The Spillover Effect of Earnings Management

Yibin Liu (UCSD)
Jun Chen (UCSD)

Abstract

We propose and test the spillover effect of earnings management by a set of firms on investors' reaction to other similar firms. We first document that China's de-listing policy separates public firms into a high and a low earnings management segments based on accounting earnings. A large proportion of firms in the high earnings management segment are suspects of earnings management which has a spillover effect on all the other firms in the same segment. We show that investors can not identify which firms have managed their earnings in the high earnings management segment. Hence, investors distrust and react less to earnings announcements by all firms in the high earnings management segment. Moreover, firms in the high earnings management segment suffer from less stock price informativeness and higher risk factor loadings. Lastly, we present causal evidence on the spillover effect by studying China's public firms that exogenously shift from low to high earnings management segment due to the 2007-08 financial crisis in the U.S..

Keywords: Earnings Management, Spillover Effect,Investor Reaction, Price Informativeness

1 Introduction

The financial and real consequences of earnings management are central to accounting and finance research. Recently, an emerging literature studies how a firm's financial reporting quality affects peer firms' decisions. Beatty et al. (2013) and Li (2015) show that prominent firms' financial misreportings lead to peer firms' sub-optimal investments on capital investment, R&D, and advertising. In this paper, we study a new research question: how do some firms' earnings management affect stock market investors' reaction to other similar firms' financial reports?

We study a novel spillover effect of *manipulating* firms' earnings management on *non-manipulating* firms. Instead of studying non-manipulating firms' real decision changes as in the literature, we investigate how earnings management by manipulating firms distorts investors' reaction to financial reports by non-manipulating firms. We first document that China's de-listing policy separates public firms into a high and a low earnings management segments based on accounting earnings. A large proportion of firms in the high earnings management segment engages in earnings management, which has a spillover effect on all the other firms in the same segment. More specifically, we show that investors distrust and react less to earnings announcements by all firms in the high earnings management segment since they can not identify which firms have managed their earnings. Moreover, firms in the high earnings management segment suffer from less stock price informativeness and higher risk factor loadings. Lastly, we present causal evidence on the spillover effect by studying China's public firms that exogenously shift from low to high earnings management segment due to the 2007-08

financial crisis in the U.S..

Firms listed in China's stock market have a much stronger incentive to manage their accounting earnings than their counterparts in the U.S. due to China's delisting policy. China's Securities Regulatory Committee (CSRC, counterpart of the SEC in the U.S.) set the rule in 1998 that publicly traded firms would be delisted if they consecutively reported annual losses [1]. An important unintended consequence of this policy is that it incentives firms to engage in massive earnings management to stay listed when they expect to report a negative earnings. As a result, there is an abnormally large amount of firms in China that report a small and positive return on book equity (ROE) compared to firms in the U.S. as shown in Figure 1.

Stock market investors are well aware of both this delisting policy and what firms do. In our research, we define all firms with an annual ROE from 0 to 4% as high earnings management segment since many firms in this segment are suspects of earnings management. Correspondingly, firms with ROE in (7%,+∞) are categorized as low earnings management segment since these firms do not face an imminent pressure of delisting. We provide evidence on why we divide China's stock market this way[2]. We also show that firms in the high earnings management segment indeed have higher earnings management than other firms. However, firms from some industries would naturally report an ROE between 0 to 4% even without any earnings management [3].

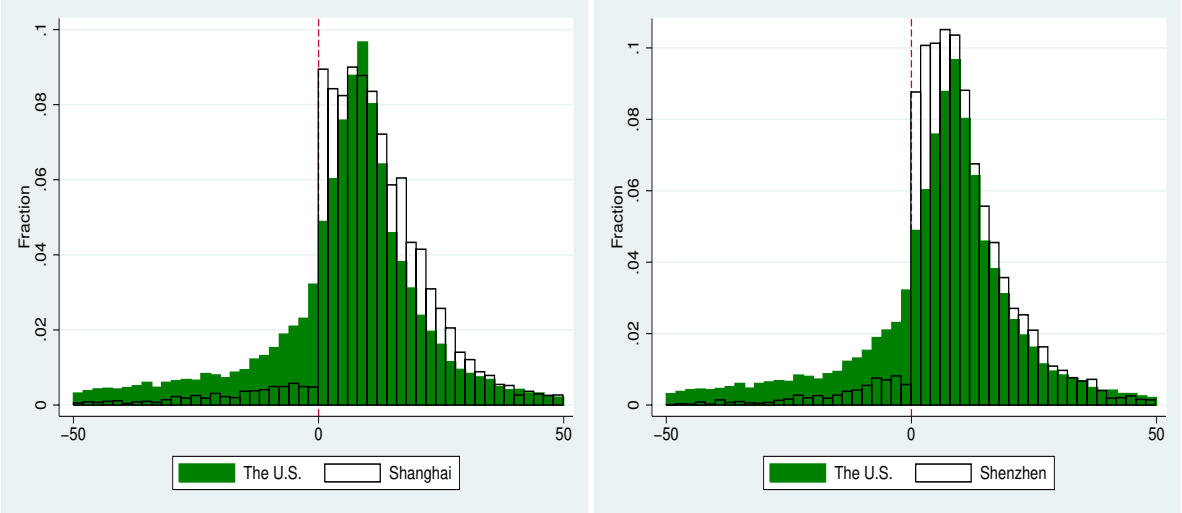
[1] This earnings-based delisting policy was meant to protect stock market investors from risks imposed by poorly performing firms.

[2] As for firms with ROE in (4%, 7%), investors are much less certain whether they have managed their earnings or not. In our analysis, we leave firms with ROE from (4%, 7%) out and directly compare firms in high and low earnings management segments.

[3] According to the statistics compiled by Aswath Damodaran at NYU Stern, the U.S. firms in the industries such as education, advertising, insurance, and green & renewable energy on average report an ROE below 4%. Our own

Consequently, the high earnings management segment (ROE $\in$ (0,4%)) consists of non-manipulating firms that truthfully report their earnings and also manipulating firms that manage their earnings from negative to (0,4%). The central contribution of our paper is to show that manipulating firms have a spillover effect on non-manipulating firms. China's stock market offers an ideal laboratory for us to study this novel spillover effect.

Figure 1: Firm ROE Distribution: China v.s. the U.S. (2009-2016)



(a) Shanghai v.s. the U.S. (b) Shenzhen v.s. the U.S.

Note: we pool together all the listed firms in China and the U.S. from 2009 to 2016 and plot their respective ROE distribution. The x-axis is ROE from -50% to 50% and the y-axis is the fraction of firms falling into each 2% ROE bin. China has two major stock exchanges. Figure 1a plots all the firms listed in the Shanghai Stock Exchange whereas Figure 1b all the firms in the Shenzhen Stock Exchange.

Why would investors treat all firms in the high earnings management segment as if they all have managed their earnings? We will first show theoretically that investors' optimal strategy is to assume that all firms in the high earnings management segment

calculations show that Chinese firms from industries such as healthcare, education, entertainment, and technology service have an industry-average ROE below 4% in year 2000-2016. The full list of industries with an average industry ROE below 4% from 2000-2016 in China: A: Agriculture H: Restaurant/Dining M: Technology Service P: Education Q: Healthcare R:Entertainment S: Social Service.

have managed their earnings. It is costly for investors to determine whether each firm has managed its earnings. Moreover, even if investors pay a cost to identify which firms have managed their earnings, they would only be able to identify a few good firms on which they can invest. Our model shows that the cost of detecting earnings management exceeds the gain in identifying worthy firms if there is a large proportion of manipulating firms in the high earnings management segment. Hence, investors choose not to detect firms in the high earnings management segment and react less to their earnings announcements regardless of whether they have actually managed their earnings or not. Furthermore, we provide empirical evidence that investors indeed treat all firms similarly in the high earnings management segment based on different proxies for firm's earnings management and fundamental quality.

Furthermoe, we provide evidence that firms in the high earnings management segment suffer from lower stock market investors' reaction and lower cumulative abnormal return around the dates of earnings announcements, insignificant earnings response coefficient, lower stock trading liquidity, higher market risk, and higher co-movement with the overall stock market. These results imply that investors distrust the earnings numbers reported by all firms in the high earning management segment. As a result, investors react less to earnings announcements and incorporate less firm-specific information in the stock prices. In other words, stock prices of firms in the high earnings management segment are less informative about firms' fundamentals and co-move more significantly with the overall stock market. Our findings offer a new explanation on the unusually large stock price co-movement among individual stocks in China as documented in Morck et al. (2000a).

We further corroborate our findings with causal evidence. We identify a group of firms that exogenously switch from low earnings managment segment to high earnings management segment as a result of the 2007-08 global financial crisis. Comparing this group of firms with firms that had the same magnitude of drop in ROE but stayed in low earnings management segment, firms that exogenously join the high earnings managment segment suffer from adverse effects in the financial market due to investors' distrust.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 provides institutional background on China's delisting policy. Section 4 presents summary statistics on the data. We present evidence on firms' earnings management in Section 5. In section 6, we document the existence of two earnings management segments and the financial effects of falling into the high earnings management segment. In section 7, we show that investors treat good and bad firms similarly in the high earnings management segment. In section 8, we pin down a group of firms that exogenously falls into the high earnings management segment as a result of the global financial crisis and present causal evidence on the effects of sliding into high earnings management segment. Section 9 concludes.

2 Literature Review

Our research is closely related to several strands of literature in finance and accounting.

2.1 Earnings Management

Our paper is related to a massive accounting literature on firms' earnings management. We review four parts of the earnings management literature: discretionary accrual, real earnings management (operational), real earnings management (non-operational), and market reaction to earnings management.

Firstly, we briefly explain what accruals are and why they are important. The total accruals are managers' estimates about future cash flows. By recording accruals, a company can measure what it owes and also what cash revenue it expects to receive in the future. Annual accounting earnings is the sum of accruals and current cash flows. Adding accruals to accounting earnings gives a more complete picture of a firm's fundamental performance than just current cash flows.

The non-discretionary component of accruals reflects business conditions that naturally affect accruals, which is largely out of manager's control. However, managers can adjust their estimates of firms' future cash flows, within the flexibility of accounting regulations. The component of accruals at managers' discretion is called the discretionary accruals. According to Dechow (1994), discretionary accruals often provide managers with opportunities to manipulate earnings.

Managers can also manage earnings through real earning management. Roychowdhury (2006) define real earnings management as management actions that deviate

from normal operational practices, undertaken with the primary objective of meeting certain earnings thresholds. The accounting literature captures real earnings management by checking whether firms use price discounts to generate unsustainable sales, overproduce and put additional output to inventory to report a lower cost of goods sold, cut discretionary expenses such as R&D, advertising, and selling, general, and administrative (SG&A) expenditures to inflate current year's earnings.

There is also a strand of literature that examine non-operational real earnings management. Bartov (1993) and Herrmann et al. (2003) document that firms in the U.S. and other developed countries manipulate the timing and magnitude of transactions inducing sales of fixed asset and financial securities. HAW et al. (2005) and Chen and Yuan (2004) study the non-operational real earnings management in the context of China. They found that Chinese firms manage their earnings by selling financial securities and real estate properties, restructuring debt, and obtaining government subsidies.

