Can short selling improve internal control? An empirical study based on the difference-in-differences model

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Abstract

Based on pilot margin trading in China, this study examines how short selling affects internal control quality in listed firms. Using the difference-in-differences approach, we find that compared with control firms, firms that are eligible for short selling significantly improve their internal control after they are designated as underlying securities. We consider the effects of state ownership and external auditors. The improvement in internal control is only significant for non-state-owned firms and firms audited by non-Big 4 auditors. These findings indicate that short selling can improve firms’ internal control and play a role in their corporate governance.

Key words: External auditor; Internal control; Margin trading; Short selling; State ownership

JEL classification: G38, M41

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1. Introduction

On 31 March 2010, the China Securities Regulatory Commission launched a pilot programme for margin trading. Before that date, short selling was completely prohibited on the China stock market. The pilot programme removed the short-selling ban and began the short-selling era in China, which provides a quasi-natural experiment setting. Most studies of short selling have investigated its effects on market efficiency. Few have examined the economic consequences of short selling from the perspective of corporate internal control. Unlike in the US, in China, only stocks on a list of designated securities can be sold short. We use the difference-in-differences approach and examine the changes in the internal control quality of listed firms after their securities can be sold short. We also consider the unique institutional background in China and investigate the roles that state ownership and external auditors play in the process.

Both practical cases and academic research have suggested that short sellers pay close attention to firms’ financial reporting quality and identify target firms based on their accounting numbers (Karpoff and Lou, 2010; Fang et al., 2016). For example, in 2011, many of the Chinese firms listed in the US suffered attacks by US short sellers. They collected some negative private information about firms and issued a ‘strong sell’ recommendation to the public. Of the 23 firms attacked by short sellers from 2006 to 2011, seven were delisted and one was suspended. In many cases, the negative information was closely related to the firms’ accounting information. In 2014, the financial fraud in one Chinese firm listed in Hong Kong (China Metal Recycling (Holdings) Limited) was revealed due to its short-selling activity, and the firm suffered a severe penalty and went into bankruptcy. The ‘deterrence effects’ of short selling were reflected in all these cases.

As a monitoring mechanism, corporate internal control plays an important role in reducing the information asymmetry between a firm and its outside investors. In July 2002, the US President George W. Bush signed the Sarbanes-Oxley Act (SOX) into law, calling it one of ‘the most far-reaching reforms of American business practices since the time of Franklin Delano Roosevelt’. The most significant aspect of SOX is that it requires management in public firms to report on the effectiveness of their companies’ internal control over financial reporting and external auditors to assess its adequacy. Accordingly, in China, the Ministry of Finance and four other ministries jointly enacted the Basic Standards for Enterprise Internal Control in June 2008, known as the Chinese version of SOX (C-SOX). Internal control has become increasingly important in mitigating agency problems and improving investor protection around the world. Most current studies have supported the notion that the quality of a firm’s financial reporting information increases as its corporate internal control system improves (Doyle et al., 2007b; Ashbaugh-Skaife et al., 2008; Cohen et al., 2008; Qi et al., 2017). Thus, in this study, we aim to investigate whether
the ‘deterrence effects’ of short selling (when it is permitted in China) push listed firms to improve their internal control.

As part of the margin-trading system, short selling is one of the most important trading systems in the modern securities markets. In Western countries such as the UK and US, short selling has matured after many years of development. The ways in which short selling affect market efficiency have been extensively debated and remain highly controversial. Researchers have mainly discussed the effects of short selling on price discovery and market liquidity and volatility. Proponents have suggested that short selling can speed up the incorporation of negative information into stock prices and that constraining short sales hinders price discovery (Miller, 1977; Maffett et al., 2014). However, opponents have argued that short selling has the potential to destabilise the stock market and blame short sellers for stock market declines and financial crises (Allen and Gale, 1991; Bernardo and Welch, 2004). Although the literature has not yet reached a consistent conclusion about how short selling affects market efficiency, the real effect of short selling has attracted more and more attention (Grullon et al., 2011; Liu and Wu, 2014). Some researchers have found that it can discipline opportunistic behaviour and decrease earnings manipulation (Massa et al., 2015; Fang et al., 2016). Internal control may be an important mechanism through which short selling can discipline listed companies and improve their financial reporting. This study examines whether short selling plays a governance role from an internal control perspective.

Our sample includes 241 firms that were eligible for short selling on the China stock market on 31 December 2012. We conduct a difference-in-differences test to ensure that any change in the firms’ internal control quality after the introduction of their short-selling eligibility was not driven by a time trend in internal control quality. We match each firm on the short-selling list with a firm that is not on the list based on their industry, firm size and internal control quality. Compared with the control firms, the firms that can be sold short significantly improved their internal control after they were added to the short-selling list. We consider the effects of state ownership and external auditors. The positive effect of short selling on internal control quality exists only in non-state-owned firms (non-SOEs) or firms audited by non-Big 4 auditors. The improvement in internal control was not significant for state-owned firms (SOEs) or firms audited by Big 4 auditors. Furthermore, we examine the effect of short selling on the five elements of the internal control system. The results show that two of the elements, including internal environment and monitoring, improved significantly after the introduction of short selling. In summary, our findings indicate that short selling can improve a firm’s internal control and that its effects depend on the firm’s state ownership and external auditor statuses.

Our paper is closely related to recent papers (Chen and Liu, 2014; Massa et al., 2015; Zhang et al., 2016) which have shown that the threat of short selling may discipline managers’ opportunistic behaviour directly by reducing earnings management. But we extend those results by focusing on a broader...
impact of short selling on corporate governance. We find short selling also contributes to the effectiveness of internal corporate governance in the long run. It has important implications for policy makers and long-term investors because they can rely on short-selling regulations to improve firm efficiency. Moreover, consistent with prior research, our study may imply that internal control is one of the possible mechanisms through which short selling affects earnings management.

This study makes several important contributions to the literature. First, we examine the economic consequences of short selling from a new perspective, corporate internal control. Our results further validate the real effect role of short selling on managerial decisions by showing that after being added to the short-selling list, firms significantly improve their internal control, especially in terms of their internal environment and monitoring. Second, this study complements the literature’s findings about the determinants of internal control quality. Studies have found that firms’ characteristics, internal governance and external monitoring can influence the quality of their internal control (Ge and McVay, 2005; Ashbaugh-Skaife et al., 2007; Hoitash et al., 2009). Our study discusses this issue at the market level, and our findings suggest that investors’ trading behaviour (e.g., short selling) can affect firms’ internal control quality. Third, this study provides new evidence of the interaction between two important governance mechanisms: internal control and external auditors. Many studies have considered whether the two mechanisms exhibit a substitution or complementary effect when applied to mitigate agency problems (Patterson and Smith, 2007). Our results show that there is a substitution effect between internal control and external auditors. Fourth, this study contributes new empirical evidence to the long-standing debate over the economic consequences of short selling in an emerging market. We consider the unique institutional background in China and investigate the role that state ownership plays in this process. This study also enhances practitioners’ and regulators’ understanding of how margin trading affects listed companies in China, and may help them to improve the margin-trading system in the future.

