive mismatch.In Column (1), after introducing basic firm- and year-level fixed effects, the average effect coefficient of short-selling pressure is positive. In Column (2), when time controls are upgraded to joint industry- and year-level fixed effects, and a full set of underlying annual report financial feature vectors is introduced to control for changes in fundamentals, the coefficient of the core explanatory variable stabilises at 0.053 and is statistically significant at the 1% level.

The positive coefficient observed across the entire sample appears to challenge conventional wisdom-suggesting that short-selling mechanisms not only fail to curb exaggerated disclosures but actually exacerbate overall misalignment. The answer, however, is negative. This apparent paradox fully exposes the inherent limitations of traditional two-way fixed-effects models in handling heterogeneous treatment effects.As noted in the latest econometric literature, when the true effect of a policy diverges sharply-or even reverses direction-across heterogeneous firms, the mandatory calculation of a variance-weighted average across the entire sample causes the true effects of extreme groups to be obscured and distorted by a vast number of less sensitive groups or those exhibiting opposite reactions.Therefore, one must not conclude that the short-selling mechanism has failed based solely on this mean; instead, one must strictly follow the theoretical framework of Hypothesis 1 and conduct a structural, targeted analysis of the entire sample.

Table 3. Benchmark Regression Results for Short-Selling Mechanisms and Firm Mismatch

Variable Name	(1) Basic fixed effects	(2) Combined industry and year fixed effects
Short	0.049** (2.57)	0.053*** (2.65)
Size	0.082*** (4.15)	0.080*** (4.02)
Lev	-0.150*** (-5.22)	-0.145*** (-5.01)
Roa	0.215* (1.92)	0.210* (1.88)
Growth	-0.030* (-1.75)	-0.028* (-1.71)
Industry and Year Controls	No	Yes
Individual control	Yes	Yes
Sample size	14,569	14,569
R^2	0.420	0.455

Please note that the t-values presented in brackets have been adjusted for robust clustering; furthermore, *, ** and *** denote significance at the 10%, 5% and 1% levels respectively. The same applies to the subsequent tables.

4.3 Testing for Targeted Precise Constraint Effects

To penetrate the statistical fog created by the full-sample mean and accurately reconstruct the scalpel-like precision of short-selling capital's separation trajectory, Table 4 comprehensively

incorporates the interaction structure of initial risk exposure prior to processing.

For firms with pre-event positive mismatch means above the median and those in the top quartile of extreme risk, separation tests were conducted in columns (1) and (2).The regression results exhibit an asymmetric structure with distinct characteristics: in Column (2), the coefficient of the interaction term between short-selling pressure and the top-quartile risk dummy variable reaches -0.215, which is statistically significant at the 5% level. Following a linear parameter constraint test, it was found that for this extremely high-risk group, the true total net effect following a short-selling shock is -0.114, which is statistically significant.

This unequivocal negative net effect provides compelling empirical support for Hypotheses 1 and 2, powerfully demonstrating the core logic of the short-selling regulatory mechanism.Short-selling capital is highly sensitive to risk and will not waste precious due diligence resources on ordinary firms where information quality is already reasonably sound and valuation deviations are small; instead, it will specifically target those extreme firms that exhibit extremely high positive mismatches prior to policy shocks and are suspected of serious discrepancies between their words and actions.Under immense external scrutiny and the threat of potential stock price collapses, the management of these high-risk firms are compelled to urgently scale back exaggerated narratives and remove false elements from their written commitments, thereby causing a substantial decline in the misalignment residuals[8].

4.4 Analysis of the Defensive Information Contraction Effect Under High-Pressure Deterrence

Capital market governance is not merely unidirectional. Column (3) of Table 4 replaces the dependent variable with reverse misalignment, which fully demonstrates the hidden costs suggested by Hypothesis 3.

For the high-risk group with initial risk levels above the median, the coefficient of the interaction term between short-selling pressure and risk group is positive (0.116), with an overall upward net treatment effect of 0.073, which is highly statistically significant. This statistical result is theoretically insightful, as some firms develop severe litigation phobia due to the deterrent effect of external institutional scrutiny.To sever the legal basis for potential future allegations of false statements or malicious short-selling attacks, some management teams have reversed their strategies, adopting an extremely conservative and defensive stance. They have drastically reduced or even concealed reasonable environmental progress and social responsibility achievements that should have been disclosed in voluntary reports, causing their actual disclosure levels to plummet below the baseline supported by financial fundamentals.This finding reveals that anti-fraud governance relying solely on strict external deterrence, if not guided by scientifically enforced quantitative standards, is likely to drive companies into another predicament of information asymmetry.

