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Can Shorting Curb Major Shareholder Hollowing Out

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Abstract

This paper studies the external supervisory and restrictive role of short-selling deregulation, focusing on major shareholders' "hollowing out" in China's corporate governance. Theoretically, post-deregulation, small and medium shareholders can short to lower stock prices; when hollowing gains are less than price fall losses, major shareholders' behavior is restrained. Using 2008-2020 A-share data, empirical analysis shows short-selling deregulation significantly reduces major shareholders' fund occupation proportion, with more obvious effects in weakly governed companies like private enterprises and those with high shareholding concentration. This indicates the short-selling mechanism protects minority shareholders' interests via market-based supervision, providing empirical evidence for regulators to optimize short-selling policies and improve corporate governance.

Keywords

Short-selling Mechanism; Major Shareholder Short-selling; Capital Misappropriation; Short-selling Deregulation; Corporate Governance; External Oversight.

1. Introduction

The hollowing out of listed companies by large shareholders through capital appropriation and connected transactions is a common governance challenge in emerging capital markets. Hollowing out is particularly prominent in the Chinese capital market due to high equity concentration and insufficient legal constraints [1,2]. The launch of the financing and securities financing pilot in 2010 provides a quasi-natural experimental scenario for studying the external governance effects of the short-selling mechanism.

This paper focuses on the capital appropriation of large shareholders, explores whether the relaxation of short-selling control can inhibit short-selling through market-based supervision, reveals the moderating effect of corporate equity structure and property rights on the governance effect of short-selling, and provides empirical evidence for optimizing short-selling policy and improving corporate governance.

Structure of the paper: introduction, literature review, formulation of research hypothesis, research design, empirical results, and summary of the full paper.

2. Literature Review

2.1. Relevant Studies on Short-selling Mechanisms

The shorting mechanism is a strategy for investors to earn the difference in price by borrowing and selling and buying back at a lower price when they expect the price of an asset to fall, and many scholars believe that this mechanism can improve market liquidity, the main forms of which include securities trading, shorting stock index futures, and shorting ETF options[3].

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Compared with developed countries, China's short-selling mechanism differs: developed countries rely on sound legal and regulatory frameworks (e.g., U.S. "report up rules", ban on "naked short selling"), with mainly institutional investors, abundant liquidity, and sound supporting mechanisms (e.g., limiting short selling of stocks down over 10%); China has a high proportion of retail investors, prudent supervision, strictly limited shorting tools, and issues like unsynchronized rules and "naked short selling" controversies.

In recent years, China has introduced policies to standardize and improve the short-selling mechanism: adjusting and expanding the underlying scope and strengthening violation crackdowns in securities financing; adjusting margin ratios and other rules for stock index futures to control risks timely; and strengthening overall supervision to support normal short-selling and combat malicious short-selling.

2.2. Research Related to the "Hollowing Out" Behavior of Large Shareholders

In the capital market, the shorting mechanism is of profound significance in curbing major shareholder shorting. Major shareholder shorting stems from the separation of control and cash flow rights, which is manifested in capital appropriation (accounting for 60% of A-share shorting behavior), connected transactions, etc., and the effect of the existing internal governance mechanism is limited [4-6].

Existing literature focuses on shorting's impact on corporate innovation or stock price volatility, with insufficient analysis of its behavioral paths-especially lacking empirical tests from the capital appropriation perspective, and needing deeper exploration of regulatory variables like equity concentration. Thus, this paper verifies if short-selling inhibits hollowing out via major shareholders' capital appropriation, examines how corporate characteristics affect its governance effect, supplementing external monitoring research; it also informs margin trading policy optimization, aids small and medium shareholders' rights protection, and warns major shareholders to reduce hollowing out.

3. Comprehensive Analysis and Research Hypotheses

3.1. Short-selling Deregulation and "Short-selling" by Major Shareholders

Theoretically, short selling addresses corporate governance gaps by exposing insider control issues and forcing major shareholders to consider costs like liquidation risks. It improves resource allocation efficiency by reducing information asymmetry and preventing inflated share prices from hiding misconduct.