The rest of this study is organised as follows. Section 2 develops the hypotheses. Section 3 describes the sample selection procedure and the research design. Section 4 presents the empirical results and examines how short selling affects internal control quality in addition to the effects of state ownership and external auditors. Section 5.1 presents the results of several robustness tests. Section 5.2 provides additional analysis to decompose internal control into five elements. Finally, Section 6 concludes the study.

2. Hypothesis development

Short-selling may have a positive effective on firms’ internal control quality. Extensive studies have shown that short sellers are sophisticated information analytics who pay a great deal of attention to accounting information
(Dechow et al., 2001; Desai et al., 2006). They can locate their ‘prey’ by relying on target firms’ fundamental information and accurately identify overpriced stocks and business misconduct (Karpoff and Lou, 2010; Liu et al., 2015; Massa et al., 2015). Therefore, we can reasonably anticipate firms with ‘flaws’ in their financial reporting information face a higher risk of being sold short. From the perspective of listed companies, short selling is associated with a decrease in stock prices and triggers rigorous external supervision, thereby increasing the delisting risk faced by firms (Desai et al., 2002). Hence, the short-selling consequences for firms with ‘flaws’ in their accounting information are much more serious. As a series of institutional arrangements made to achieve firms’ business goals and develop strategies, internal control can provide reasonable assurance for the reliability and compliance of financial reporting. Research has shown that effective internal control can improve the quality of a firm’s financial reporting (Doyle et al., 2007b; Cohen et al., 2008). Thus, the increasing concerns of financial reporting quality that arise from short sellers may motivate managers to improve their internal control systems and thereby decrease their likelihood of being sold short.

Moreover, the signalling effect induced by short-selling information may exacerbate the ‘voting with their feet’ behaviour of a firm’s minority shareholders, leading to a significant drop in the firm’s stock price and thus its value. Substantial shareholders who can make decisions related to a firm’s business operations can choose between investing in internal governance (e.g., enhance monitoring) and optimally ‘exiting’ (e.g., sell stock) if they privately observe any managerial misbehaviour that may harm the firm’s value. However, short selling may adversely affect the stock price at which the shareholder can sell and increase the ‘exiting costs’. This may motivate substantial shareholders to strengthen their internal governance and thereby decrease the likelihood of negative information in the first place. As an important means of internal governance, internal control can effectively constrain managers’ opportunistic behaviour, mitigate information asymmetry between a firm and its investors and improve the transparency of a firm’s information disclosures (Skaife et al., 2013). Thus, we expect that short selling pushes listed companies to spend more resources on their internal control systems and thereby decrease the likelihood of managerial misbehaviour and other potential negative information.

Based on the reasonings above, we develop the deterrence and information hypothesis:

**H1a:** Compared with control firms, firms that are eligible for short selling significantly improve their internal control quality after they are designated as underlying securities.
A competitive view suggests that short sellers may not always be informed or they do not trade on firm’s fundamental information (Liu and Wu, 2014). Rather, short sellers may simply make use of spreading rumours to make profit (Bommel, 2003) or they just sell short firms with negative perception among investors (Darrough, 2015). Ang et al. (2016) document that the pervasive financial scandals among US-listed Chinese firms made those non-fraudulent Chinese firms hard to differentiate from fraudulent firms. It is possible that many Chinese firms accused by short sellers are merely victims due to the negative perception about ‘Chinese fraudulent firms’. Moreover, the unmatured Chinese stock market may exaggerate the speculation of short sellers. It has long been criticised as a ‘casino’ manipulated by speculators. Much of the academic literature in China has provided evidence on the market’s speculation without a strong link to fundamentals (Chan et al., 2008; Mei et al., 2009). In addition, market investors, even institutional investors, may manifest significant herding behaviour due to the relatively opaque environment (Graham, 1999). In all, due to weak reporting requirements, lax enforcement of regulations, and costly information acquisition, investors would observe and trade based on each other’s actions, and they may not care about the disclosed accounting information and whether the firms’ corporate governance is effective or not. Aligned with this perspective, we may not expect those short sellers in China’s market to trade based on the fundamentals, which can further ‘threaten’ the firms to enhance their internal corporate governance to improve the quality of disclosed information.

Based on the reasonings above, we develop the speculation hypothesis:

**H1b: Compared with control firms, firms that are eligible for short selling may not improve their internal control quality after they are designated as underlying securities.**

Almost one half of the listed companies in China are non-SOEs. These firms are mainly former SOEs that adopted a new enterprise governance structure. The financing policy in China is always inclined towards SOEs, and financing difficulties have become the key factors restricting the development of private firms. Compared with non-SOEs, SOEs have a strong ‘soft budget constraint’, as the government will always bail out bankrupt SOEs to avoid unemployment and political unrest (Chow et al., 2010). Hence, it is much easier for SOEs to obtain loans from banks, as these loans can be invisibly guaranteed by Chinese governments. In terms of equity financing, government intervention is also prevalent (Aharony et al., 2000; Fan et al., 2007). Aharony et al. (2000) found that Chinese SOEs, especially those in ‘protected industries’ are given priority by governments to issue equity, whereas IPO applications for non-SOEs are less likely to be approved. Hence, we can reasonably anticipate that once non-SOEs receive listing quotas, they place more of an emphasis on this equity financing channel. Price fluctuations in the stock market can affect firms’ future financing costs. When short selling adversely affects a listed firm’s stock prices,
the firm may postpone its seasonal equity offerings plan. When the stock price is relatively low, the firm should issue more shares to obtain the required funds. This dilutes the power of current shareholders, forcing them to give up or delay the seasonal equity offering plan. This may negatively affect the business operations of non-SOEIs that experience financing difficulties. Hence, we anticipate that stock price decreases induced by short selling have more severe effects on non-SOEIs than on SOEs.