Lastly, we review the literature on market reaction to firms' earnings management. Hayn (1995), Burgstahler and Dichev (1997), and Degeorge et al. (1999) found that a significantly large number of firms has an annual earnings that is either slightly greater than zero or just beats analyst forecasts. Bartov et al. (2002) and Bhojraj et al. (2009) reported that firms manage accruals and cut discretionary expenses to just beat analyst forecasts. Their stocks' performance improves in the short term. However, HAW et al. (2005) concluded that investors are able to differentiate the quality of earnings and discount the earnings suspected of a greater degree of management.

2.2 Market Transparency

The value of market efficiency is one of the most important questions in the finance literature. First, it is the essential assumption for most of the modern asset pricing models. Second, in spite of many findings about return anomalies, Fama (1998) supports the market efficiency and shows most long-term return anomalies tend to disappear with reasonable changes in technique.

Among all the factors that contribute to the efficiency, market transparency has been mostly used and well documented. Using laboratory experiments, Bloomfield and O'Hara (1999) shows that higher transparency increases the informational efficiency of transaction prices. Recent papers also shed light on the effects of the corporate bond transparency. Using a complete record of all US OTC secondary trades in corporate bonds (TRACE), Edwards et al. (2004) finds that transaction costs of corporate bonds are higher than in equities and decrease significantly with trade size. Moreover, later Bessembinder et al. (2006) further shows the trade execution costs significantly dropped after an increase of the transaction reporting transparency.

Instead of directly studying market transparency, most papers use disclosure level as a proxy. Various financial and real effects have been studied under a variation of disclosure level. Using the 1990 annual reports of 122 manufacturing firm, Botosan (1997) finds that for firms that attract a low analyst following, greater disclosure is associated with a lower cost of equity capital. Similarly, Sengupta (1998) provides evidence that firms with high disclosure quality ratings from financial analysts enjoy a lower effective interest cost of issuing debt. Healy et al. (1999) shows that the

disclosure rating increases are accompanied by increases in sample firms' stock returns, institutional ownership, analyst following, and stock liquidity. Recent papers also tried to distinguish various information sources inside regular disclosures. Easley and O'Hara (2004) find that investors demand a higher return to hold stocks disclosing a greater percentage of private information.

In this paper, we mainly focus on the real and financial effects of market transparency. We contribute to the current literature by the following aspects. First, for all of the prior literatures that directly study the effects of market transparency(Levine and Zervos (1996)), they use a cross-country analysis to acquire the necessary variation of transparency, which leads to an inevitable edogeneity problem. However, due to one specific delisting policy, Chinese firms have a huge incentive to manage their earnings right above 0, which gives us a significant variation of market transparency in China. Second, event though the real and financial effects of disclosure level have been widely studied, these effects have rarely been investigated in the transparency area. The most important reason here is that prior research mainly focus on individual firm-level disclosure measure. They cannot link disclosure level to market transparency since there is not a systematically biased distribution of disclosure quality inside the market. The connection between individual firm-level disclosure and aggregate market transparency in our paper depends on the dramatically different earnings manipulation incentives across different ROE ranges in Chinese stock market. Third, unlike US market, individual investors take up more than 70 percent of Chinese stock holdings. The variation of market transparency comes from the investors' inability to fully detect a specific firm's earnings manipulation. The large percentage of individual investors

in China further strengthens the connection between individual firm-level disclosure and aggregate market transparency. Moreover, we sort firms based on their measures of discretionary accruals and real earnings management and observe no evidence for investors' detection in either measurement.

2.3 Market Reaction and Price Informativeness

Our paper studies short-term market reactions and long-term price informativeness of firms in the high earnings management segment.

For market reaction measures, we first use the earnings respond coefficient(ERC) following Collins and Kothari (1989), which basically describes the relationship between cumulative abnormal return and unexpected earnings. The ERC has been widely adopted both in accounting and finance literature. Furthermore, we use two other announcement reaction measures following Pevzner et al. (2015a). One is the abnormal return volatility, which mainly measures the abnormal return volatility during announcement window versus the estimation window. The other is the abnormal trading volume, which is constructed similarly only instead using the trading volume. We expect ERC to be less significant and two abnormal reaction measures to be lower in the high earnings management segment.

For price informativeness measures, we first choose the synchronicity following Morck et al. (2000b). Synchronicity comes from the R^2 in CAPM model and describes the degree that a stock price co-moves with the market index. The higher R^2 is, the less firm-specific information is incorporated into the stock price. We expect the synchronicity to be higher in high earnings managment segment since investors distrust firms'

announcement. We also use the factor loadings from CAPM model as an alternative measure. We expect the market β to be higher in high earnings management segment.

3 Institutional Background on China's Delisting Policy

The delisting policy in China was established in 1998 by the China Securities Regulatory Commission (CSRC). The intention of the policy is to protect unsophisticated retail investors by reminding them of the risk in investing in the stock market. Specifically, the delisting policy mandates that if a publicly-listed firm reports negative accounting earnings in two consecutive years, its stock will be put under *special treatment* status (ST). There are various trading and financing restrictions on ST stocks[4]. If an ST firm reports one more annual loss, it is suspended from trading on the stock exchanges. After a fourth annual loss, the stock will be de-listed from the stock exchange. In total, approximately 100 firms have actually been delisted in China.

The delisting policy has a far-reaching impact on all firms in China. Every firm wants to avoid being put under special treatment status which we refer to as a delisting threat. A delisting threat not only brings stigma to a firm but also strictly restricts firm's financing activities in the capital market. As a result, firms go great length to avoid reporting two consecutive negative annual earnings by engaging in earnings management. We will first show evidence on firms' earnings management and then present the real and financial consequences of the delisting policy.

[4]ST companies' daily stock price movement is restricted to be no more than 5% in either direction. Non-ST stocks' daily price range is restricted to 10% in either direction. ST companies' semi-annual reports must be audited. Furthermore, ST firms cannot raise additional capital from stock market.

4 Data and Summary Statistics

Our research utilizes data on stock price and firm-level fundamentals for all listed firms in the U.S. and China from 2009 to 2016. For firms listed in China, we mostly rely on data from the China Stock Market and Accounting Research (CSMAR) database. We obtain data from CSMAR on daily stock return, market return, and announcement dates of annual financial report along with other firm-level variables such as firm size (total assets), return-on-equity (ROE), sales, account receivables, leverage (book debt/total assets), operating and net cash flows, R&D expenditure, adversting, selling, general, and administrative expenses, cost of goods sold, and inventory. We obtain data on stock price, ROE, and announcement dates of annual financial reports for all firms listed in the U.S. from Compustat, CRSP, and the Bloomberg Terminal.

Table 1 presents the summary statistics for key variables used in our research. Before each one of our regression analysis, we winsorize all continuous variables at 1st and 99th percentile to mitigate the impact of outliers.

Table 1: Summary Statistics For Companies Listed in China 2009-2016

	N	Mean	Std	p25	p50	p75
Abnormal Return Variance	8823	2.05	4.22	0.35	0.82	1.97
Abnormal Trading Volume	6987	1.29	1.09	0.64	1.00	1.58
Log (Firm Size)	8818	21.58	1.18	20.78	21.43	22.19
Firm Leverage	8823	0.46	0.21	0.30	0.46	0.62
Return on Equity	8823	0.10	0.10	0.05	0.09	0.15
Unexpected Earnings	8002	0.00	0.02	0.00	0.01	0.02

5 Evidence on Firm-level Earnings Management

We present two pieces of evidence on earnings management by firms listed in China. First, we plot the histograms of firms' return on equity (ROE) [5] distribution for both China and the U.S. The tremendously high proportion of firms falling into ROE range (0, 4%) in China compared to the U.S. suggests that a large number of Chinese firms engages in massive earnings management to report positive earnings. Second, we present direct evidence that Chinese firms with ROE from 0 to 4% take part in significantly more real earnings management than other firms, using methods borrowed from the accounting literature.

5.1 Firm ROE Distribution Histograms: China V.S. the U.S.

Figure 1 plots the ROE distribution histograms for listed firms in China and in the U.S.. We pool together all the listed firms from 2009 to 2016. The x-axis is ROE from -50% to 50% and the y-axis is the fraction of firms falling into each 2% ROE bin. China has two major stock exchanges. Figure 1a plots all the firms listed in the Shanghai Stock Exchange whereas Figure 1b all the firms in the Shenzhen Stock Exchange.

We find similar patterns across the Shanghai and Shenzhen Stock Exchanges. Comparing the ROE distribution of Chinese firms to the U.S. firms, we make two immediate observations: 1) 18 % firms listed in China report an ROE from 0 to 4% compared to 10% firms in the U.S. 2) the difference between fractions of firms in ROE range (-2%, 0) and (0, 2%) is 8% in China compared with 1.5% in the U.S.. A much higher mass of

[5] Return on Equity (ROE) = Net Earnings/Book Equity

firms with ROE from (-2%, 0) than firms with (0, 2%) convincingly suggests that firms engages in earnings management to achieve positive earnings.

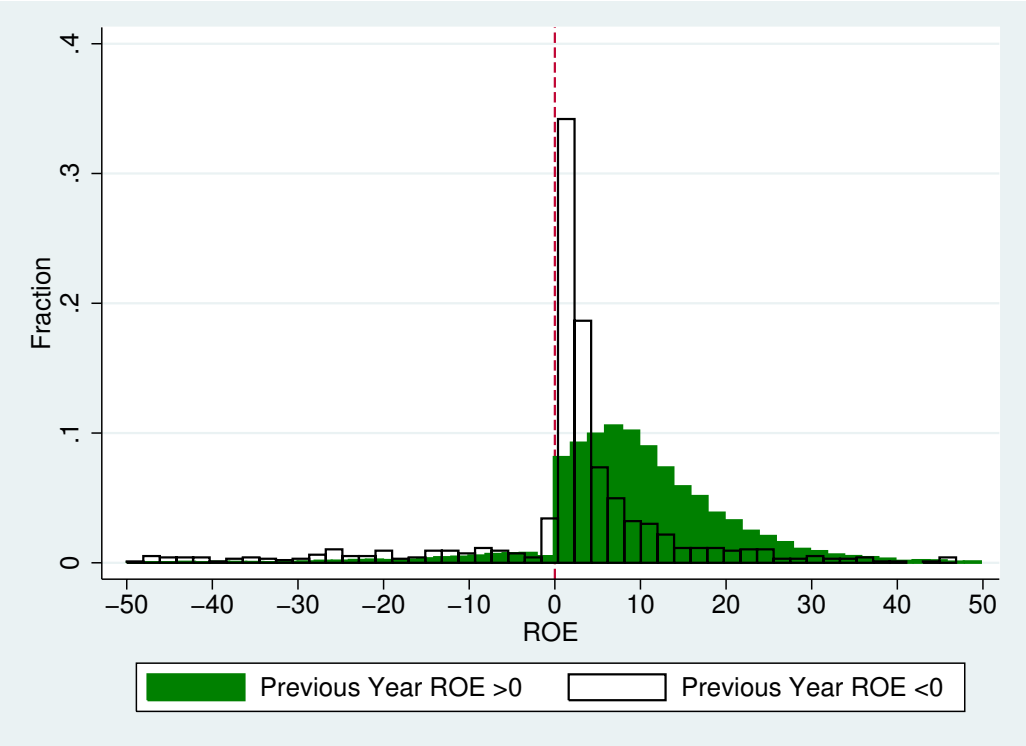
We further divide Chinese firms into two categories: firms with a positive ROE last year and those with a negative ROE last year. Since the firms only face a de-listing threat after two consecutive years of negative earnings, we expect that firms with negative ROE last year would have a much stronger incentive to manage and to report a positive earnings this year. Consequently, we expect to see a even higher mass of firms with negative ROE last year falling into small and positive ROE range this year, than firms with positive ROE last year. We see exactly what we have expected on Figure 2: at least 50% of firms with a negative ROE last year report an ROE from 0 to 4% this year. On the contrary, less than 20% of firms with a positive ROE last year reporting a (0, 4%) ROE in the following year.