In reality, shorting mechanisms expose corporate fraud and optimize capital markets. Cases like Comet Pharmaceutical and Leshi highlight administrative supervision's limitations, while Muddy Waters' Luckin Coffee shorting demonstrates market-based supervision's effectiveness. The 'woodpecker effect' deters fraud, channels funds to quality firms, and reduces resource misallocation.

Thus, this paper argues for the governance effects of the short-selling mechanism. It accelerates negative information integration into stock prices via short-selling power forming market-oriented external monitoring. Hou et al found that post short-selling deregulation, large shareholders reduce capital occupation as share price declines cause greater equity value losses than gains. Short-selling pressure also curbs financial fraud and controlling shareholders' equity pledge risks , showing its broad governance effects. Hence, the first research hypothesis is proposed[7-10]:

H1: The relaxation of short-selling policy (expansion of the underlying of financing and bond financing) can significantly reduce the level of capital utilization by large shareholders.

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3.2. Different Firm Characteristics and Short Selling Deregulation

The core motivation for major shareholders' hollowing out is the separation of control and cash flow rights, with governance effects affected by internal and external environments. Private enterprises, with weaker external regulation and easier internal manipulation by major shareholders, have stronger motivation and covertness for such behaviors. Companies with low equity checks and balances, where the largest shareholder holds excessive shares and lacks constraints, see "one-man decision-making" more likely to breed hollowing out.

The short-selling mechanism turns the negative consequences of hollowing out into share price decline risks via market-based supervision, forcing major shareholders to weigh costs and benefits. For private firms and those with low equity checks and balances-where internal governance is weak and traditional oversight fails-external shorting pressure is more deterrent: share price drops may threaten major shareholders' control, and their high information asymmetry gives short sellers greater gains from exposing violations, strengthening the inhibition on hollowing out. Thus, a second hypothesis is proposed based on how governance environment differences affect shorting mechanism sensitivity:

H2: The dampening effect of shorting on hollowing out is stronger among private firms and firms with low equity checks and balances.

4. Research Design

4.1. Impact of Short Selling Deregulation on "Short Selling" by Major Shareholders

Since the quasi-natural experiment of short selling deregulation is conducted progressively at different points in time, this paper draws on the modeling design of Bertrand and Mullainathan and Chen et al. to examine the effect of short selling on the "short-selling" behavior of large shareholders. Firms that are not available for short selling in a given year are used as a control group. The test model for hypothesis 1 is designed as follows[11,12]:

$$Adj-RPT_{i,t} = \alpha_t + \alpha_i + \gamma \mathrm{Short}_{i,t} + \beta_1 \mathrm{PreRoa}_{i,t} + \beta_2 \mathrm{Lev}_{i,t} + \beta_3 \mathrm{LogMV}_{i,t} + \beta_4 \mathrm{Turnover}_{i,t} + \beta_5 \mathrm{TobinQ}_{i,t} + \beta_6 \mathrm{SOE}_{i,t} + \beta_7 \mathrm{Grow}_{i,t} + \beta_8 \mathrm{IndDir}_{i,t} + \beta_9 \mathrm{Balance}_{i,t} + \beta_{10} \mathrm{Age}_{i,t} + \varepsilon_{i,t} \quad (1)$$

The specific variables are defined as shown in Table 1.

The ratio of other receivables to total assets (Adj-RPT) measures 'hollowing out' behavior of major shareholders by eliminating firm size effects. It intuitively reflects the extent of resources appropriated by large shareholders and is a common proxy for capital-appropriating hollowing out. [8]

After short-selling deregulation, major shareholders may reduce fund transfers via other receivables to avoid equity value shrinkage. Observing changes in other receivables before and after deregulation can test short-selling's impact on major shareholders' fund usage and 'hollowing out' behavior.

Short-selling underlying stocks requires meeting conditions related to company size and trading activity. Key variables include company size (LogMV), turnover rate (Turnover), gearing ratio (LEV), previous year's total asset profitability (PreROA), TobinQ, ownership nature (SOE), listing years (Age), equity concentration, and independent director proportion (InDir).