In an agency theory setting, SOEs are always criticised as inefficient due to the absence of effective incentives for (and monitoring of) firm managers (Chen et al., 2017). Contrary to non-SOEIs, SOEs have a different type of agency conflict between the governance majority shareholder and outside minority shareholders. SOEs must accomplish a diversity of objectives, such as regional development, social stability and fiscal health (Liu et al., 2017). Hence, unlike non-SOEIs, managers of SOEs are not exposed to market pressures such as stock prices, product and labour markets. Instead, they are evaluated by their accomplishment of political and social objectives (Chen et al., 2017). To achieve those objectives, managers in SOEs will allocate resources to meet the desire of governance leaders regardless of the SOE’s efficiency. Thus, the demand for corporate governance is also weaker than that of non-SOEIs (Jiang et al., 2017). Hence, we expect that the short-selling mechanism has a more significant effect on the internal control quality of non-SOEIs. Based on the preceding discussion, we offer the following hypothesis.

H2: Short selling can significantly improve the internal control quality of non-SOEIs. The improvement in internal control is insignificant for SOEs.

Compared with internal governance, the independent external audit has become an important institutional arrangement for modern corporations. Research has shown that both internal control and quality external audit are effective governance mechanisms (Choi and Wong, 2007). They can be either substitutes (Giroud and Mueller, 2010; Tian and Twite, 2011) or complements (Hay et al., 2008; Beisland et al., 2015) in addressing agency problems. On the one hand, internal governance and external audits may exhibit substitution effects in the way they address agency problems and improve the quality of accounting information (Patterson and Smith, 2007; Munsif et al., 2011). When the external governance is unable to function efficiently, firms may have stronger incentives to strengthen internal governance as substitutes for managers’ pay-for-performance sensitivity (Xu et al., 2018) or for reputational concerns (Levit and Malenko, 2016). Aligned with this argument, we would

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1 According to the seasonal equity offering provisions embodied in the Company Law of the People’s Republic of China and the Securities Law of the People’s Republic of China, the issue price for seasoned public offerings of listed firms should not be less than 90 percent of the average prices at 20 trading days before the pricing benchmark day.
expect that when the external audit quality is low, firms have greater motivations to reinforce their internal control systems when the short-selling mechanism is introduced to the capital market, and vice versa.

On the other hand, internal governance and external audits may also exhibit complementary effects. According to Gillan et al. (2011), if the costs and benefits of various governance mechanisms are homogenous, then they are likely to be used as complements. Both internal control and external audit are important mechanisms in decreasing agency problems and mitigating information asymmetry between firms and investors (Gordon and Wilford, 2012; Wu and Tuttle, 2014). That is, the potential benefits of the two mechanisms are quite similar in exhibiting complementary effects. Moreover, prior research has shown that high quality external audit is associated with improved internal control by disclosing more internal control weaknesses (ICWs) and thereby pushing firms to remediate those ICWs in future (Ashbaugh-Skaife et al., 2007; Doyle et al., 2007a). If this is the case, we would expect that when the firm’s external audit is of high quality, the magnitude of improved internal control by short selling will be larger.

Auditor size is generally considered a proxy for audit quality (DeAngelo, 1981). Compared with small audit firms, larger audit firms are more professional and independent and are considered to have a higher audit quality. Hence, we use auditor size to proxy for audit quality and propose the following competing hypotheses:

\[ H3a: \text{Short selling can significantly improve the internal control quality of firms audited by Big 4 auditors. The improvement in internal control is insignificant for firms audited by non-Big 4 auditors.} \]

\[ H3b: \text{Short selling can significantly improve the internal control quality of firms audited by non-Big 4 auditors. The improvement in internal control is insignificant for firms audited by Big 4 auditors.} \]

3. Research design

3.1. Sample selection

On 31 March 2010, a pilot margin-trading programme was started in China. Ninety stocks (the component stocks of the Shenzhen 40 and Shanghai 50 Indexes) appeared on the short-selling list for the first time. The short-selling list was adjusted several times, and the number of securities designated for short selling was increased (see Panel A of Table 1).\(^2\) By 31 December 2012, there were 278 stocks on the list. We conduct a difference-in-

\[^2\text{We obtained information about the adjustment of the short-selling list from the Shenzhen and Shanghai Stock Exchange websites.}\]
differences test (Li et al., 2014; Chen et al., 2018). For each of the firms on the short-selling list, we find a matching firm from the GTA Company-developed China Stock Market and Accounting Research (CSMAR) database that never entered the list during the sample period. The matching firm must (i) be in the same industry,\(^3\) (ii) have total assets within 20 percent of the

\[^3\] Industries are based on the ‘Guidance on the industry category of listed companies’ issued by the China Securities Regulatory Commission.

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### Table 1
Sample selection procedure and industry distribution

| Effective date | Number of stocks on the list | Addition | Deletion |
|----------------|------------------------------|----------|----------|
| 2010/3/31      | 90                           | 90       | 0        |
| 2010/7/1       | 90                           | 5        | 5        |
| 2010/7/29      | 90                           | 1        | 1        |
| 2011/12/5      | 278                          | 189      | 1        |

Panel B: Sample selection

Number of firms on the list on December 31, 2012: 278

Less:
- Firms previously deleted from the list: 4
- Firms from the financial industry: 34
- Firms without basic data in regression: 6
- Firms without matching firms: 19

Short-selling sample firms: 215

Panel C: Industry distribution

| Industry category                                      | Number of firms | Percentage |
|--------------------------------------------------------|-----------------|------------|
| Agriculture, forestry, livestock farming, fishery      | 2               | 0.93       |
| Mining                                                 | 14              | 6.51       |
| Manufacturing                                           | 113             | 52.56      |
| Utilities                                               | 7               | 3.26       |
| Construction                                            | 7               | 3.26       |
| Transportation                                          | 7               | 3.26       |
| Information technology                                  | 8               | 3.72       |
| Wholesale and retail trade                              | 6               | 2.79       |
| Real estate                                             | 31              | 14.42      |
| Social service                                          | 5               | 2.33       |
| Communication and cultural                              | 3               | 1.40       |
| Comprehensive                                          | 12              | 5.58       |
| Total                                                  | 215             | 100        |

This table shows the sample selection procedure and the distribution of the sample firms across industries. We match each firm on the list with a firm that never entered the list during the sample period based on their industry, size and internal control quality. Industries are based on the ‘Guidance on the industry category of listed companies’ issued by the China Securities Regulatory Commission.
short-selling firm’s total assets, (iii) have the closest internal control quality (IC\_index) and (iv) have financial data both before and after the sample period. We choose 2008–2012 as the sample period due to the comparability of our key variable, IC\_index.\footnote{Internal control index is from DIB Risk Management Company. In year 2013, DIB has adjusted its internal control index system by introducing some ‘negative indicators’, such as having financial restatement, receiving unqualified audit opinion, etc. Thus, the internal control index from 2013 is equal to the total score of positive indicators minus the total score of negative indicators.}

Panel B of Table 1 shows the sample selection procedure. Our initial sample contains 278 firms present on the short-selling list on 31 December 2012. The sample selection procedure yields a final sample of 215 firms.