To sum up, firms listed in China have a much stronger incentive to manage their earnings than firms in the U.S. due to China's distortive delisting policy. Furthermore, the incentive to report a positive earning is even stronger for firms that had a loss in the previous year in China.

5.2 Accounting Measures of Earnings management

The accounting literature mainly uses discretionary accruals (DA) and real earnings management (RM) to measure firm-level earnings management. We calculate both DA and RM for each listed firm in China, following methodologies developed in accounting. We show direct evidence that Chinese firms in the ROE range (0, 4%) are managing their earnings more than other firms.

Figure 2: Firm ROE Distribution in China: Positive v.s. Negative ROE (Last Year)



5.2.1 Discretionary Accruals (DA)

Discretionary Accruals (DA) are components of firms' cash flow that managers can choose within the flexibility of accounting regulations. Dechow (1994) stated that discretionary accruals often provide managers the opportunities to manipulate earnings. We measure each firm's DA using modified Jones model (Jones, 1991) which is the standard model in accounting literature:

$$\frac{Accruals_t}{A_{t-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{t-1}} + \alpha_2 \frac{\Delta S_t - \Delta AR_t}{A_{t-1}} + \alpha_3 \frac{PPE_t}{A_{t-1}} + \epsilon_t \tag{1}$$

where $Accruals_t$ is calculated by subtracting a firm's operating cash flow from its

operating income in year t. PPE_t is the gross property, plant, and equipment and A_{t-1} is a firm's total asset in year $t-1$. ΔS_t is the change in sales from year $t-1$ to t and ΔAR_t is the change in account receivables from year $t-1$ to t. We estimate the above regression cross-sectionally for each industry-year group with at least 20 observations. The estimated residuals, capturing the abnormal part of accruals, proxy for firms' accrual-based earnings management.

Lastly, we test if firms in the ROE range (0,4%), which are highly suspected of managing their earnings based on ROE distribution histograms, have higher discretionary accruals than other firms by running the following regression:

$$DA_i = \alpha + \beta_1 * \mathbb{1}_{\mathbf{ROE} \in \mathbf{(0,0.04)}} + \beta_i * Controls_i + \epsilon_i \tag{2}$$

where DA_i is the discretionary accural of firms i. $\mathbb{1}_{\mathbf{ROE} \in \mathbf{(0,0.04)}}$ is a dummy variable that equals to 1 if a firm's ROE is in (0, 4%), 0 otherwise. We also include control variables such as firm size, leverage, industry, and year dummies that can explain firms' discretionary accruals.

Our results in Table 2 show that firms in the ROE range (0, 4%) do not have a significantly higher discretionary accrual than other firms. There result may due to increasing attention from securities authorities on firms' abnormal accruals.

5.2.2 Real Earnings Management

Real earnings management refers to management actions that deviate from normal operational practices, undertaken with the primary objective of meeting certain earnings

thresholds (Roychowdhury (2006), Zang (2011)).

Following Roychowdhury (2006), we examine two major components of real earnings management: production costs and discretionary expenses. Facing enormous pressure to report a positive earnings, firm could increase earnings by reducing the cost of goods sold by overproducing inventory and cutting discretionary expenditures, including R&D, advertising, and selling, general, and administrative (SG&A) expenditures. The former is measured by the abnormal level of production costs, the latter by the abnormal level of discretionary expenditures. Subsequent studies using the same methods provide further evidence that these measures capture real activities manipulation (Cohen et al., 2008; Cohen and Zarowin, 2010).

We estimate the normal level of production costs using the following regression:

$$PROD_t/A_{t-1} = \alpha_0 + \alpha_1(1/A_{t-1}) + \alpha_2(S_t/A_{t-1}) + \alpha_3(\Delta S_t/A_{t-1}) + \alpha_4(\Delta S_{t-1}/A_{t-1}) + \epsilon_t \quad (3)$$

where $PROD_t$ is the sum of the cost of goods sold in year t and the change in inventory from $t-1$ to t. A_{t-1} is the total assets in year $t-1$. S_t is sales in year t. ΔS_t is the change in sales from year $t-1$ to t. We estimate the above equation cross-sectionally for each industry-year with at least 20 observations. The abnormal level of production cost (RM_{PROD}) is measured as the estimated residual. The higher the residual, the larger is the amount of inventory overproduction, and the greater is the increase in reported earnings through reducing the costs of goods sold.

Furthermore, we estimate the normal level of discretionary expenditures using the

following regression:

$$DISX_t/A_{t-1} = \alpha_0 + \alpha_1(1/A_{t-1}) + \alpha_2(S_{t-1}/A_{t-1}) + \epsilon_t \tag{4}$$

where $DISX_t$ is the discretionary expenditures (i.e., the sum of R&D, adverting, and SG&A expenditures) in year t. We estimate the above regression cross-sectionally for industry-year groups with at least 20 observations. The abnormal level of discretionary expenditures is measured as the estimated residual from the regression. We multiply the residuals by -1 to get RM_{DISX} so that higher values of RM_{DISX} imply greater amounts of cut on discretionary expenditures by firms to inflate reported earnings. We construct an aggregate measure of firm level real earnings management (RM) by taking the sum of RM_{PROD} and RM_{DISX}.

Lastly, we test if firms in the ROE range (0,4%), which are highly suspected of managing their earnings based on ROE distribution histograms, have higher real earnings management than other firms by running the following regression:

$$RM_i = \alpha + \beta_1 * \mathbb{1}_{\mathbf{ROE\in\,(0,0.04)}} + \beta_i * Controls_i + \epsilon_i \tag{5}$$

where $\mathbb{1}_{\mathbf{ROE\in\,(0,0.04)}}$ is a dummy variable that equals to 1 if a firm's ROE is in (0, 4%), 0 otherwise. We also include control variables such as firm size, leverage, industry, and year dummies that can explain firms' real earnings management.

Our results in Table 2 show that real earnings management as a share of last year's total asset is 3-6% higher for firms with ROE from 0 to 4%. This result lends direct

support to our claim that firms in China tend to manage their earnings under the pressure of a delisting threat.

Table 2: Earnings Management across Firms: 2009-2016 China

	(1) RM	(2) RM	(3) DA	(4) DA
$\mathbb{1}_{ROE}\in(0,0.04)$	0.0622***	0.0342***	-0.000881	0.00110
	(0.00508)	(0.00473)	(0.00262)	(0.00271)
Firm Size		-0.00639***		0.00133
		(0.00243)		(0.00119)
Firm Leverage		0.165***		0.00252
		(0.0132)		(0.00586)
Return on Equity		-0.535***		0.0305***
		(0.0257)		(0.0113)
Observations	12231	12144	12231	12144
Adjusted R^2	0.013	0.131	0.004	0.007

Note: In the parentheses below coefficient estimates are robust standard errors adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the 1st and 99th percentile. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively. RM stands for real earnings management and DA stands for discretionary accrual.

6 Two Earnings Management Segments in China's Stock Market

A large fraction of firms with ROE from 0 to 4% are suspects of earnings management. We establish that there are two earnings management segments within China's stock market with event studies focusing on firms' annual earnings announcements. The high earnings management segment consists of firms in ROE (0,4%) in which many of them are suspects of massive earnings management. The low earnings management segment has all the firms with ROE (7%, $+\infty$) which are not under an immediate pressure of delisting. Consequently, firms in the low earnings management segment are much more candid about their earnings.

We show that firms in the high earnings management segment suffer from lower stock market investors' reaction and lower cumulative abnormal return around the dates of earnings announcements, insignificant earnings response coefficient, lower stock trading liquidity, higher market risk, and higher co-movement with the overall stock market. These results imply that investors distrust the earnings numbers reported by all firms in the high earning management segment. As a result, investors react less to earnings announcements and incorporate less firm-specific information in the stock prices. In other words, stock prices of firms in the high earnings management segment are less informative about firms' fundamentals and co-move more significantly with the overall stock market. Our findings offer a new explanation on the unusually large stock price co-movement among individual stocks in China as documented in Morck et al. (2000a).

6.1 Abnormal Stock Return Variance

Abnormal return variance is calculated as the average of the squared market-model adjusted daily returns over the event window (-1, +1), scaled by the stock return variance over the estimation window (-120, -21) (Pevzner et al., 2015b). The market model is estimated over the estimation window (-120, -21). Specifically, firm i's market model adjusted returns on day t during the event window is computed as follows:

$$U_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

where R_{it} is the daily stock return of firm i on day t, R_{mt} is the daily market return on day t, and α_i and β_i are firm i's market model estimates obtained from the estimation window. Stock return variance over the event window (-1, +1) then is calculated as the average of the squared market adjusted return, U_{it}^2. The stock return variance over the estimation window (-120, -21) equals the variance of the residual returns from the firm's market model estimated over the estimation window.

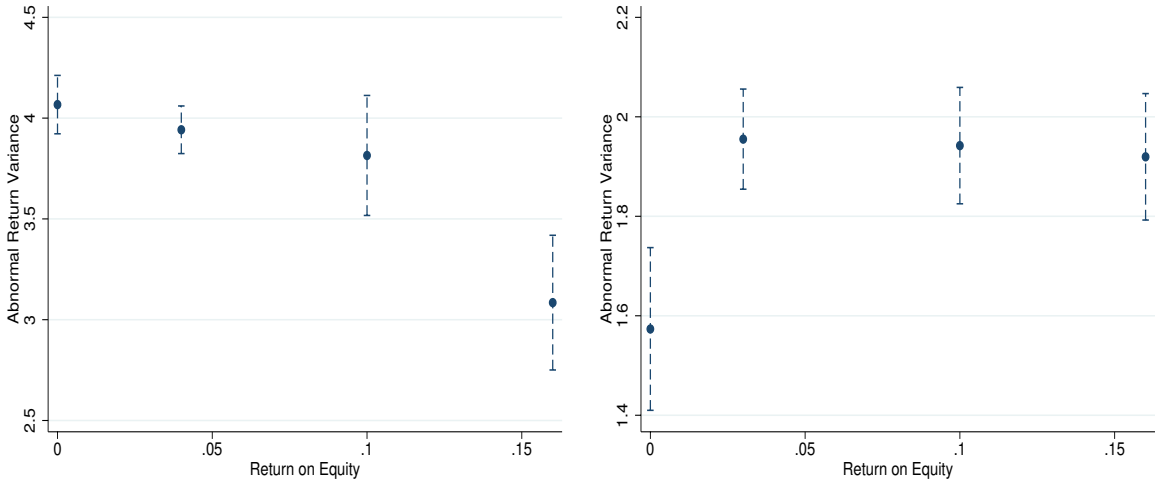
We plot the abnormal return variance on Figure 3 for all the listed firms in China and the U.S. from year 2009 to 2016. The X-axis is the firm ROE in percentage and the Y-axis is the level of abnormal return variance. Each dot is the average of abnormal return variance for all firms in the corresponding ROE range. The first dot is the average for firms in ROE from 0 to 4%, second 4-10%, third 10-16% and fourth all firms with a ROE above 16%. The dashed bars are the 1.96 standard error of the mean.