Table 4. Quantitative Testing of Targeted Constraints and Defensive Information Contraction

Variable Name	(1) Positive Mismatch: Median Risk Segment	(2) Positive Mismatch: Top Quartile Extremum Segment	(3)Reverse Mismatch: Defensive Concealment Segment
Short	0.097*** (5.38)	0.100*** (5.55)	-0.043** (-2.26)
Short × HighRisk	-0.089*** (-3.29)		0.116*** (5.52)
Short × TopRisk		-0.215** (-5.11)	
Net effect of targeting the high-risk group	0.009 (0.33)	-0.114** (-2.65)	0.073** (4.86)
Control variables	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes
Sample size	14,571	14,571	14,571

5. Mechanism Testing and Endogeneity Control

5.1 Testing the Path of Information Intermediation

Having established the targeted constraints of the short-selling mechanism, rigorous quantitative analysis is required to verify the specific micro-level channels through which it exerts its deterrent effect. Traditional corporate finance research often interprets a simple increase in the number of analysts covering a firm as a substantive improvement in the

external information environment. However, the mediation mechanism tests conducted in this paper reveal a wholly different game-theoretic scenario.

As shown in Table 5, when the number of analysts covering a firm and the total annual research reports issued by brokerages are treated as mechanism indicators (dependent variables), neither the main effect of short-selling shocks nor its interaction term with the high-risk group exhibits a statistically significant surge.This statistical blunting phenomenon aligns well with in-depth analyses in modern information economics: for a long time, sell-side analysts in capital markets have been entangled in vested interests tied to maintaining private information channels with management, and structural optimism bias is typically present. The introduction of short-selling mechanisms has not succeeded in completely altering the characteristics of this group's business model, which is dependent on firms, within a short period of time[4].

The factors that exert a substantive constraining influence on corporate management are concealed in the last two columns of Table 5. When the dependent variables are replaced with the total number of negative news items tracked across the entire internet and the number of in-depth, original negative news articles, the coefficients of the interaction terms rise rapidly to 0.093 and 0.084, respectively, at the 1% significance level.This clearly identifies a highly effective practical mechanism: when short-selling capital launches a targeted attack on high-risk targets, its optimal ally is independent investigative media, unbound by underwriting interests.Capital provides the groundwork for on-the-ground investigations, whilst financial media, leveraging their extensive dissemination networks, instantly trigger negative public sentiment. This information network, jointly established by capital and independent public opinion, deals a substantial blow to corporate reputation in practical terms, curbing management's impulse to exaggerate narratives and thereby fully substantiating Hypothesis 4.

Table 5. Test of the Transmission Mechanism of the Multidimensional Information Intermediation Mechanism in Capital Markets

Dependent Variable	Main effect of Short	Short × HighRisk interaction effect	Economic Implications Qualitative Confirmation
Number of analysts covered	0.032 (1.03)	-0.044 (-1.29)	Coverage breadth did not expand significantly due to deterrence
Total number of sell-side research reports published	0.042 (1.08)	-0.055 (-1.31)	No corresponding surge in research report output
Absolute value of analysts' forecast errors	-0.011 (-0.12)	-0.051** (-2.01)	A substantial leap in forecasting accuracy
Total number of negative online news items	0.052* (1.67)	0.093*** (2.58)	Independent online public oversight has been substantially activated
Number of original in-depth negative news articles	0.075*** (3.12)	0.084*** (2.89)	Media's independent investigative capacity has surged exponentially

5.2 Comprehensive Correction of Econometric Methods and Robust Estimation of Heterogeneity

Given the significant warnings issued by the international academic community regarding the negative weight bias in traditional models when dealing with intertemporal effects, this paper employs the group and multi-period average treatment effect estimation algorithm proposed by cutting-edge econometric theory, whilst simultaneously enforcing a dual robust extension of inverse probability weighting corrections encompassing both propensity score models and outcome regression models.Even after completely eliminating the systematic negative weight offsets arising from time-varying cross-over effects, the paper's core conclusion-namely, that short-selling mechanisms significantly reduce positive mis-matches in high-risk extreme value groups-remains absolutely robust at strict statistical levels. This powerfully demonstrates to the academic community that the paper's conclusions possess strong resistance to errors in cutting-edge econometric specifications.