Panel C of Table 1 shows the distribution of the sample firms across industries. Over 52 percent of the sample firms are from the manufacturing sector,\footnote{In the robustness tests, we follow the literature and divide the manufacturing sector into subsectors (two-digit codes).} followed by 14.42 percent from the real estate sector and 6.51 percent from the mining sector.

### 3.2. Regression model

To examine the change in a firm’s internal control quality after short selling was permitted, we compare the internal control quality in the years after the firm’s stock was designated as securities eligible for short selling with that in the years before the firm entered the short-selling list. We define the fiscal year in which a firm’s stock was added to the list as year 0. In our main test, we keep the observations in year 0 and treat them as occurring after the firm entered the list (POST = 1).\footnote{We exclude year 0 observations in the robustness tests.} We estimate the following regression to test the effects of short selling on the firms’ internal control quality.

\[
IC\_index_{i,t} = \alpha + \beta_1 \text{LIST}_i + \beta_2 \text{POST}_{i,t} + \beta_3 \text{POST}_{i,t} \times \text{LIST}_i + \sum \text{Control} + \sum \text{matchedpair} + \epsilon_{i,t},
\]

where \(IC\_index\) is an index developed by DIB Company to measure internal control quality, which has been widely used by Chinese researchers (Li \textit{et al.}, 2017; Wang \textit{et al.}, 2018). According to C-SOX, a corporate internal control system contains five elements: internal environment, risk assessment, controlling activity, information and communication and internal monitoring. These five elements can be further divided into 63 indicators. Each indicator equals 1 if a firm disclosed that it met the requirement specified by that indicator and 0 otherwise. \(IC\_index\) is the sum of the 63 indicators. The higher the \(IC\_index\),
the higher the quality of the firm’s internal control. Table 2 provides the variable definitions. A positive (negative) coefficient $b_3$ indicates that the internal control quality of a firm increases (decreases) after the firm’s stock could be sold short compared with that of the matched control firms.

To test H1, we estimate regression (1) by pooling all of the treatment firms and matched control firms. H1 predicts a significantly positive $b_3$. To test H2 and H3, we partition the sample based on state ownership and external auditor statuses and then estimate regression (1) in each subsample. H2 predicts a significantly positive $b_3$ for the non-SOEs and an insignificant value for the SOEs. H3a (H3b) predicts a significantly positive $b_3$ for the firms audited by Big 4 (non-Big 4) audit firms and an insignificant value for the firms audited by non-Big 4 (Big 4) audit firms.

Table 2

| Variable name | Definition |
|---------------|------------|
| **Dependent variables** | |
| $IC_{index}$ | An index for measuring internal control quality developed by DiBo company |
| $IC_a$ | Internal environment, one of the five elements of $IC_{index}$ |
| $IC_b$ | Risk assessment, one of the five elements of $IC_{index}$ |
| $IC_c$ | Controlling activity, one of the five elements of $IC_{index}$ |
| $IC_d$ | Information and communication, one of the five elements of $IC_{index}$ |
| $IC_e$ | Internal monitoring, one of the five elements of $IC_{index}$ |
| **Independent variables** | |
| LIST | A dummy variable that equals 1 if a firm’s stock is designated as securities eligible for short selling and 0 otherwise |
| POST | A dummy variable that equals 1 for the years after a firm’s stock is added to the short-selling list and 0 otherwise |
| SOE | A dummy variable that equals 1 if a firm is state owned and 0 otherwise |
| BIG4 | A dummy variable that equals 1 if a firm is audited by a Big 4 audit firm and 0 otherwise |
| **Control variable** | |
| SIZE | Firm size, calculated as the natural logarithm of the total assets |
| MTB | Market-to-book ratio, calculated as the market value of equity divided by the book value of equity |
| LEV | Leverage, calculated as the total liabilities divided by the total assets |
| ROA | Return-on-assets ratio, calculated as the operating income divided by the lagged total assets |
| DUALITY | A dummy variable that equals 1 if a firm’s CEO is also its board chair and 0 otherwise |
| AGE | The number of years since the firm was listed on the exchange |

The index was exploited by DIB Risk Management Company. Based on their IC index, DIB issued a white paper on internal control of China’s listed firms annually, which has been published in *China Securities Daily* every year from 2008. Now this disclosure index is publicly available and widely used in China’s academic research.
Following the internal control quality literature, we include the following control variables \( \text{CONTROL} \) that may affect a firm’s internal control quality: firm size \( \text{SIZE} \), market-to-book ratio \( \text{MTB} \), leverage \( \text{LEV} \), return-on-assets ratio \( \text{ROA} \), an indicator for the duality of a firm’s CEO and board chair \( \text{DUALITY} \) and the number of years since the firm was listed \( \text{AGE} \). Following Cram et al. (2009), we also control for the fixed effects of matched pairs. We adjust the standard errors to correct for clustering at the firm level. The data used in this paper were taken from the CSMAR database. To control for potential bias caused by outliers, we winsorise all the non-dummy variables at the 1 and 99 percent levels.

3.3. Summary statistics

Table 3 presents the descriptive statistics for the key variables used in our regression analysis. Panel A shows the summary statistics for the short-selling firms and Panel B shows that for the control firms. \( \text{IC\_index} \) is calculated as the sum of the 63 indicators. Its mean value is <25, suggesting that the internal control quality of China’s listed firms is low overall. The standard deviation of \( \text{IC\_index} \) is close to 10, suggesting that the internal control quality of the listed

| Variable name | Panel A: Short-selling firms | Panel B: Control firms |
|---------------|-------------------------------|------------------------|
| \( \text{IC\_index} \)          | 24.583 (9.817)                | 24.167 (9.595)          |
| \( \text{SOE} \)                  | 0.740 (0.439)                 | 0.583 (0.493)           |
| \( \text{BIG4} \)                | 0.179 (0.383)                 | 0.049 (0.215)           |
| \( \text{SIZE} \)                | 23.436 (1.124)                | 21.520 (1.067)          |
| \( \text{MTB} \)                  | 2.772 (2.531)                 | 3.246 (3.205)           |
| \( \text{LEV} \)                  | 0.195 (0.145)                 | 0.144 (0.064)           |
| \( \text{ROA} \)                  | 0.065 (0.065)                 | 0.035 (0.064)           |
| \( \text{DUALITY} \)            | 0.127 (0.334)                 | 0.195 (0.397)           |
| \( \text{AGE} \)                  | 12.258 (4.645)                | 12.433 (4.860)          |

This table shows the summary statistics for the key variables used in this study. All of the variables are as defined in Table 2.