Firstly, Figure 3 shows that American firms have an average abnormal return variance

of 4 [6] which is much higher than the average of 1.9 for Chinese firms. The difference in magnitude indicates that the U.S. stock market is more efficient in incorporating firms' annual earnings news into stock prices than China's.

Secondly, we notice that abnormal return variance of American firms is slightly decreasing with ROE. In contrast, abnormal return variance is significantly positive correlated with ROE for Chinese firms. For now, we do not take a stand on why abnormal return variance is declining with ROE in the U.S.. We are using the firms in the U.S. to illustrate what the correlation between abnormal return variance and ROE would normally look like in a stock market without a delisting policy based solely on firms' earnings. Comparing with the decreasing trend in the U.S., an increasing trend of abnormal return variance in ROE in China seems rather peculiar and is likely related to its delisting policy.

Figure 3: Abnormal Return Variance Around Firms' Annual Earnings Announcement: China v.s. the U.S. (2009-2016)



(a) the U.S.

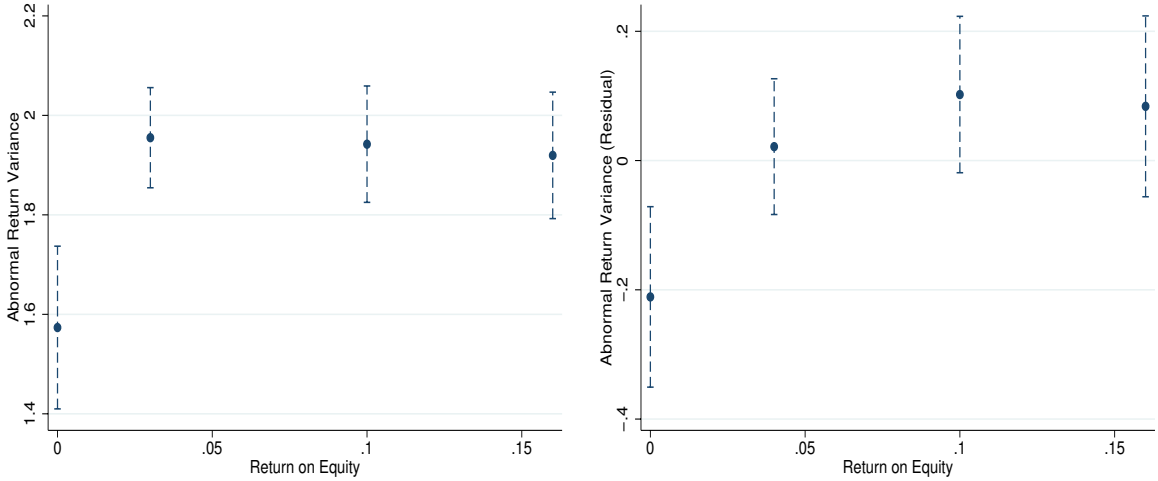
(b) China

[6] which is similar to what Pevzner et al. report in their paper (Pevzner et al., 2015b)

We address potential concerns that the positive correlation between abnormal return variance and ROE in China is a spurious correlation by controlling for covariates such as firm size, leverage, unexpected earnings, industry, and year. Specifically, we filter out the impact of the covariates mentioned above by regressing our firm-level abnormal return variance on those covariates and plot the residual of the abnormal return variance on Figure 4. Firms with an ROE from 0 to 4% still have a lower abnormal return variance (residual) compared to other firms. This finding not only supports our hypothesis but also alleviates the endogeneity concerns on what we find on Figure 3.

From Figure 4, we see that firms in the ROE range of 0 to 4% have an abnormal return variance that is about 0.3 lower than firms with ROE greater than 10%. The difference is statistically significant and is free of impacts of common covariates of stock return variance. The sample average of abnormal return variance is around 1.9, which means that average return variance for a firm when it announces its annual report is 90 % higher than its average return variance in normal times. Firms with ROE from 0 - 4% only have an average abnormal return variance of 1.6 which is 60% higher than normal times. We could define the *extra* return variance brought by earnings announcement as abnormal return variance - 1. We see that normal firms (ROE> 0.1) have an *extra* return variance that is 1.5 times as large as firms with ROE from 0-4%. The magnitude is economically significant and lends support to our hypothesis that investors distrust and react less to earnings reported in the balance sheet of suspicious firms in terms of return variance.

Figure 4: Abnormal Return Variance Around Firms' Annual Earnings Announcement: China



(a) Level of Abnormal Return Variance

(b) Residual of Abnormal Return Variance

Note: residual is predicted after regressing abnormal return variance on firm size, leverage, absolute value of unexpected earnings, industry, and year dummies.

6.2 Abnormal Trading Volume

We measure abnormal trading volume by calculating average trading volume over the event window (-1, +1), scaled by the average trading volume over (-120, -21) (Pevzner et al., 2015b). Trading volume is defined as the number of shares of firm i traded on day t divided by the total number of shares outstanding of firm i on day t.

We plot the abnormal trading volume (residual) [7] on Figure 5. The X-axis is the firm ROE in percentage and the Y-axis is the residual of abnormal trading volume. Each dot is the average of abnormal trading volume (residual) for all the firms in the corresponding ROE range. The first dot is the average for firms in ROE from 0 to 4%, second 4-10%, third 10-16%, and fourth all firms with a ROE above 16%. The bars are

[7] We take the residual after regressing abnormal trading volume on firm size, leverage, absolute value of unexpected earnings, industry, and year effects.

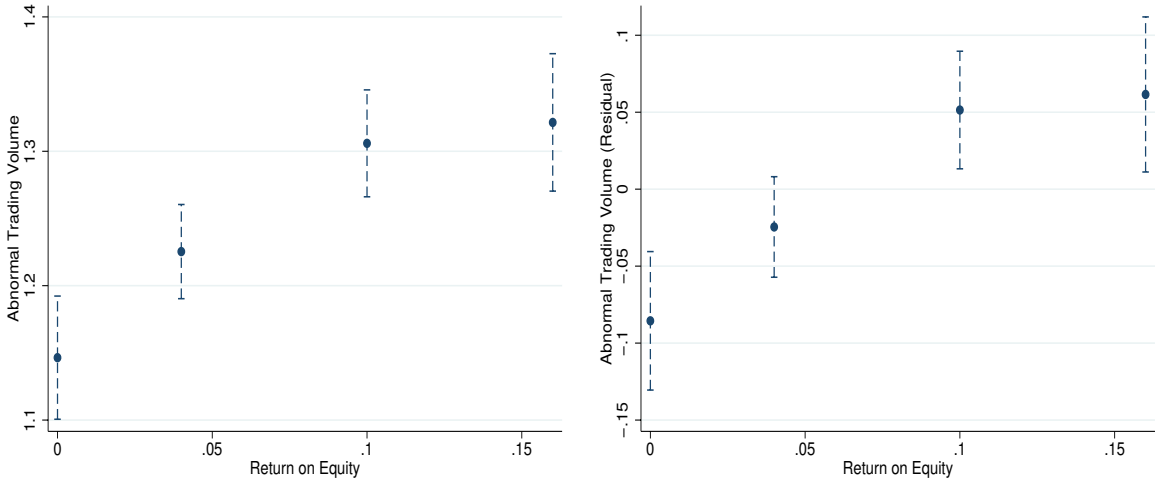
1.96 standard errors of the mean.

From Figure 5, we see that firms in the ROE range of 0 to 4% have an abnormal trading volume that is 0.15 lower than firms with ROE greater than 10%. The difference is statistically significant and is after controlling for common covariates of trading volume. The sample average of abnormal trading volume is around 1.2, which means that average trading volume for a firm when it announces its annual report is 20 % higher than its average trading volume in normal times. Firms with ROE from 0 - 4% only have an average abnormal trading volume of 1.05 which is 5% higher than normal times. We could define the *extra* trading volume brought by earnings announcement as abnormal trading volume - 1. We see that normal firms (ROE> 0.1) have an *extra* trading volume that is 4 times as large as firms with ROE from 0-4%. The magnitude is economically significant and reinforces our hypothesis that investors discount the earnings numbers reported by suspicious firms and react less accordingly in the stock market.

6.3 Earnings Response Coefficient

We provide further evidence on whether investors discount the earnings of suspicious firms by calculating earnings response coefficient (ERC) for each firm. Suppose that firm A and B report the same and positive unexpected earnings and investors trust firm A's earnings more, we expect that firm A's price increase would be higher than that of firm B's. We estimate the ERC using the following regression:

Figure 5: Abnormal Trading Volume Around Firms' Annual Earnings Announcement: China



(a) Level of Abnormal Trading Volume

(b) Residual of Abnormal Trading Volume

Note: residual is predicted after regressing Abnormal Trading Volume on firm size, leverage, absolute value of unexpected earnings, industry, and year dummies.

$$CAR_i = \alpha + \beta_1 * UE_i + \sum_{2}^{i=k} \beta_i * Controls_i + \epsilon_i \tag{6}$$

where CAR_i is the three-day cumulative abnormal return over event window (-1,+1) with 0 denoting the day when the annual earnings announcement is made. UE_i is firm i's unexpected earnings which is defined as actual annual earnings minus the most recent mean analyst forecast, scaled by the most recent stock price. We also include covariates such as: firm size, ROE, leverage, industry, and year dummies.

The estimated coefficient ($\hat{\beta_1}$) of UE_i is the earnings response coefficient and measures how stock prices respond to firms' unexpected earnings. There is extensive empirical finance research documenting that ERC ($\hat{\beta_1}$) should be significantly positive. Stock prices are expected to rise after a positive unexpected earnings. A ERC that is not

significantly different from 0 suggests that price response to earnings surprises is sluggish, implying that investors do not believe in the earnings reported by the firms.

Our hypothesis is that investors distrust the earnings reported by suspicious firms' (ROE $\in (0, 4\%)$). Hence, we expect to see a ERC, estimated within the sub-sample of suspicious firms, that is either not significantly different from 0 or smaller than ERC estimated within the sub-sample of normal firms (ROE> 10%). We find exactly what we have expected in Table 3. The first column is estimated using the whole sample and we see that ERC is significantly positive which is consistent with the previous literature. A one unit increase in UE results in a 17.4% gain in three-day cumulative abnormal return around earnings announcement. The second column provides strong evidence that investors do not react to unexpected earnings of suspicious firms. The ERC for firms with ROE greater than 4% is positive and statistically significant, indicating that investors do respond to firm-level earnings surprises if they trust what these firms say on their balance sheet.

