A theory of managerial tax aggression: evidence from China, 2008-2013 (9702 observations)

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Abstract

Purpose – This paper aims to investigate the economic consequence of the tax reductive strategy on stock price. The authors' theory, empirically reinforced, suggests managerial tax aggressiveness endangers the corporation through a heightened risk in stock price crashing. Information opacity worsens the situation by reinforcing the relationship. Policymakers should emphasize two aspects: market openness and tighter institutional monitoring. The evidence shown in this paper demonstrates that these two weaken the tax aggressiveness impact on risk of a crashing stock price.

Design/methodology/approach – The sample in this paper consists of 9,702 observations from listed firms from 2008 to 2013 in China. The tax rate is manually collected and all the other original data used in this study are sourced from Wind and China Capital Market and Accounting Research databases. Both logistic regression and ordinary least squares regression methods are used to test the hypothesis in this paper.

Findings – One key insight is in tax aggressiveness to be strongly correlated with a greater risk of future stock price crashing. The authors also found information opacity to exert a positive moderating effect. That is, the higher the information opacity, the stronger and more positive the correlation between tax aggression and stock price crash risk. However, the market process and an institutional investor have opposite, negative impacts. An open market environment reduces their correlativeness. Similarly, stronger institutional vigilance leads to an attenuation of such a co-relationship.

Practical implications – The findings of this paper have wide policy implications for management and control by authorities of listed corporations. Aggressiveness in management of corporate taxes accentuates the risks borne by stockholders. If so, internally within the corporation, such aggression shown by management, if not proscribed, could be subject to scrutiny, possibly by an independent committee. Externally, this may be countered by the authority in emphasizing three key factors: openness in information sharing, the market environment and tighter institutional monitoring.

Originality/value – This study provides a consequential theory of aggressive management of tax, rigorously analyzed and strongly, empirically supported. Overall, aggressiveness in tax management is related with assumption of higher risks in the crashing of stock price. The relationship is enhanced through information opacity, but reduced via market environment and institutional monitoring.

Keywords Institutional investor, Information opacity, Market environment, Risk of stock price crashing, Tax aggressive

Paper type Research paper

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1. Introduction

1.1 Background for theory

In recent years, the tax aggressive behavior of Google, Amazon and Apple has received global attention (*Bloomberg*, 2010, 2013; *The New York Times*, 2012; Reuters, 2013) and many researchers have analyzed its corresponding economic consequences as a result (Jensen, 2012; Sun, 2013; Dowling, 2014; Hasan *et al.*, 2014). Numerous companies suffered a large tax penalty within the European Union, and consequentially, stock prices also fell, which led to many countries enhancing their anti-tax aggression measures. China acted (via State Administration of Taxation) and has since increased corresponding anti-tax aggression measures such as "Measures for the Administration of General Anti-Tax aggressive", while the Chinese capital market turned turbulent with stock prices crashing more often (Li and Liu, 2012; Xu *et al.*, 2012; Zou, 2013a, 2013b; Wang and Xie, 2013; Yang *et al.*, 2014). Clearly, this is not conducive to the long-term development of China's capital market, and it is this aspect that is the catalyst for our research in investigating the potential impact of managerial tax aggressive behavior on the risk of stock price crashing.

In traditional finance, tax aggressiveness is a form of wealth transfer of money not paid (taxes *legally* avoided) to the government, but is instead available to stockholders (or shareholders). Thus, logically, this enhances corporate value for shareholders, but ignores the corporate reality (especially publicly listed corporations) of owners and managers (as agents). However, based on the agency theory, potential managerial expropriation exists behind aggressive tax behavior (Chen *et al.*, 2010; Desai and Dharmapala, 2009a, 2009b; Wang *et al.*, 2014).

These often involve a wide variety of executive compensation (seen and hidden), training for career development (in top-end resorts) and perks (corporate jets, ocean-going yachts and more) that all contrive to push the managers to hide the bad news for their own purposes (Hanlon and Heitzman, 2010; Liu and Ye, 2012). Managers may utilize aggressiveness in taxes as a mask (Kim *et al.*, 2011; Luo and Wei, 2012; Luo and Du, 2014) and a variety of implementations such as mergers and acquisitions, stock issuance, assets reevaluation and obscure transfer pricing (related parties) are expropriated, which are, in reality, solely for the benefit of management. Complex tax planning techniques are then deployed to shelf any bad news arising from these transactions. In this way, the wealth of stockholders are invisibly sequestrated.

Time is a critical factor. For the longer that corporate managers amass hidden, negative information, the greater the stock price will become grossly overvalued, thus spiraling a bubble. Such internal bubbling cannot go on *ad infinitum* and stock price will eventually crash (Jin and Myers, 2006; Marin and Olivier, 2008; Hutton *et al.*, 2009). Yet, there is very little research in management literature on a phenomenon of tax aggressiveness with potentially dire consequences. As argued in the aforesaid paragraphs, tax aggressiveness by management that leads to enhanced risks of stock price crashing appears to be widespread. As such, we embark to study the relationship between tax aggressive behavior and stock price crashing within China. More specifically, the range research questions and issues that form the very basis of our agenda:

RQ1 Primarily, does tax aggressiveness matter in stock price crashing? If it does, what can be done about it?

RQ2 Managerial actions, if hideously executed in opaque settings: Does informational opacity matter?

RQ3 This leads us to inquire if an open market environment matters?