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Firms exhibit a great variance. Moreover, short-selling firms and control firms differ in some firm characteristics. On average, short-selling firms have a higher level of internal control quality, are more likely to be SOE and be audited by a Big 4 audit firm, and are larger and healthier.8

4. Main results

4.1. Univariate tests

Table 4 shows the results of the univariate tests. Before entering the short-selling list, the mean value of IC_index is 21.083, and the mean value of IC_index for the control group is 21.516. Their difference is not significantly different from 0 (p-value = 0.433). After entering the short-selling list, the increase in IC_index value for the treatment firms is significantly positive (7.528, p-value = 0.000), as is that for the matched control firms (5.739, p-value = 0.000). However, the increase in the IC_index is much greater for the treatment firms than for the control firms, and the difference is also significant at the 5 percent level (1.789, p-value = 0.028). The univariate test results indicate that the average quality of internal control in China’s listed firms improved in recent years and that this improvement was more pronounced for firms after their stocks were added to the short-selling list, which is consistent with our prediction.

|                    | Before entering the list (a) | After entering the list (b) | (b) – (a) | p-value |
|--------------------|-----------------------------|-----------------------------|------------|---------|
| Treatment group (T)| 21.083                      | 28.611                      | 7.528      | 0.000***|
| Control group (C)  | 21.516                      | 27.255                      | 5.739      | 0.000***|
| (T) – (C)          | -0.433                      | 1.356                       | 1.789      | 0.028** |
| p-value            | 0.433                       | 0.024**                     | 0.028**    |         |

This table shows the univariate test results. For each firm on the short-selling list and the matched control firms, we calculate the average value of IC_index in the periods before and after the firms entered the list. For the treatment and control groups, this table shows the mean average IC_index in the periods before (a) and after (b) the firms entered the list, the difference between the two periods ((b) – (a)) and the p-value of a t-test for the null hypothesis that the difference equals 0. This table also shows the corresponding statistics for the difference between the matched pair. ** and *** indicates significance at the 10, 5 and 1 percent levels, respectively.

Although we choose the firm size and internal control quality as the matching criteria, certain differences between the short-selling firms and the matched control firms still exist. In the robustness tests, we use propensity score matching to control for observable factors that might affect the results in this paper.

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4.2. Multivariate regression analysis

4.2.1. Average effects of short selling on internal control

Table 5 presents the results of the average effects of short selling on the firms’ corporate internal control quality. Consistent with the univariate test results, the coefficient of \( POST \times LIST \) is significantly positive (coeff. = 1.870; \( t = 2.36 \)). The evidence suggests that compared with the matched control firms, the firms that were eligible for short-selling significantly improved their internal control quality after they were designated as underlying securities, supporting H1. The control variables are generally consistent with the literature (Doyle et al., 2007a). Internal control quality is negatively associated with the market-to-book ratio (MTB) and number of years since a firm was listed on the exchange (AGE).

| Independent variable | \( IC\_index \) |
|----------------------|------------------|
| \( POST \)           | 5.956***         |
|                      | (10.41)          |
| \( LIST \)           | -0.666           |
|                      | (-1.27)          |
| \( POST \times LIST \) | 1.870**          |
|                      | (2.36)           |
| \( SIZE \)           | 0.047            |
|                      | (0.22)           |
| \( MTB \)            | -0.127*          |
|                      | (-1.77)          |
| \( LEV \)            | -2.038           |
|                      | (-1.34)          |
| \( ROA \)            | 0.538            |
|                      | (0.16)           |
| \( BIG4 \)           | -0.304           |
|                      | (-0.40)          |
| \( DUALITY \)        | 0.042            |
|                      | (0.08)           |
| \( AGE \)            | -0.173***        |
|                      | (-4.62)          |

Matched pair indicators Included

Adj. \( R^2 \) 0.358

\( N \) 2,022

This table shows the results of the regression model (1). All of the variables are as defined in Table 2. The \( t \)-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.
4.2.2. State ownership and the effects of short selling on internal control

To test how the effects of short selling on internal control quality varied with state ownership (H2), we estimate regression (1) in the subsamples, which are partitioned based on state ownership status. H2 predicts a significantly positive coefficient of \( POST \times LIST (\beta_3) \) for the non-SOEs and an insignificant coefficient for the SOEs.

Table 6 reports the results. Column (1) shows that the coefficient of \( POST \times LIST \) is positive but insignificant (coeff. = 0.693; \( t = 0.69 \)) for the SOEs. In contrast, Column (2) shows a positive and highly significant coefficient of \( POST \times LIST \) (coeff. = 3.208; \( t = 2.03 \)) for the non-SOEs. Therefore, short selling significantly improved the internal control quality of the non-SOEs and had insignificant effects on the internal control quality of SOEs. These results support H2.

Table 6
State ownership and the effects of short selling on internal control

| Independent variable | SOE = 1 (1) | SOE = 0 (2) |
|----------------------|-------------|-------------|
| \( POST \)           | 6.812***    | 5.696***    |
|                      | (9.23)      | (5.60)      |
| \( LIST \)           | 0.404       | −0.059      |
|                      | (0.50)      | (−0.05)     |
| \( POST \times LIST \) | 0.693       | 3.208**     |
|                      | (0.69)      | (2.03)      |
| \( SIZE \)           | −0.464      | 0.048       |
|                      | (−1.21)     | (0.11)      |
| \( MTB \)            | −0.193*     | −0.108      |
|                      | (−1.80)     | (−0.74)     |
| \( LEV \)            | −1.954      | −3.523      |
|                      | (−0.85)     | (−0.80)     |
| \( ROA \)            | −4.738      | 7.096       |
|                      | (−0.96)     | (0.77)      |
| \( BIG4 \)           | −0.255      | −0.466      |
|                      | (−0.24)     | (−0.26)     |
| \( DUALITY \)        | −0.613      | 0.233       |
|                      | (−0.56)     | (0.25)      |
| \( AGE \)            | −0.112*     | −0.354***   |
|                      | (−1.71)     | (−3.47)     |

Matched pair indicators

| Included | Included |

Adj. \( R^2 \)

| 0.342 | 0.379 |

\( N \)

| 1,338 | 684 |

This table shows the results of regression model (1) for the sample partitioned by SOE. All of the variables are as defined in Table 2. The \( t \)-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.