6.4 Price Informativeness

In principal, stock price movements of an individual firm can be decomposed into movements due to market/industry level news and firm-level news (Roll, 1998). Suppose that firm A and B publish the same amount of idiosyncratic news and investors believe that the quality of firm A's news is higher, we expect that the price informativeness of firm A's stock price will be higher since investors are more likely to trade on firm A's idiosyncratic news. Investors are aware that the trustworthiness of annual financial reports for firms with ROE from 0 to 4% is substantially lower than those published by

Table 3: Earnings Response Coefficient Across Sub-samples (2009-2016 China)

	CAR			
	All Firms	ROE ∈(0,0.04)	ROE ∈(0.04,0.1)	ROE ∈(0.1,+∞)
Unexpected Earnings	0.174***	0.0233	0.235***	0.213***
	(0.0485)	(0.131)	(0.0858)	(0.0743)
Return on Equity	0.0184***	-0.00355	-0.00406	0.0400***
	(0.00700)	(0.0997)	(0.0485)	(0.0133)
Firm Size	0.00114**	0.00305**	0.000746	0.00112
	(0.000512)	(0.00127)	(0.000996)	(0.000779)
Firm Leverage	-0.00574**	-0.0132*	-0.00425	-0.00765*
	(0.00290)	(0.00692)	(0.00514)	(0.00453)
Year effect	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes
Observations	7403	1188	2593	3382
Adjusted R^2	0.010	0.004	0.006	0.017

Note: in the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the 1st and 99th percentile. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively.

firms with ROE greater than 10%. We further hypothesize that the stock prices of firms with ROE from 0 - 4% contain less idiosyncratic firm-level information and hence shall co-move significantly more with the market.

We test our hypothesis using price non-synchronicity proposed by Roll (1998). Price non-synchronicity basically measures the correlation between a firm's return and a market or industry benchmark. The higher the correlation between a firm's stock return and market return, the less informative stock price is about the company's idiosyncratic news and fundamentals. Papers that adopt this measure include Morck et al. (2000a), Durnev et al. (2003), and Chen et al. (2006). Durnev et al. (2003) show that price non-synchronicity is positively related to the correlation between returns and future earnings at the industry level, which helps to validate it as a measure of informativeness.

Following Morck et al. (2000a); Jin and Myers (2006), we estimate a Capital Asset Pricing Model (CAPM):

$$r_{it} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \epsilon_{it} \tag{7}$$

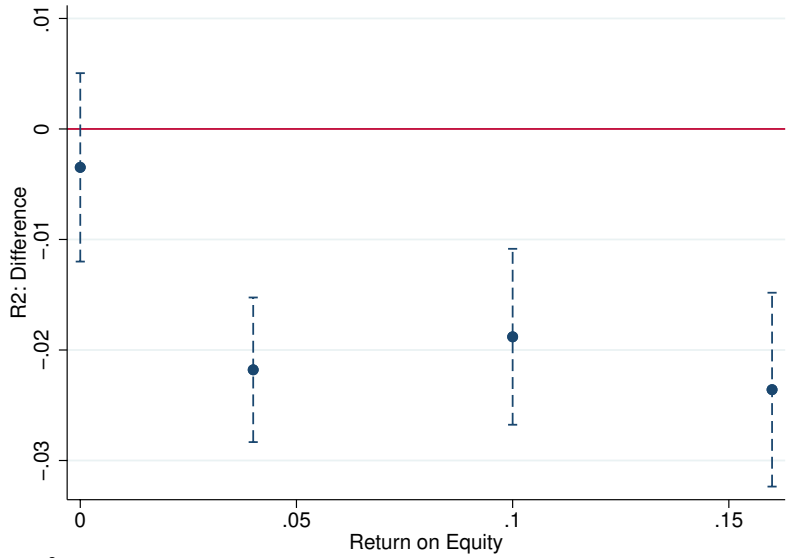
separately in the pre-event period (-100, -1) and post-event period (+1, +100) for each individual firm. r_{it} is firm i's return on date t; r_{mt} stock market return on date t; r_{ft} risk-free rate on date t. We define R^2_{diff} as the difference between the R^2 of the CAPM in pre- and post-event period: R^2_{pre}, R^2_{post}. We are plotting on Figure 6 the average of R^2_{diff} for four groups of firms based on their ROE: (0, 4%), (4%, 10%), (10%, 16%), (16%, $+\infty$).

In the pre-event period (-100, -1) which corresponds to 4 months to 1 day before the annual earnings announcement of a firm, there are a lot of uncertainties on how the firm performed in the past year and what its earnings would be. Individual stock price comove greatly the overall market due to scarcity of firm-level idiosyncratic news. As soon as firms publish their annual earnings numbers, the uncertainties are largely dissolved and stock prices would reflect more of firms' fundamentals instead of market-wide news such as GDP growth, unemployment, inflation, etc.

What we see on Figure 6 is consistent with our reasoning. We see from Figure 6 that on average, firms with ROE greater than 10% have a significant drop in R^2 of over 0.02 (3.4-6.7 % of the sample average R^2 (0.3)) from pre-event to post-event period, which is a sign that uncertainties on firms' earnings are dissipated and stock prices reflect more of firms' own fundamentals. However, for firms with ROE from 0 to 4%, they actually experience a significant increase in R^2 of 0.02 (a 6.7% increase of sample mean (0.3))

from pre-event to post-event period. We are not sure how to interpret the increase of R^2. For now, we take it as strong evidence that investors distrust the financial reports published by these firms. In contrast with firms with high quality reports, there are still a lot of uncertainties and speculations on the actual performance of firms reporting a ROE from 0 to 4%.

Figure 6: Difference in R^2: Pre- and Post- Earnings Announcement



Note: we estimate R^2 pre- and post- annual earnings announcement using event days (-60,-5) and (5,60) respectively. Results similar if controlling for industry and year

6.5 Risk Factor Loadings

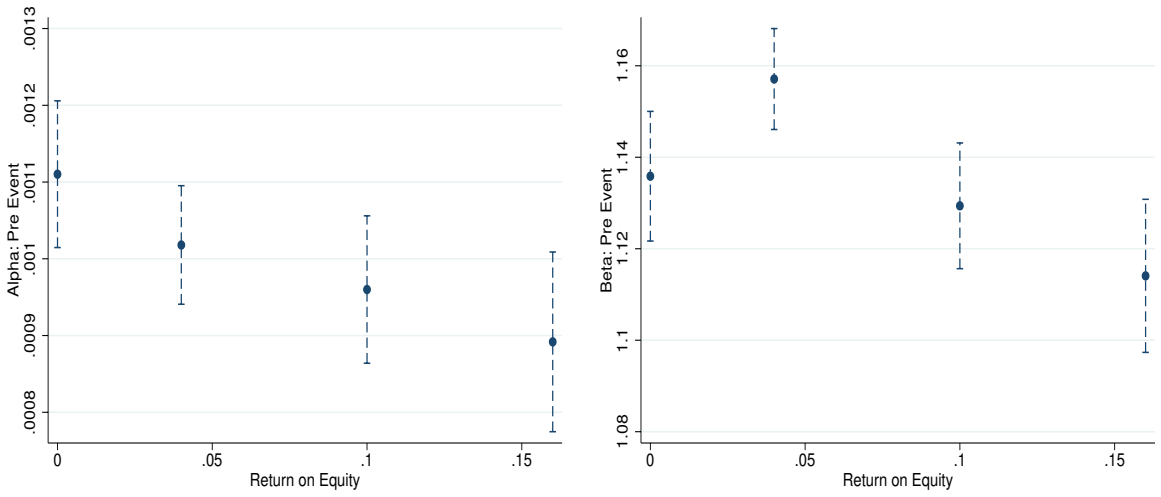
We are interested in whether risk factor loadings would be different across different ROE ranges as a consequence of market transparency. We are particularly interested in testing whether firms with low transparency are more exposed to market risk. Following (Morck et al., 2000a; Jin and Myers, 2006), we estimate a Capital Asset Pricing Model

(CAPM):

$$r_{it} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \epsilon_{it} \tag{8}$$

in post-event period (+1, +100) for each individual firm. r_{it} is firm i's return on date t; r_{mt} stock market return on date t; r_{ft} risk-free rate on date t. We obtain $\hat{\alpha}_i$ and $\hat{\beta}_i$ for each firm in the post event period. We then plot on Figure 8 the average of $\hat{\alpha}_i$ and $\hat{\beta}_i$ for four groups of firms based on their ROE: (0, 4%), (4%, 10%), (10%, 16%), (16%, $+\infty$).

Figure 7: Alpha and Beta: Pre Earnings Announcement



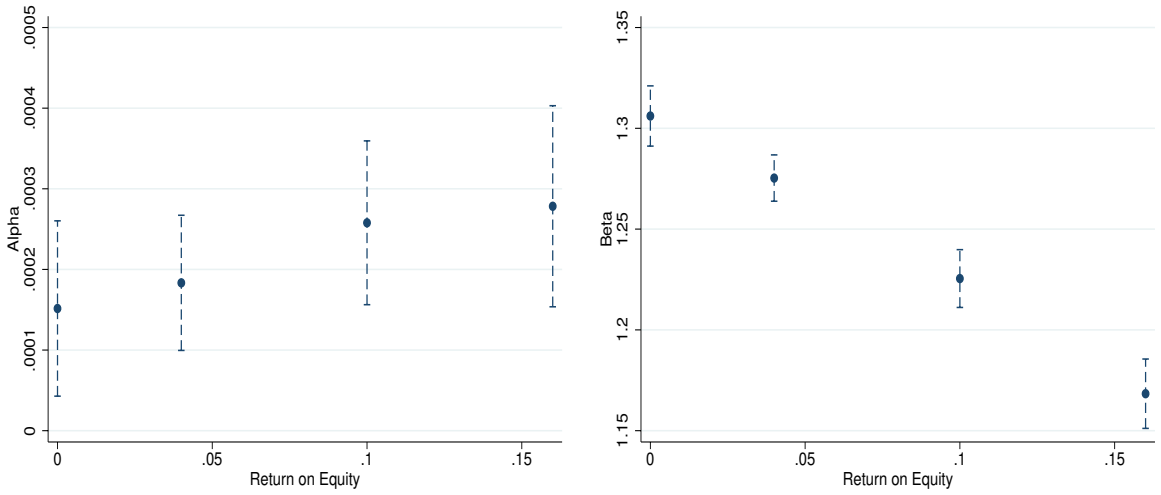
(a) Alpha

(b) Beta

Note: we estimate pre-annual earnings announcement alpha and beta using event days $(-100, -1)$ respectively. Results similar if controlling for industry and year.