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Table 1. Definition of variables

variable name	Variable Definition
Adj-RPT1	(Other receivables - other payables)/total assets
at	Dummy variables for yearly fixed effects
ai	Dummy variables for firm fixed effects
Short	A 0-1 variable for whether the underlying security can be sold short, taking 1 if the firm can sell short at the end of the year; otherwise, taking 0
PreRoa	Return on total assets for the previous year, which is equal to net profit at the end of the previous year divided by total assets at the end of the period
Lev	The level of corporate indebtedness, equal to the gearing ratio at the end of the period
LogMV	The natural logarithm of a firm's outstanding market capitalization
Turnover	Turnover ratio, equal to annual stock turnover/annual outstanding market capitalization of the stock
TobinQ	Equal to market capitalization A/total assets; denoted as NULL when the denominator is not published or is zero or less than zero.
Soe	The value of 1 if the ultimate controller at the end of the year is state-owned, and 0 otherwise.
Grow	(Amount of operating income for the current period of the year - Amount of operating income for the same period of the previous year)/(Amount of ABS operating income for the same period of the previous year)
IndDir	Number of independent directors/number of board of directors
Balance	Proportion of shares held by the second to tenth largest shareholder / proportion of shares held by the first largest shareholder
Age	Years of listing

4.2. The Impact of Short Selling Deregulation on "Short Selling" by Large Shareholders under Different Firm Characteristics

In order to investigate the effect of equity concentration on the implementation of short selling deregulation policy, the test model for hypothesis 2 is designed as follows:

$$Adj-RPT_{i,t} = \alpha_t + \alpha_i + \gamma \text{Short}_{i,t} + \lambda \text{Short}_{i,t} \times \text{Soe}_{i,t} + \beta_1 \text{PreRoa}_{i,t} + \beta_2 \text{Lev}_{i,t} + \beta_3 \text{LogMV}_{i,t} + \beta_4 \text{Turnover}_{i,t} + \beta_5 \text{TobinQ}_{i,t} + \beta_6 \text{Soe}_{i,t} + \beta_7 \text{Grow}_{i,t} + \beta_8 \text{IndDir}_{i,t} + \beta_9 \text{Balance}_{i,t} + \beta_{10} \text{Age}_{i,t} + \varepsilon_{i,t} \quad (2)$$

The study tests the inhibitory effect of short selling on corporate hollowing by introducing interaction terms and incorporating variables like corporate ownership, gearing ratio, firm size, and major shareholders' shorting behavior. It aims to determine differences based on company characteristics to validate hypothesis 2.

5. Analysis of Empirical Results

5.1. Sample Selection and Data Sources

This paper uses 2008-2020 Shenzhen and Shanghai A-share listed companies as samples, excluding ST, financial/insurance firms and those with missing data to get 31,267 samples (continuous variables Winsorized at 1% and 99%), with data from CSMAR and WIND.

Table 2 shows the distribution of the samples by year, and it can be noticed that the number of short-saleable samples increases every year during the sample period 2010-2020.

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Table 2. Sample distribution by year

year	sample size	percentage of	number of samples that can be sold short
2008	1330	4.41%	0
2009	1414	4.69%	0
2010	1710	5.67%	61
2011	1960	6.50%	224
2012	2100	6.96%	221
2013	2074	6.87%	578
2014	2122	7.03%	742
2015	2278	7.55%	725
2016	2513	8.33%	777
2017	2915	9.66%	784
2018	3117	10.33%	808
2019	3218	10.67%	1365
2020	3421	11.34%	1424
total	30172	100.00%	7709

5.2. Descriptive Statistics for Key Variables

To mitigate the effect of outliers, this paper then regression analysis of all continuous variables again at the 1% and 99% level of the extreme value treatment, the descriptive statistics of the main variables are shown in Table 3.

Table 3. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
AdjRPT1	30172	-.025	.193	-18.818	.698
short	30172	.256	.436	0	1
PreRoa	30172	.043	.067	-.261	.228
Lev	30172	.431	.214	.051	.971
LogMV	30172	15.148	1.11	12.817	18.3
Turnover	30172	6.582	5.462	.48	29.465
TobinQ	30172	2.035	1.338	.871	9.02
SOE	30172	.401	.49	0	1
Grow	30172	.172	.434	-.607	2.885
IndDir	30172	37.322	5.289	30.77	57.14
Balance	30172	.886	.762	.041	3.944
Age	30172	2.848	.345	1.792	3.555

Table 3 shows Adj-RPT1 for large/major shareholders' share has a mean of -0.025 (-2.5% of total assets), with Min -18.818 and Max 0.698, indicating large variations across listed companies. The Short dummy variable has a mean of 0.256, meaning short-sellable samples accounted for 25.6% during the study period. PreRoa (total net asset margin) has a mean of 0.043, Min -0.261, and Max 0.228, showing large differences in profitability among companies.