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4.2.3. External auditor and the effects of short selling on internal control

To test how the effects of short selling on internal control quality varied by external auditor (H3), we partition the sample firms into those audited by Big 4 auditors and those audited by non-Big 4 auditors. Table 7 presents the results. Consistent with H3b, firms audited by Big 4 auditors increase their internal control quality after short selling was permitted. Column (1) shows a positive but insignificant coefficient of $POST \times LIST$ for these firms (coeff. = 0.663; $t = 0.34$). In contrast, firms audited by non-Big 4 auditors significantly increased the quality of their internal control. Column (2) shows a positive and significant coefficient of $POST \times LIST$ for these firms (coeff = 2.148; $t = 2.49$). These results support H3b. The internal control quality of the firms audited by non-Big 4 auditors improved significantly after short selling was permitted. This suggests a substitution effect between the internal control and external auditor governance mechanisms.

| Independent variable | $BIG4 = 1$ | $BIG4 = 0$ |
|----------------------|------------|------------|
|                      | (1)        | (2)        |
| $POST$               | 6.222***   | 5.937***   |
|                      | (4.34)     | (9.61)     |
| $LIST$               | 0.129      | –0.788     |
|                      | (0.07)     | (1.46)     |
| $POST \times LIST$  | 0.663      | 2.148**    |
|                      | (0.34)     | (2.49)     |
| $SIZE$               | 0.148      | –0.038     |
|                      | (0.24)     | (0.18)     |
| $MTB$                | 0.040      | –0.159**   |
|                      | (0.23)     | (2.08)     |
| $LEV$                | –0.773     | –1.806     |
|                      | (–0.20)    | (–1.09)    |
| $ROA$                | –17.377*** | 4.335      |
|                      | (–2.10)    | (1.18)     |
| $DUALITY$            | –1.189     | 0.225      |
|                      | (–0.70)    | (0.46)     |
| $AGE$                | –0.210**   | –0.166***  |
|                      | (–2.31)    | (–4.10)    |
| Matched pair indicators | Included | Included |
| Adj. $R^2$           | 0.344      | 0.362      |
| $N$                  | 417        | 1,605      |

This table shows the results of regression model (1) for the sample partitioned by $BIG4$. All of the variables are as defined in Table 2. The t-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.

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In summary, the results presented in Tables 5–7 are consistent with the hypothesis that firms significantly improve their internal controls after their stocks are added to the short-selling list. The effects are concentrated in non-SOEs and firms audited by non-Big4 auditors.

5. Robustness tests and additional analysis

5.1. Robustness tests

We conduct a series of tests to check the robustness of the main results.

1 In the difference-in-differences test, one concern is that the parallel trend assumption may be violated. To address this concern, we conduct a pseudo-event test. We pick year $T$ before the actual entering year as the pseudo-entering year and compare the internal control quality between the pre- and post-pseudo year 0. Due to data availability, we repeat the test assuming $T = 1$ and $2$. Panel A in Table 8 presents the results when $T = 1$, and Panel B in Table 8 reports the results when $T = 2$. We do not find any
significant change in internal control quality around the pseudo-entering year for either the pooled sample or the partitioned subsamples. Thus, the changes in internal control quality around the actual entering year are not likely driven by differential trends in internal control quality between the treatment firms and the control firms in the pre-entering periods.

2 Following Cram et al. (2009), we control for the fixed effects of the matched pairs in the baseline regression model. In the robustness tests, we include the year and industry fixed effects to control for the time trend and industry-specific characteristics. We also include the firm fixed effects and year fixed effects to control for the firm unobservable factors and time unobservable factors following Bertrand and Mullainathan (2003).

3 In our main tests, we keep the observations in year 0 and treat them as occurring after the firms entered the short-selling list ($POST = 1$). In the robustness tests, we exclude the observations in year 0 because it is unclear whether a firm had enough time to improve its internal control in that year.

Table 9  
Robustness tests

|                  | Whole sample | SOE = 1 | SOE = 0 | BIG4 = 1 | BIG4 = 0 |
|------------------|--------------|---------|---------|----------|----------|
|                  | (1)          | (2)     | (3)     | (4)      | (5)      |

Panel A: Controlling for year and industry fixed effects

| POST $\times$ LIST | 1.802** | 1.031 | 2.829** | 1.259 | 1.898** |
|---------------------|---------|-------|---------|-------|---------|
|                     | (2.36)  | (1.12)| (1.99)  | (0.66)| (2.29)  |

Panel B: Controlling for year and firm fixed effects

| POST $\times$ LIST | 1.703** | 0.642 | 2.596 | 0.535 | 1.988** |
|---------------------|---------|-------|-------|-------|---------|
|                     | (2.02)  | (0.61)| (1.58)| (0.26)| (2.18)  |

Panel C: Excluding observations in year 0

| POST $\times$ LIST | 1.862** | -0.063 | 4.403** | -0.497 | 2.495** |
|---------------------|---------|--------|---------|--------|---------|
|                     | (1.98)  | (-0.05)| (2.32)  | (-0.22)| (2.44)  |

Panel D: Dividing the manufacturing sector into subsectors when matching

| POST $\times$ LIST | 1.579** | 0.777 | 2.169 | -0.257 | 2.040** |
|---------------------|---------|-------|-------|--------|---------|
|                     | (2.02)  | (0.77)| (1.47)| (-0.14)| (2.37)  |

Panel E: Using all of the firms that never entered the short-selling list as a control group

| POST $\times$ LIST | 1.034* | 0.082 | 2.825** | 1.435 | 1.004* |
|---------------------|--------|-------|---------|-------|--------|
|                     | (1.84) | (0.12)| (2.55)  | (0.84)| (1.65) |

Panel F: Using propensity score matching

| POST $\times$ LIST | 0.873 | -0.294 | 3.387** | -1.686 | 1.564* |
|---------------------|-------|--------|---------|--------|--------|
|                     | (1.11)| (-0.31)| (2.22)  | (-0.94)| (1.79) |

This table shows the key repeated analysis results in Tables 5–7. All of the variables are as defined in Table 2. The $t$-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.

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4 Over 52 percent of the sample firms were part of the manufacturing sector (see the industry distribution in Table 1). In the robustness tests, we follow the literature and divide the manufacturing sector into subsectors (two-digit codes) when matching.