We see from Figure 8 that $\hat{\alpha}$ is stable across ROE groups. Since α measures the mispricing of an individual stock based on CAPM, we conclude that firms with low transparency are not more mispriced than other firms. However, when we look at β, we observe that β is significantly higher for firms with low transparency whose ROE is from 0 to 4%. This finding suggests that firms with low-transparency are more exposed to systematic market risk. Higher β may be caused by low-quality firm level information

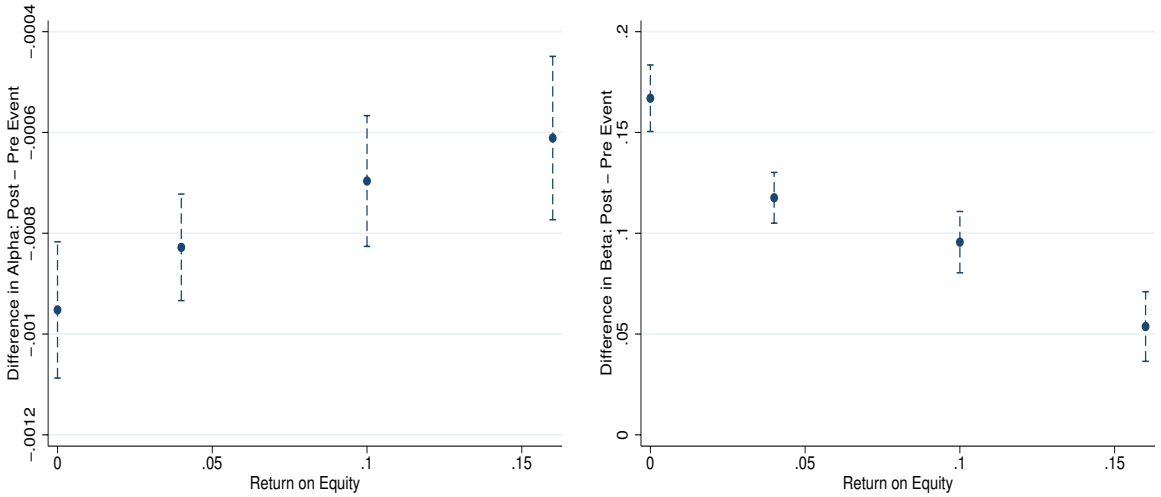
Figure 8: Alpha and Beta: Post Earnings Announcement



(a) Alpha (b) Beta

Note: we estimate post-annual earnings announcement alpha and beta using event days $(+1, +100)$ respectively. Results similar if controlling for industry and year.

Figure 9: Alpha and Beta: Post - Pre Earnings Announcement



(a) Alpha (b) Beta

Note: we estimate pre and post-annual earnings announcement alpha and beta using event days $(-100, -1)$ and $(+1, +100)$ respectively. Results similar if controlling for industry and year.

and high uncertainties on firm's performance.

In an efficient market, investors are compensated with expected return commensurate to the risk in an individual stock. The higher the risk, the higher the expected return that investors would demand. As a consequence of a higher β, investors are taking more market risk by buying stocks of firms with ROE from 0 to 4% and they will only be doing so if they are compensated with a higher expected return. A higher expected return is equivalent to a lower current stock price. Depressed stock prices have adverse effects on firm's additional capital raising from stock market. In a seasoned equity offering (SEO) in which firms sell new shares to shareholders, firms are only able to sell shares at the current price. A depressed stock price would hurt firms' ability of raising additional capital from stock market, which may result in a binding financing constraint and force firms to forego worthy investment projects.

7 Can Investors Distinguish Good and Bad Firms in the High Earnings Management Segment?

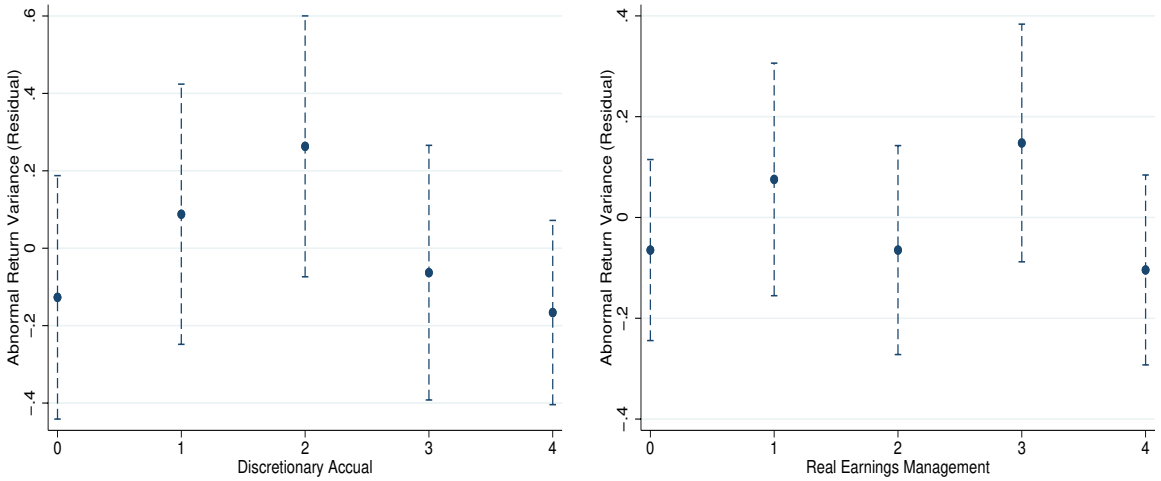
We present two pieces of evidence that investors are not able to tell *good* and *bad* firms apart in the high earnings management segment.

Firstly, we construct two measures of earnings management for all firms in the high earnings management segment based on accounting literature. Namely, real earnings management and discretionary accrual. Afterwards, we divide all firms in the high earnings management segment into 5 sub-samples using the level of discretionary accrual and real earnings management in ascending order. In Figure 10, we plot the abnormal return variance for firms with different levels of earnings management in the high earnings management segment. The five dots are the average of abnormal return variance (residual) for each sub-sample. The residual is predicted after regressing abnormal return variance on firm size, leverage, absolute value of unexpected earnings, return on equity, industry, and year dummies. We see that abnormal return variance is similar across groups of firms with different levels of earnings management. Similarly, we plot on Figure 11 the abnormal trading volume and find similar results.

In summary, our results suggest that investors can not distinguish good and bad firms in the high earnings management segment based on levels of earnings management.

Secondly, we show that investors react identically to annual reports by firms that accidentally/temporarily fall into the high earnings management segment and firms systematically stay in the high earnings management segment. More specifically, we want to show investors cannot distinguish between future stayers and escapers. Here, we

Figure 10: Abnormal Return Variance for Firms with Different Levels of Earnings Management in the High Earnings Management Segment



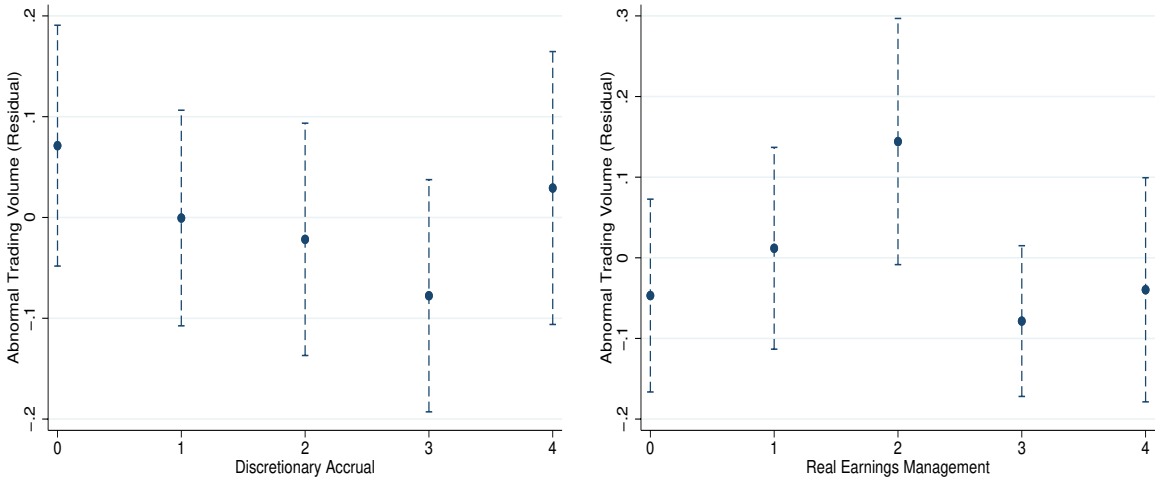
Note: We divide all firms in the high earnings management segment into 5 subsamples using the level of discretionary accrual and real earnings management in ascending order. The five dots are the average of abnormal return variance (residual) for each subsample. Residual is predicted after regressing abnormal return variance on firm size, leverage, absolute value of unexpected earnings, return on equity, industry, and year dummies. We find that investors can not distinguish good and bad firms in the high earnings management segment based on levels of earnings management.

define escapers as of those firms that moves from high earnings management segment to low earnings management segment in the next year, and stayers as of those firms that still stay in the high earnings management segment in the next year.

$$Y_t = \alpha + \beta_1 Escaper_{t+1} + \beta_2 Controls_t + \epsilon_t \tag{9}$$

As shown in equation (9), we define *Escaper* as a dummy variable that equals 1 if a firm moves out of high earnings management segment next year, and equals to 0 if a firm stays in the high earnings management segment next year. We restrict our sample to only include these two types of firms. Y_t remains to be our short term financial measures and long term price informativeness measures. The significance of β_1 here

Figure 11: Abnormal Trading Volume for Firms with Different Levels of Earnings Management in the High Earnings Management Segment



Note: We divide all firms in the high earnings management segment into 5 subsamples using the level of discretionary accrual and real earnings management in ascending order. The five dots are the average of abnormal trading volume (residual) for each subsample. Residual is predicted after regressing abnormal trading volume on firm size, leverage, absolute value of unexpected earnings, return on equity, industry, and year dummies. We find that investors respond similarly to firms with different levels of earnings management in the high earnings management segment in terms of abnormal trading volume around the dates of annual earnings announcement

indicates whether investors react differently to future escapers and stayers in the higher earnings management segment. Table 4 shows that none of our reaction measures differs significantly between future stayers and escapers. In other words, investors cannot accurately distinguish relatively good firms from bad firms in the high earnings management segment.

Table 4: Investors Can Not Distinguish Escapers vs Stayers

	(1) ab_ret_var	(2) ab_trade_vol	(3) ΔR^2	(4) $\Delta\beta$	(5) $\Delta R^2/R^2$	(6) $\Delta\beta/\beta$
Escaper	-0.211	0.0136	-0.0103	-0.0000114	-0.0269	0.00273
	(0.183)	(0.0898)	(0.0120)	(0.0129)	(0.0421)	(0.0143)
ln_asset	-0.180**	-0.00757	0.0130***	0.0123**	0.0641***	0.00958*
	(0.0701)	(0.0334)	(0.00462)	(0.00493)	(0.0162)	(0.00549)
leverage	-0.250	0.0471	0.0477*	-0.0377	0.168*	-0.0402
	(0.400)	(0.194)	(0.0263)	(0.0281)	(0.0921)	(0.0313)
B/M	0.210**	-0.0824*	-0.0332***	-0.0153**	-0.137***	-0.0154**
	(0.0918)	(0.0434)	(0.00605)	(0.00646)	(0.0212)	(0.00719)
ROE	8.706	-1.505	-0.0843	-0.319	-1.255	-0.320
	(6.015)	(2.903)	(0.396)	(0.423)	(1.386)	(0.471)
Constant	5.658***	1.792***	-0.287***	-0.227**	-1.166***	-0.142
	(1.445)	(0.687)	(0.0953)	(0.102)	(0.333)	(0.113)
Observations	2544	1848	2544	2544	2544	2544
Adjusted R^2	0.002	0.001	0.010	0.003	0.015	0.002

Note: We have six dependent variables, respectively abnormal return variance (ab_ret_var), abnormal trading volume (ab_trade_vol), level change of β after firm's annual report ($\Delta\beta$), level change of R^2 after firm's annual report (ΔR^2), percent change of β after firm's annual report ($\Delta\beta/\beta$), percent change of R^2 after firm's annual report ($\Delta R^2/R^2$). Our sample is all the firms in the high earnings management segment. *Escaper* is a dummy variable that equals 1 if a firm moves out of high earnings management segment in the next year, and equals to 0 if a firm stays in the high earnings management segment in the next year. Standard errors in parentheses. * (p<0.10), ** (p<0.05), *** (p<0.01).