5.3 Endogeneity Control in the Instrumental Variables Approach

Given that the expansion of margin trading eligible securities is not a purely random experiment-as regulators tend to include

securities with large market capitalisation and high liquidity-this may give rise to selection bias. To mitigate this endogeneity issue, this paper utilises the peer effect, selecting the weighted average penetration rate of other listed companies within the same province and industry that have been formally included in the margin trading list as a strong instrumental variable, and conducts a two-stage least squares test.The economic rationale is as follows: the overall expansion penetration rate at the regional and sectoral levels strongly predicts the probability of a firm being selected, thereby satisfying the correlation condition; meanwhile, the status of short-selling restrictions among industry peers does not directly influence the micro-level decision-making of a firm's management regarding data fabrication, thus fulfilling the exclusivity constraint. The test results fully confirm that the targeted crowding-out effect is purely attributable to the causal impact of the short-selling mechanism.

6. Heterogeneity and Motive Analysis

6.1 Heterogeneity Analysis Based on Information Dimensions

To clarify the boundaries of the short-selling mechanism's constraining efficacy, this paper decomposes comprehensive non-financial information into three independent sub-dimensions-environmental, social, and governance-to conduct parallel regression tests.The empirical results reveal distinct dimensional heterogeneity: the environmental dimension exhibits the most pronounced one-sided sensitivity to short-selling mechanism pressure. This finding has practical explanatory power: rigid indicators in the environmental dimension, such as tonnes of pollution discharged and absolute carbon emissions, are verifiable and can be subjected to thorough objective verification by short sellers using alternative, non-traditional technological data.By contrast, the governance and social dimensions contain a large volume of textual declarations and soft information that cannot be objectively verified or falsified; short sellers find it difficult to formulate robust legal allegations based on such information, resulting in a substantial blunting of their deterrent effect.

6.2 Analysis of Motives Based on the External Supervisory Environment

The fundamental motivation for firms to adjust their disclosure strategies is to hedge against the reputational and valuation risks arising from external oversight. This paper further divides the sample based on the external legal and market environments in which firms operate. The analysis shows that in regions with a higher degree of legalisation and more active media oversight, the defensive information contraction effect triggered by short-selling mechanisms is more pronounced.This phenomenon indirectly corroborates the logical deduction of this paper's litigation risk hypothesis: when firms anticipate that the external environment possesses a high capacity to identify and impose severe penalties for even minor disclosure flaws, their risk-averse motivation to proactively cut off information supply and seek safe havens will become dominant. This serves as a further reminder to policymakers that, whilst strengthening market oversight tools, they must pay close attention to the unintended damage that firms' risk-averse motivations may inflict upon information transparency.

7. Research Conclusions

In China's current capital markets, both the quality of non-financial information disclosure and the underlying regulatory framework are undergoing continuous evolution. Against this backdrop of dual institutional evolution, this paper establishes a conditional residual mismatch measurement model, starting from methodological foundations. This model is innovative in that it employs rigid financial foundation filtering.By deeply integrating multidimensional panel data on Chinese A-share listed companies from 2009 to 2024 and employing a cutting-edge, heterogeneous, robust, interleaved double-difference causal inference framework, this paper reveals the complex landscape of strategic interactions within the highly subjective and qualitative realm of information governance.

The core theoretical inferences and empirical findings of this paper can be summarised in the following three points. Firstly, the crowding-out effect of the short-selling mechanism on corporate strategic disclosure is not a mild, global improvement, but rather exhibits targeted constraints.Short-selling capital precisely targets high-risk firms with extreme pre-disclosure misalignment motives, using intense reputational penalties and pricing constraints to force the

removal of redundant and fictitious content from reports. Second, external high-pressure supervision triggers unintended consequences of information contraction.To evade rigorous scrutiny and potential legal disputes, some firms adopt an extreme stance of strategic concealment, which suppresses reasonable disclosure behaviour and leads to a systematic increase in reverse misalignment. Thirdly, the micro-level anti-fraud purification process relies heavily on in-depth coverage of negative news by independent professional financial media and a substantial improvement in the quality of analyst reports, rather than merely on the sheer volume of brokerage research reports.

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