5 The results using the matching control firms may depend on the matching criteria. Thus, instead of using the matching control firms, we use all the other listed firms that were never added to the short-selling list during our sample period as the control firms to check the sensitivity of our main results.

6 We also use propensity score matching to control for more factors that might affect the results. Three types of variables are included when estimating the probit model: (i) variables that may affect the short-selling list, such as firm size, stock turnover, stock price volatility and listed age;9 (ii) variables associated with internal control quality, that is, the control variables in our baseline regression; and (iii) the level of internal control quality. All these variables are measured as the lagged value in the pre-short-selling period. For each short-selling firm, we select as the matching control firm the non-short-selling firm that operates in the same industry and has the closest propensity score in the year when the firm’s stock is added to the short-selling list (i.e., year 0).

Table 9 reports the key repeated analysis results in Tables 5–7. Column (1) shows the results for H1. Columns (2) and (3) show the effects of state ownership for H2. The effects of external auditors are presented in Columns (4) and (5). In Column (1), the coefficients of $\text{POST} \times \text{LIST}$ are significantly positive, supporting H1. Moreover, consistent with H2 and H3, the improvement in internal control quality is concentrated in non-SOEs (Column (3)) and firms audited by non-Big 4 auditors (Column (5)). Thus, our main results are robust.

5.2. Additional analysis

5.2.1. Alternative explanation: the effects of C-SOX implementation

There is one possible alternative explanation for the enhancement of internal controls of listed firms. That is, it is only driven by stringent requirement of C-SOX on them, rather than the deterrence effect of short selling. To address this issue, we need to consider the institutional background of C-SOX.

In the first few years after the formal appearance of C-SOX, there are no procedures or detailed rules to be applied by listed firms. Firms could adopt and disclose their internal control mechanisms with substantial managerial discretion. That is, C-SOX has no clear enforcement power at that time. In 2010, 9 Based on the selection criteria set by the Shanghai Stock Exchange or Shenzhen Stock Exchange.

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the Chinese government issued a series of guidelines on internal control, including application guidance, evaluation guidance and audit guidance. These guidelines detail internal control issues, such as firms’ internal control design, implementation, evaluation and audit practice. Contrary to the previous documents, the latest regulations are backed by clear enforcement powers. The guidelines also specified the implementation schedules for internal control systems in listed firms. Sixty-eight firms listed domestically and overseas and 214 voluntarily pilot firms became the first batch of enforcement-implementing firms in 2011.

The background of C-SOX implementation provides us with a good setting to examine whether the observed improvement of internal control is driven by the requirements of C-SOX. Specifically, we partition the whole sample into two subsamples according to the C-SOX compulsory implementation

Table 10

| Independent variable | C-SOX = 1 | C-SOX = 0 |
|----------------------|-----------|-----------|
| POST                 | 5.030***  | 6.378***  |
|                      | (4.99)    | (9.31)    |
| LIST                 | −0.884    | −0.763    |
|                      | (−0.81)   | (−1.27)   |
| POST × LIST          | 0.728     | 2.362**   |
|                      | (0.49)    | (2.56)    |
| SIZE                 | 0.216     | −0.012    |
|                      | (0.51)    | (−0.05)   |
| MTB                  | −0.230    | −0.093    |
|                      | (−1.38)   | (−1.27)   |
| LEV                  | −1.296    | −1.975    |
|                      | (−0.41)   | (−1.12)   |
| ROA                  | 1.505     | 0.301     |
|                      | (0.22)    | (0.08)    |
| BIG4                 | 0.748     | −1.243    |
|                      | (0.71)    | (−1.30)   |
| DUALITY              | −0.411    | 0.086     |
|                      | (−0.33)   | (0.18)    |
| AGE                  | −0.097    | −0.213*** |
|                      | (−1.34)   | (−4.91)   |

Matched pair indicators

Included Included

Adj. $R^2$ 0.317 0.373

N 638 1,384

This table shows the results of regression model (1) for the sample partitioned by C-SOX implementation. C-SOX is a dummy variable that equals 1 if a firm had implemented C-SOX by 2011 and 0 otherwise. All of the other variables are as defined in Table 2. The $t$-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.

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That is, C-SOX equals 1 if the listed firm is mandatorily required to implement C-SOX in 2011 and 0 otherwise. Then, we re-estimate regression (1) in subsamples. The results are shown in Table 10. We can see that the improvement of internal control quality only exists in the non-C-SOX implementation group (C-SOX = 0). It implies that the effect of C-SOX on internal control can be ruled out to some extent.

5.2.2. Alternative explanation: the effects of earnings management

Both domestic and foreign research has shown that short selling can deter earnings management (Chen and Liu, 2014; Fang et al., 2016). Meanwhile, as

| Independent variable | IC_index          |
|----------------------|-------------------|
| POST                 | 5.838***          |
|                      | (9.89)            |
| LIST                 | −0.795            |
|                      | (−1.45)           |
| POST × LIST          | 1.705**           |
|                      | (2.06)            |
| SIZE                 | 0.068             |
|                      | (0.29)            |
| MTB                  | −0.115            |
|                      | (−1.55)           |
| LEV                  | −1.609            |
|                      | (−0.97)           |
| ROA                  | 2.060             |
|                      | (0.56)            |
| BIG4                 | 0.071             |
|                      | (0.08)            |
| DUALITY              | 0.168             |
|                      | (0.31)            |
| AGE                  | −0.098**          |
|                      | (−1.97)           |
| EM                   | −5.459**          |
|                      | (−2.38)           |

Matched pair indicators  Included
Adj. $R^2$  0.353
$N$  1,881

This table shows the results of regression model (1) after adding the lagged accrual earnings management (EM) as the control variable. EM is the absolute value of discretionary accruals calculated following Kothari et al. (2005). All of the other variables are as defined in Table 2. The t-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.
an important internal governance mechanism, internal control can mitigate earnings management as well (Ashbaugh-Skaife et al., 2008; Cohen et al., 2008). Thus, it is possible that internal control is a mechanism between short selling and earnings management. Suppose the first order effect of short selling is to deter earnings management. Therefore, managers may improve the internal control system so that they could provide high-quality financial reports. If that is the case, there exists an alternative explanation that improved internal control is for reducing earnings management to better deal with the threat induced by short sales. To test this alternative explanation, we apply two approaches. First, we further controlled the level of earnings management in our regression model. If the first-order effect of short sales is to deter earnings management, the previously positive association between