8 Causal Evidence on Effects of Falling into High Earnings Management Segment

Firms listed in China are divided into a high versus a low earnings management segment due to its delisting policy. In section 6, we show that firms in the high earnings management segment suffer from adverse financial effects compared to firms in the low earnings management segment. We attribute the adverse financial effects for firms in the high earnings management segment to firms' massive earnings management and investors' distrust.

Obviously, it is natural to think that firms in the high earnings management segment differ in many other dimensions from firms in the low earnings management segment. We proceed in two steps to mitigate this endogeneity problem. Firstly, we control for as many firm observables as possible. In our regressions, we control for firm size, market to book ratio, unexpected earnings, leverage, industry, and year.

However, simply controlling for firm observables is not sufficent for causal inference. Our goal is to identify the impact of falling into high earnings management segment on firms. We need to make sure that firm unobservables are not driving our results. The ideal experiment is to negatively shock some firms from the low earnings management segment into the high earnings management segment. For example, pick two firms from the low earnings management segment at year t: firm A with 8% ROE and firm B with 10% ROE. We give both of them a negative 5% ROE shock in year t+1. In year t+1, firm A falls into the high earnings management segment since now its ROE is below 4% whereas firm B stays in the low earnings management segment. We can then

compare investors' reaction to their announcement of ROE in year t+1 to determine the impact of falling into the high earnings management segment. One might argue that firm A and B are different firms since they have different ROEs in year t which bias our results. Hence, we design a difference in differences estimation strategy to get rid of time-invariant firm fixed effects. More specifically, we first measure the change in investors' reaction from year t to t+1 for both firm A and B. We then take another difference between firm A's change and firm B's change. The difference in firm A and B's differences is the impact of falling into high earnings management segment. Our identifying assumption is that time-varying firm effects do not impact firm A and B differently. We will manage to present evidence on that front.

The key ingredient of our identification strategy is a large exogenous negative shock to firms' ROE. We will first explain why the 2007-08 global financial crisis can be seen as an exogenous shock to firms listed in China. Afterwards, we implement the difference in differences estimation strategy to identify the effects of sliding into high earnings management segment.

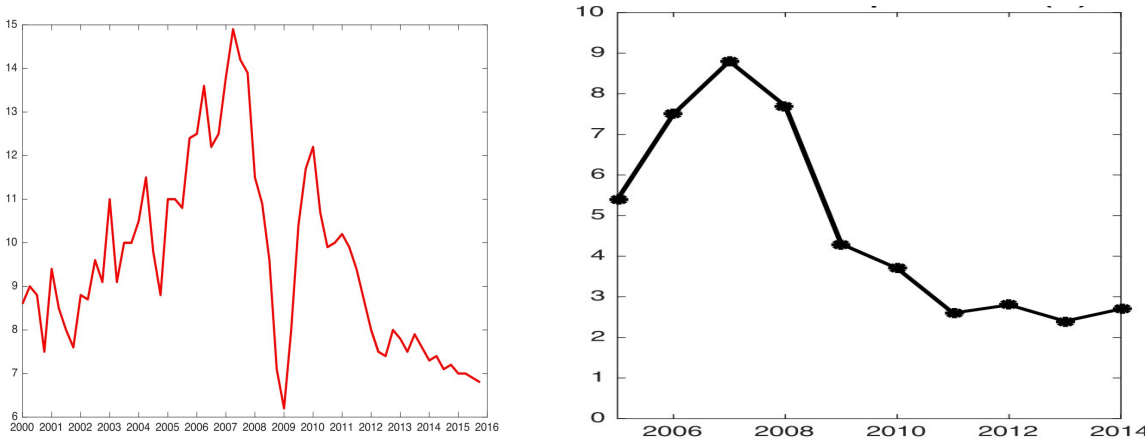
8.1 Why is the 2007-08 Global Financial Crisis an Exogenous Shock to Firms Listed in China?

China's booming export-driven economy took an unexpected hard hit in 2008 by the financial crisis (Chong-en et al., 2016). Figure 12 shows that China's average quarterly GDP growth rate from 2003 to 2007 had been over 10 %. However, China's quarterly GDP growth rate dropped from 13.9% in 2007Q4 to 7.1% in 2008Q4. In the meanwhile,

export as a ratio of GDP also declined from 9% in 2007 to 8% in 2008. Hence, the financial crisis can be viewed as an major negative foreign demand shock to Chinese firms.

Moreover, it is reasonable to view financial crisis as an exogenous shock to listed firms in China since it was caused by sub-prime mortgage defaults in the U.S.. In addition, average ROE for all firms listed in China was 8.5% in 2007 and dived to 5.1% in 2008. The drop in ROE from 2007 to 2008 is even larger for firms in the tradable sector such as manufacturing. There were over 700 listed manufacturing firms in China in 2007. Their average ROE fell by over 4% due to the financial crisis, going from 10.7% in 2007 to 6.5% in 2008. In summary, the 2007/08 financial crisis is both an exogenous and sizeable negative shock to China's listed firms.

Figure 12: Impact of the 2007/08 Financial Crisis on China's Economy



(a) China's Quarterly GDP Growth

(b) China's Annual Export/GDP Ratio

Note: these two graphs are from Chong-en et al. (2016)

8.2 Estimation Strategy

8.2.1 Forecasting Model of ROE

Looking at each firm's ROE in year 2007 and 2008, we are able to identify a group of firms that were in the low earnings management segment in year 2007 and dropped to high earnings management segment in 2008. However, we can not say that every firm in this group plunges into the high earnings management segment due to an exogenous shock. Some firms might switch from high to high earnings management segment even without the financial crisis as a shock. Hence, we need to eliminate firms that switch earnings management segments due to endogenous reasons unrelated to the financial crisis.

We follow Fama and French (2000) in constructing our forecasting model of firm's ROE. We use the model to forecast each firm's ROE in 2008 based only on information available in 2007. The financial crisis came in as an unexpected shock to listed firms in China. If a firm that is forecasted to stay in the low earnings management segment in 2008 but in reality dropped to high earnings management segment, we are confident that this firm fell into the high earnings management segment due to an exogenous reason that is not related to firm's fundamentals.

The forecasting model of firm's ROE has two stages. For the first stage, we regress $E(Y_t/BE_t)$ for the firms in our sample on variables meant to capture differences across firms in expected profitability for each year t. BE_t is a firm's total book equity at the end of year t; Y_t is earnings before interest and extraordinary items but after taxes. We then use the fitted values from this first-stage regression as the proxy for $E(Y_t/BE_t)$ for

year t.

$$Y_t/BE_t = d_0 + d_1 VE_t/BE_t + d_2 VE_{t-1}/BE_{t-1} + d_3 DD_t + d_4 D_t/BE_t + \epsilon_t \tag{10}$$

We use three variables to explain expected profitability $E(Y_t/BE_t)$. (i) D_t/BE_t is the ratio of year t dividends to the book value of common equity at the end of the year. (ii) Fama and French (1999) find that firms that do not pay dividends tend to be much less profitable than dividend payers. Our second variable is a dummy, DD_t , that is 0 for dividend payers and 1 for nonpayers. (iii) We use the market-to-book equity ratio, VE_t/BE_t, to pick up variation in expected profitability missed by the dividend variables. Here VE_t is the firm's market equity value. We develop the model in two aspects: first, we add up the lagged term VE_{t-1}/BE_{t-1} to allow intertemporal effect of market-to-book equity ratio; second, we estimate the parameters d_0, d_1, d_2 and d_0 in a three year window to exclude short term noises. Also, we scale annual net income by book equity instead of book asset.

Table 5 shows the result for our first stage regression. We need $E(Y_t/BE_t)$ for both 2006 and 2007 to construct our second stage forecasting model. Similar to Fama and French (2000), we observe higher profitability associated with dividend payers and higher dividend payout ratio. Moreover, we get a positive contemporary and a negative lagged effect of market-to-book equity ratio.

For the second stage, we use the following model based on the mean reversion in

Table 5: First stage regression for 2006 and 2007

	(1) 2006	(2) 2007
VE_t/BE_t	-0.0388***	-0.00917***
	(0.00138)	(0.000927)
VE_{t-1}/BE_{t-1}	0.0279***	0.0193***
	(0.00148)	(0.00155)
DD_t	-0.0804***	-0.0751***
	(0.00905)	(0.00887)
D_t/BE_t	1.569***	1.280***
	(0.164)	(0.162)
Constant	0.0619***	0.0506***
	(0.00826)	(0.00810)
Observations	3847	3892
Adjusted R^2	0.270	0.136

Note: The independent variable is Y_t/BE_t. BE_t is a firm's total book equity at the end of year t. Y_t is earnings before interest and extraordinary items but after taxes. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

profitability.

$$CP_{t+1} = a + b_1 DFE_t + b_2 NDFE_t + b_3 SNDFE_t + b_4 SPDFE_t + c_1 CP_t + c_2 NCP_t + c_3 SNCP_t + c_4 SPCP_t + e_{t+1} \quad (11)$$

$CP_t = Y_t/BE_t - Y_{t-1}/BE_{t-1}$ is the change in profitability from $t-1$ to t; and $DFE_t = Y_t/BE_t - E(Y_t/BE_t)$ is the deviation of profitability from its expected value; all other explanatory variables include negative deviations of profitability from its expected value ($NDFE_t$), squared negative deviations ($SNDFE_t$), squared positive deviations ($SPDFE_t$), negative changes in profitability (NCP_t), squared negative changes ($SNCP_t$), and squared positive changes ($SPCP_t$). Here, b_2, b_3, b_4 measure nonlinearity in the

mean reversion of profitability, that is, in the speed of adjustment of profitability to its expected value. And c_2, c_3, and c_4 measure nonlinearity in the autocorrelation of changes in profitability.

For the financial crisis shock, we first estimate equation (11) using CP_{2007} as our independent variable and then forecast CP_{2008} with all explanatory variables in 2007. Using CP_{2008} as our forecast ROE change without financial crisis, we are able to classify firms that are exogenously shocked to fall into the high earnings management segment. Table 6 shows the result for our second stage regression.