5.3. Regression Results

Table 4 shows SHORT has a significant negative effect (-0.016***), indicating short-selling constraints inhibit the target variable, with short-selling pressure possibly reducing related other receivables. Adding controls, model groups remain significantly consistent (e.g., Lev, TobinQ negative), showing deregulation policies reduce controlling shareholders' fund

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occupation and curb 'hollowing out' after controlling other factors, consistent with Hypothesis 1. Among controls, SOE has a significant positive effect (0.024***), meaning SOEs have higher shareholder fund occupation than private firms; Age has a negative coefficient, supporting the 'listing duration effect' (newly listed firms more prone to connected transactions and greater fund occupation); Turnover, Growth, and Balance are insignificant, with no systematic impact on 'hollowing out'.

Table 4. Short selling deregulation and "large shareholders" (H1)

	(1)	(2)	(1)	(2)
	AdjRPT1	**AdjRPT1**	**AdjRPT1**	**AdjRPT1**
short		-0.016***		-0.014***
		(-4.454)		(-2.894)
short_SOE				-0.005
				(-0.757)
PreRoa	0.161***	0.159***	0.161***	0.160***
	-7.224	-7.143	-7.224	-7.164
Lev	-0.199***	-0.201***	-0.199***	-0.202***
	(-19.862)	(-20.062)	(-19.862)	(-20.074)
LogMV	0.035***	0.037***	0.035***	0.037***
	-16.339	-16.903	-16.339	-16.716
Turnover	0	0	0	0
	-0.139	-0.571	-0.139	-0.548
TobinQ	-0.030***	-0.031***	-0.030***	-0.031***
	(-24.712)	(-25.029)	(-24.712)	(-25.010)
SOE	0.024***	0.024***	0.024***	0.025***
	-3.12	-3.208	-3.12	-3.292
Grow	0.003	0.002	0.003	0.002
	-0.987	-0.676	-0.987	-0.684
IndDir	-0.001***	-0.001***	-0.001***	-0.001***
	(-2.923)	(-2.848)	(-2.923)	(-2.837)
Balance	-0.003	-0.004	-0.003	-0.004
	(-1.129)	(-1.263)	(-1.129)	(-1.256)
Age	-0.035***	-0.025***	-0.035***	-0.025***
	(-4.940)	(-3.333)	(-4.940)	(-3.260)
_cons	-0.288***	-0.342***	-0.288***	-0.341***
	(-11.215)	(-12.049)	(-11.215)	(-11.996)
N	30172	30172	30172	30172
R^2	0.047	0.048	0.047	0.048
F	132.642	122.472	132.642	112.312

***p<0.01", "**p<0.05", "*P<0.10

5.4. Robustness Check

5.4.1. Changing the Sample Time

At end-2019, COVID-19 spread injected greater firm uncertainty. To avoid confounding effects from unexpected shocks in an extended time window, the main test truncates the sample at 2019.

Table 5 shows SHORT regression results remain significantly negative with sample data truncated at 2019. The interaction term SHORT × SOE has a significant positive effect in both

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models, indicating SOEs have a stronger positive correlation with the dependent variable than non-SOEs.

Table 5. Sample change times

variable name	(1)	(2)
	Lord's return	Lord's return
short_SOE		0.798***
		-78.39
AdjRPT1	-0.069***	-0.033***
	(-3.69)	(-2.80)
PreRoa	-0.133***	-0.141***
	(-2.81)	(-3.44)
Lev	-0.151***	-0.059***
	(-5.62)	(-2.80)
LogMV	0.135***	0.120***
	-20.66	-20.88
Turnover	0.008***	0.006***
	-16.98	-14.93
TobinQ	-0.018***	-0.011***
	(-5.77)	(-4.29)
Grow	-0.035***	-0.024***
	(-7.51)	(-6.76)
Balance	-0.022***	-0.016**
	(-2.87)	(-2.37)
Age	-0.06	0.155***
	(-0.96)	-2.88
Constant	-1.514***	-2.085***
	(-7.84)	(-12.81)
Annual fixed effects	yes	yes
Corporate fixed effects	yes	yes
Observations	25,499	25,499
R-squared	0.719	0.822
Robust t-statistics in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