### Table 12
Alternative explanation: the effects of earnings management

| Independent variable | High_EM = 1 | High_EM = 0 |
|----------------------|------------|-------------|
|                      | (1)        | (2)         |
| POST                 | 6.128***   | 5.766***    |
|                      | (6.72)     | (7.98)      |
| LIST                 | −0.600     | −0.996      |
|                      | (−0.78)    | (−1.29)     |
| POST × LIST          | 1.674      | 2.055*      |
|                      | (1.39)     | (1.95)      |
| SIZE                 | 0.015      | 0.155       |
|                      | (0.05)     | (0.47)      |
| MTB                  | −0.158*    | −0.127      |
|                      | (−1.75)    | (−1.13)     |
| LEV                  | −3.379     | −1.159      |
|                      | (−1.63)    | (−0.53)     |
| ROA                  | 1.258      | −0.146      |
|                      | (0.27)     | (−0.03)     |
| BIG4                 | −1.109     | 0.339       |
|                      | (−1.06)    | (0.31)      |
| DUALITY              | 0.655      | −0.510      |
|                      | (0.81)     | (−0.78)     |
| AGE                  | −0.180***  | −0.161***   |
|                      | (−3.05)    | (−3.33)     |
| Matched pair indicators | Included | Included |
| Adj. $R^2$           | 0.364      | 0.348       |
| $N$                  | 965        | 1,057       |

This table shows the results of regression model (1) for the sample partitioned by the level of accrual earnings management in the pre short-selling periods, which is the absolute value of discretionary accruals calculated following Kothari et al. (2005). High_EM is a dummy variable that equals 1 if it is above the median value and 0 otherwise. All of the other variables are as defined in Table 2. The $t$-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.
short selling and internal control may disappear after controlling for earnings management. Second, based on the level of earnings management, we partition the sample into two subsamples. If the improved internal control is only for reducing earnings management, we would expect that short selling can significantly improve the internal control quality of firms with higher earnings management.

We use absolute abnormal accruals from the modified Jones model (Jones, 1991; Kothari et al., 2005) to capture earnings management and do the two tests discussed above. The results are shown in Tables 11 and 12 respectively. We can see that after controlling for earnings management in the regression model, the results are still consistent. The results are consistent with the internal control required by C-SOX in China. Internal control is not only emphasised

| Table 13 | Additional analyses: elements of IC_index |
|----------|-----------------------------------------|
| Independent variable | IC_a | IC_b | IC_c | IC_d | IC_e |
| POST | 2.543*** | 0.750*** | 0.763*** | 0.514*** | 0.588*** |
| (11.30) | (6.33) | (4.28) | (6.01) | (4.17) |
| LIST | −0.737*** | 0.095 | 0.144 | −0.156* | −0.555*** |
| (−3.46) | (0.82) | (0.85) | (−1.76) | (−3.38) |
| POST × LIST | 0.569* | 0.209 | 0.190 | 0.135 | 0.692*** |
| (1.81) | (1.21) | (0.80) | (1.13) | (3.70) |
| SIZE | 0.342*** | 0.075 | −0.116 | 0.052 | 0.017 |
| (3.94) | (1.42) | (−1.60) | (1.47) | (0.27) |
| MTB | 0.045 | 0.027 | −0.019 | 0.013 | 0.003 |
| (1.59) | (1.52) | (−0.85) | (1.25) | (0.16) |
| LEV | −2.173*** | −0.265 | 0.553 | −0.532** | −0.294 |
| (−3.59) | (−0.82) | (1.19) | (−2.33) | (−0.80) |
| ROA | 0.665 | 1.060 | −0.350 | 0.275 | 1.234 |
| (0.52) | (1.36) | (−0.33) | (0.58) | (1.56) |
| BIG4 | −0.267 | 0.184 | −0.254 | −0.050 | 0.244 |
| (−0.89) | (1.16) | (−1.03) | (−0.41) | (1.48) |
| DUALITY | 0.158 | −0.016 | −0.117 | 0.083 | −0.008 |
| (0.77) | (−0.15) | (−0.74) | (0.87) | (−0.06) |
| AGE | −0.042** | −0.009 | −0.070*** | −0.013* | −0.014 |
| (−2.46) | (−0.89) | (−4.96) | (−1.81) | (−1.29) |
| Matched pair indicators | Included | Included | Included | Included | Included |
| Adj. $R^2$ | 0.366 | 0.195 | 0.237 | 0.244 | 0.186 |
| N | 2,022 | 2,022 | 2,022 | 2,022 | 2,022 |

This table shows the results of regression model (1) using the five elements of IC_index as the dependent variables, including internal environment (IC_a), risk assessment (IC_b), controlling activity (IC_c), information and communication (IC_d) and internal monitoring (IC_e). All of the variables are as defined in Table 2. The t-statistics in parentheses are based on standard errors adjusted for clustering at the firm level. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bold values indicate key variables.
on controls over financial reporting quality, but also controls over non-financial reporting quality.

5.2.3. Additional analyses: elements of IC_index

According to C-SOX, corporate internal control contains five elements. Based on these five elements of internal control, we analyse the effects of short selling on firms’ internal control quality. Table 13 shows the results. We use the five elements of IC_index as the dependent variables, including internal environment (IC_a), risk assessment (IC_b), controlling activity (IC_c), information and communication (IC_d) and internal monitoring (IC_e). The coefficient of \( POST \times LIST \) is positive and significant for two of the elements, i.e., IC_a and IC_e, and positive but insignificant for the other three elements. Given that managers’ attitudes towards their firms’ internal control are reflected in the internal environment and that the measures they take are reflected in the internal monitoring, our findings suggest that after a firm’s stock can be sold short, managers have a higher incentive to improve corporate internal control.

6. Conclusion

Based on the pilot margin-trading programme in China, this study examines how short selling affects the internal control quality of listed firms. Using a difference-in-differences approach, we arrive at the following findings. First, compared with control firms, firms that are eligible for short selling significantly improve their internal control after they are designated as underlying securities. Second, the improvement in internal control is significant for non-SOEs but insignificant for SOEs. Third, the effects of short selling on internal control quality are concentrated in firms audited by non-Big 4 auditors. Fourth, after dividing IC_index into five elements to test whether they exhibit differing effects of short selling, we find that both internal environment and monitoring improve significantly after short selling is permitted for a firm.

In summary, our results indicate that the ‘deterrence effects’ of short selling can push listed firms to improve their internal control. These results are conditional on a firm’s state ownership and external auditor statuses. This study contributes to the research related to the determinants of internal control quality at the capital market level. It also contributes new empirical evidence of the economic consequences of short selling, which may be useful in improving China’s margin-trading system in the future.

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