8.2.2 Difference in Differences Estimation

Here is our estimation equation:

$$Y_{it} = \alpha + \beta_1 * Post + \beta_2 * Treatment + \beta_3 * Post * Treatment + Controls_{it} + \epsilon_i \qquad (12)$$

where t= 2007 or 2008. i denotes firms listed in China. We only keep firms that have data in both year 2007 and 2008. Y_{it} is our outcome variable that can either be a financial effect or a real effect. $Post$ is a dummy variable that equals 1 if year=2008 and 0 if year= 2007. We define our treatment group to be firms that were in the low earnings management segment in 2007, forecasted to be in the low earnings management segment in 2008, and actually fell into the high earnings management segment in 2008. Respectively, our control group consists of firms that were also in the low earnings management segment in 2007, forecasted to be in the low earnings management segment in 2008, and actually stayed in the low earnings management segment in 2008. More

Table 6: Second stage regression

	(1) CP_{t+1}	(2) CP_{t+1}	(3) CP_{t+1}	(4) CP_{t+1}
DFE_t	-0.469***	0.0982	-0.312***	0.0904
	(0.0295)	(0.0675)	(0.0298)	(0.0702)
CP_t	-0.0867***	-0.0807***	-0.0454	-0.186**
	(0.0291)	(0.0266)	(0.0875)	(0.0877)
$NDFE_t$		-1.183***		-1.069***
		(0.140)		(0.165)
$SNDFE_t$		-0.239**		-0.252**
		(0.106)		(0.116)
$SPDFE_t$		-0.226***		-0.251***
		(0.0732)		(0.0763)
NCP_t			-0.0347	0.298*
			(0.163)	(0.169)
$SNCP_t$			0.845***	0.522***
			(0.181)	(0.189)
$SPCP_t$			0.0948	0.157
			(0.0964)	(0.0977)
Constant	0.0559***	-0.00394	0.0303***	0.00189
	(0.00481)	(0.00658)	(0.00587)	(0.00688)
Observations	1211	1211	1211	1211
Adjusted R^2	0.317	0.438	0.406	0.442

Note: The independent variable is CP_{2007}. We then use the parameters obtained in 2007 to forecast CP_{2008}. $CP_t = Y_t/BE_t - Y_{t-1}/BE_{t-1}$ is the change in profitability from $t-1$ to t; and $DFE_t = Y_t/BE_t - E(Y_t/BE_t)$ is the deviation of profitability from its expected value; all other explanatory variables include negative deviations of profitability from its expected value ($NDFE_t$), squared negative deviations ($SNDFE_t$), squared positive deviations ($SPDFE_t$), negative changes in profitability (NCP_t), squared negative changes ($SNCP_t$), and squared positive changes ($SPCP_t$). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

specifically, treatment =1 if ROE(07) > 7%, forecasted ROE (08) > 7%, and ROE(08) $\in$ (0, 4%). Respectively, treatment=0 if ROE(07) > 7%, forecasted ROE (08) > 7%, and ROE(08) > 7%. We further restrict our control group (treatment=0) to be firms whose ROE in 2008 is lower than their ROE in 2007. Basically, we remove from our control group all the firms that had an increase in ROE from 2007 to 2008 so that our control group is more comparable to treatment group. We include controls such as market to book ratio, firm size, leverage, difference in ROE from 2007 to 2008, etc. All continuous variables are winsorized at 1% and 99% before all regressions.

The key coefficient of interest is β_3 which measures the difference in treatment and control's differences from 2007 to 2008. In other words, β_3 measures the impact of falling into high earnings management segment due to an exogenous shock of ROE.

8.3 Regression Results

Table 7 shows the result for our difference-in-differences regression around 2008 financial crisis. For short-term reaction measures, both abnormal return variance and abnormal trading volume correspond to a significant negative coefficient. The mean of abnormal return variance and abnormal trading volume in 2007 are respectively 2.11 and 1.70, which indicates a 46.4% drop of abnormal return variance and a 22.2% drop of abnormal trading volume when a firm moves from the low earnings management segment to the high earnings management segment. On the contrary, for long-term financial measures, both $\Delta\beta/\beta$ and $\Delta R^2/R^2$ correspond to a significant positive coefficient. There is an 8% increase of β and a 16.4% increase of R^2 when a firm moves from the low earnings management segment to the high earnings management segment.

As we expected, firms will co-move more with market index after falling into high management segment. Investors tend not to trust these firm's disclosure, which leads to a smaller proportion of firm level reliable information compared with the market overall influence. Moreover, firms falling into higher management segment bear a higher systematic risk β and also a higher realized cost of equity.

Table 7: DID for financial crisis shock

	(1) ab_ret_var	(2) ab_trade_vol	(3) $\Delta\beta$	(4) ΔR^2	(5) $\Delta\beta/\beta$	(6) $\Delta R^2/R^2$
post	-1.042***	-0.795***	-0.0243	-0.195***	-0.0199	-0.395***
	(0.250)	(0.109)	(0.0196)	(0.0184)	(0.0215)	(0.0434)
treatment	0.472*	0.153	0.00270	-0.00936	-0.00237	-0.0368
	(0.286)	(0.129)	(0.0225)	(0.0210)	(0.0245)	(0.0496)
post× treatment	-0.978**	-0.377**	0.0728**	0.0648**	0.0805**	0.164**
	(0.398)	(0.176)	(0.0312)	(0.0292)	(0.0341)	(0.0690)
ln_asset	0.00173	-0.108***	0.0146**	0.0219***	0.0174**	0.0443***
	(0.0825)	(0.0354)	(0.00648)	(0.00607)	(0.00708)	(0.0143)
Firm Leverage	-0.939*	0.0137	-0.0259	0.0757*	-0.0109	0.226**
	(0.560)	(0.246)	(0.0439)	(0.0411)	(0.0480)	(0.0970)
B/M	0.464***	0.134*	-0.00254	-0.0368***	-0.0108	-0.0853***
	(0.168)	(0.0733)	(0.0132)	(0.0124)	(0.0144)	(0.0291)
ROE	0.0677	0.276	0.109	0.0369	0.0819	0.329
	(1.206)	(0.526)	(0.0947)	(0.0886)	(0.103)	(0.209)
ΔROE	-0.335	-0.840*	0.00545	0.185**	0.0174	0.238
	(1.090)	(0.479)	(0.0856)	(0.0802)	(0.0935)	(0.189)
Constant	2.168	4.027***	-0.306**	-0.419***	-0.352**	-0.838***
	(1.747)	(0.748)	(0.137)	(0.128)	(0.150)	(0.303)
Observations	683	516	683	683	683	683
Adjusted R^2	0.041	0.162	0.016	0.408	0.014	0.349

Note: We have six dependent variables, respectively abnormal return variance (ab_ret_var), abnormal trading volume (ab_trade_vol), level change of β after firm's annual report ($\Delta\beta$), level change of R^2 after firm's annual report (ΔR^2), percent change of β after firm's annual report ($\Delta\beta/\beta$), percent change of R^2 after firm's annual report ($\Delta R^2/R^2$). *Post* is a dummy variable that equals 1 if year=2008 and 0 if year= 2007. We define our treatment group to be firms that were in the low earnings management segment in 2007, forecasted to be in the low earnings management segment in 2008, and actually fell into the high earnings management segment in 2008. Respectively, our control group consists of firms that were also in the low earnings management segment in 2007, forecasted to be in the low earnings management segment in 2008, and actually stayed in the low earnings management segment in 2008. Standard errors in parentheses. * (p<0.10), ** (p<0.05), *** (p<0.01).

9 Conclusion

China's stock market is critical in allocating capital and aggregating firm level information efficiently. However, the efficiency of its stock market is severely held back by government policies and regulations. In this paper, we focus on the delisting policy in China's stock market, which is based on firms' reported earnings and hence incentivizes firms to engage in massive earnings management to stay listed.

In addition, we show that the delisting policy endogenously divides China's stock market into a high and a low earnings management segments. We document significant adverse consequences of firms falling into the high earnings management segment including lower market reaction to earnings announcement, insignificant earnings response to unexpected earning, lower price informativeness, and higher exposure to market risk. Our results can be supported by causal evidence using the 2007-08 financial crisis in the U.S. as an exogenous shock to listed firms in China.

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10 Appendix

Table 8: Delisting Threat vs Non-Delisting Threat 2009-2016 China

	Abnormal Return Variance					
	ROE∈ (0,0.06)		FROE ∈ (-0.1,0.06)		FROA ∈ (-0.1,0.03)	
Delisting Threat	-0.228**	-0.200**	-0.212**	-0.221**	-0.224***	-0.200**
	(0.0967)	(0.101)	(0.0959)	(0.104)	(0.0867)	(0.0929)
Firm Size		-0.0272		0.0134		-0.0169
		(0.0385)		(0.0418)		(0.0344)
Firm Leverage		-0.0386		-0.0692		0.0278
		(0.192)		(0.218)		(0.223)
Industry effect	No	Yes	No	Yes	No	Yes
Year effect	No	Yes	No	Yes	No	Yes
Observations	2126	2126	1686	1686	1897	1897
Adjusted R^2	0.002	0.018	0.002	0.017	0.002	0.032

Note: In the parentheses below coefficient estimates are standard errors adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the 1st and 99th percentile. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively.

Table 9: Delisting Threat vs Non-Delisting Threat 2009-2016 China

	Abnormal Trading Volume					
	ROE∈ (0,0.06)		FROE ∈ (-0.1,0.06)		FROA ∈ (-0.1,0.03)	
Delisting Threat	-0.141***	-0.0845*	-0.166***	-0.127***	-0.158***	-0.123***
	(0.0481)	(0.0456)	(0.0487)	(0.0473)	(0.0431)	(0.0424)
Firm Size		0.00119		-0.00289		-0.0273**
		(0.0144)		(0.0163)		(0.0134)
Firm Leverage		0.144*		0.164*		0.219**
		(0.0841)		(0.0911)		(0.105)
Industry effect	No	Yes	No	Yes	No	Yes
Year effect	No	Yes	No	Yes	No	Yes
Observations	2191	2171	1468	1468	1691	1691
Adjusted R^2	0.003	0.179	0.005	0.201	0.005	0.193

Note: In the parentheses below coefficient estimates are standard errors adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the 1st and 99th percentile. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively.

Table 10: Stock Market Reactions Surrounding Earnings Announcements: 2009-2016

	Abnormal Return Variance		Abnormal Trading Volume	
	(1)	(2)	(3)	(4)
Return on Equity	1.228***	1.476***	0.722***	0.676***
	(0.255)	(0.256)	(0.110)	(0.110)
Firm Size		-0.0152		-0.00548
		(0.0192)		(0.00707)
Firm Leverage		-0.231**		-0.00176
		(0.112)		(0.0408)
|Unexpected Earnings|		0.672		-0.0316
		(1.537)		(0.173)
Year effect	No	Yes	No	Yes
Industry effect	No	Yes	No	Yes
Observations	9243	8393	8610	8567
R^2	0.00223	0.0239	0.00486	0.162

Note: In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the 1st and 99th percentile. *, **, and *** denote significance at the 0.1, 0.05, and 0.01 level, respectively.

10.1 Real Effects

In progress. Right now we mainly want to focus on short-term firm performance related real effects, such as CEO turnover, CEO compensation change. In addition, we plan to explore real effects on firms' investment, RD, patents, etc. There are two empirical difficulties in investigating firms' real effects. First, these real effect measures are not fully collected back in 2007. We do not have enough data comparable with the financial measures we studied before. We may need to change to years after 2012 with better data. Second, investment, RD and patents normally come into play over a really long period. Firms in the high earnings management segment may prefer other real effects with faster payoffs.