5.4.2. Changing the Measurement of Equity Concentration

High-shareholding shareholders may form an interest community, so short-selling deregulation affects them consistently; major shareholders may include groups beyond the largest. A robustness test uses the ratio of 2nd-10th largest shareholders' holdings to the largest's (value > mean 0.886) as the equity structure variable, with major shareholders' fund occupation as the dependent variable.

Table 6 tests Hypothesis 1, with regression results using the ratio of 2nd-10th shareholders' holdings to the largest's (> mean 0.886) as equity structure measure remaining significant: SHORT coefficient is -0.012 (5% significance), supporting that short-selling deregulation inhibits major shareholders' fund occupation even with adjusted equity structure measures.

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Table 6. Robustness test: short selling deregulation and "large shareholders' share" under changing equity structure measures (H1)

	(1)	(2)
	AdjRPT1	**AdjRPT1**
short		-0.012**
		(-2.122)
PreRoa	0.170***	0.169***
	(6.350)	(6.296)
Lev	-0.151***	-0.153***
	(-10.064)	(-10.184)
LogMV	0.029***	0.030***
	(9.066)	(9.306)
Turnover	0.000	0.000
	(1.027)	(1.251)
TobinQ	-0.024***	-0.024***
	(-13.650)	(-13.785)
SOE	0.024**	0.024**
	(2.451)	(2.508)
Grow	-0.006*	-0.007**
	(-1.815)	(-1.975)
IndDir	0.001*	0.001*
	(1.934)	(1.960)
Balance	-0.000	-0.001
	(-0.045)	(-0.144)
Age	-0.023*	-0.016
	(-1.926)	(-1.337)
_cons	-0.327***	-0.361***
	(-8.659)	(-8.802)
N	11713	11713
R^2	0.042	0.042
F	41.421	38.078
***p<0.01", "**p<0.05", "*P<0.10		

Table 7 tests Hypothesis 2. With 2nd-10th to largest shareholders' holdings ratio (> mean 0.886) as ownership measure, short-selling deregulation's impact on major shareholders' holdings weakens, for both state-owned and non-state-owned firms.

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Table 7. Robustness test: short-selling deregulation and "large shareholders' share" under changing equity structure measures (H2)

	(1)	(2)
	AdjRPT1	AdjRPT1
short		-0.009
		(-1.319)
short_SOE		-0.009
		(-0.929)
PreRoa	0.170***	0.169***
	(6.350)	(6.303)
Lev	-0.151***	-0.154***
	(-10.064)	(-10.223)
LogMV	0.029***	0.030***
	(9.066)	(9.169)
Turnover	0.000	0.000
	(1.027)	(1.220)
TobinQ	-0.024***	-0.024***
	(-13.650)	(-13.765)
SOE	0.024**	0.027***
	(2.451)	(2.662)
Grow	-0.006*	-0.007**
	(-1.815)	(-1.963)
IndDir	0.001*	0.001**
	(1.934)	(1.961)
Balance	-0.000	-0.000
	(-0.045)	(-0.125)
Age	-0.023*	-0.015
	(-1.926)	(-1.270)
_cons	-0.327***	-0.359***
	(-8.659)	(-8.742)
N	11713	11713
R^2	0.042	0.042
F	41.421	34.977
***p<0.01", "**p<0.05", "*P<0.10		

6. Conclusion and Implications

Using 2008-2020 A-share listed companies as samples, this study empirically finds short-selling control relaxation significantly reduces major shareholders' capital appropriation, with more prominent effects in private enterprises and companies with low equity checks and balances-indicating the short-selling mechanism constrains major shareholders via market-based supervision, with more obvious effects on firms with weak internal governance. Thus, regulators should optimize shorting policies and adopt differentiated supervision; listed companies need to reduce hollowing out and improve governance; small and medium investors can use shorting information to identify risks. This study only focuses on capital appropriation, with future expansion possible to other hollowing forms and long-term research.

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