RQ4 Furthermore, we argue managers operating within a tighter, more vigilant institutional environment are less likely to take risky ventures. This leads us to raise this research question: Does institutional environment matter?

In the following section, we highlight our arguments by shaping the theoretical framework and hypotheses.

2. Theoretical framework and hypotheses

The traditional view in managerial finance in justifying tax aggressiveness is for the transfer of wealth from the government to owners, thus enhancing the corporate value of stockholders. Consequently, the literature focused on the analysis of tax aggressiveness: methods, means and techniques. As discussed in such studies, the reality in the separation of owners from stewardship or management is side stepped. On the basis of agency theory, there remains opportunism for management in being tax aggressive. This other side of the story is of equal, if not greater, significance, yet is still very much unexplored to date. Tax aggressiveness supplies unique (if not hideous) opportunities for managers to benefit themselves.

Jin and Myers (2006) built the information structure model (a theory of bad news cellars). Since this model was created, many scholars have explored, from an agency perspective, the risk of stock price crashing. Their analysis unmasked a reality of inside self-beneficial behavior, such as incentive payments. For enhancing personal reputations, top managers seek to grow businesses quickly and, if they are lucky, build an empire. Thus, this causes a far greater motivation to strenuously shield *any* bad news from the public. Given such information asymmetry, the general public (external market) will tend to overvalue the stock. Management in these circumstances may cause good news to be overblown in the media. Over time, as the management gets bolder, a spiral may be set in spinning up a bubble.

However, bad news cannot be suppressed within the corporation forever. At a critical turning point, the management had to, at least selectively, release *some* of these news. With the past deliberate buildup of the positive image of the company, this will result in a much greater negative impact. Indeed, it may trigger an onslaught on stock price that may cause it to crash. Desai and Dharmapala (2006) cite the American Enron Company as an example. Inside Enron, managers acted aggressively in managing tax savings using stockholders as the rationale and deliberately designed highly complex tax aggressive schemes that were challenging, even for revenue departments. For their own personal benefit, they hid the bad news from owners (investors), but the eventual release of the bad news resulted in the crashing of Enron's stock price.

Hanlon and Slemrod (2009) found that investors respond negatively whenever a company discloses information related to aggressive tax behavior. Such a finding suggests owners (as external investors) are wary of the potential for hidden expropriation behind tax aggressive activities. Open corporate governance may reduce the scope for such opportunities. In hiding bad news, managers may even seek to "beautify" the actual performance. Kim and Zhang (2015) found that, given the information asymmetry, the stronger is the case for accounting conservatism to reduce the risk of a stock price crash. Accounting conservatism reduces the motivation by managers to overvalue and as well as undermine their tendency to hide bad news.

We argue that tax aggressiveness internally by management will eventually lead to stock price crashing. Within the framework of agency (internal managers) theory, tax aggressiveness is manifested internally by managerial expropriation and the hiding of bad news. Following the theory of the presence of informational cellars, the bad news will accumulate, resulting in a higher than expected stock price, or stocks that are overvalued by investors (stockholders). The accumulative effect of bad news will reach a critical turning point once pieces of bad news begin to be filtering into the open market. Even though these may be released one at a time, their accumulative impact will lead to a sudden collapse of the stock price.

In our work, we focused as our primary relationship of interest on the management of taxes, particularly aggressiveness for modeling the riskiness of stock price crashing. By doing so, we are opening up new possibilities in innovative modeling of managerial tax aggressive behavior as we found them to be the deeper reasons for trends in the rising risks of stock prices crashing. Clearly, in the interest of good ethical governance, management should be constrained from hiding bad news. Yet, how do you suppress the tendency of management in hiding bad news? That brings us to instituting controls. From the literature, this paper considers good corporate governance. Specifically, it is the degree of a listed company in terms of informational transparency. Beyond the micro firm-level, we can explore (given data across regions inside China) other external aspects as well. These being the openness of the market as well as institutional controls through monitoring of listed corporations. Therefore, we develop our hypotheses linking to the existing literature.

Kim *et al.* (2011) found that tax avoidance and the risk of stock collapse are positively related using data from American firms from 1995 to 2008 that shows management hid bad news along with tax aggressive behavior. If this persisted, the stock becomes overvalued. Beyond a critical point and upon the release of bad news, the stock price will collapse. According to the differences of tax law and financial regulating reporting, management may apply complex and covert approaches for both, hiding bad news under the subterfuge of reducing corporate tax obligations. Such managerial behaviors are likely to persist and even spiral in scope, until the critical turning point. Then, within a short period of time, the stock price collapses. Thus, we propose our first hypothesis:

H1. Ceteris paribus, greater managerial tax aggressiveness will correlate with a higher level of stock price crash risk.

Next, we discuss the set of hypotheses of moderator variables.

The lower the information transparency of listed companies, the less specific information is reflected in the stock price about the company that can be obtained by external investors (Li *et al.*, 2011). Therefore, there will be more investor's cognitive risk in an unclear information environment. Tao and Shen (2011) found that the greater the investor's cognitive risk, the more is the risk of stock price plummet resulting in the bigger loss. Further, they found opaque information disclosure is an important factor affecting investors' cognitive risk. Pan *et al.* (2011) found that the higher the corporate informational opacity, the higher the risk of stock price crashing. Logically, opacity will help managers to keep their tax aggressiveness hidden from the public. Similarly, opacity is required to keep bad news hidden. Such opacity will be sustained until the crisis of stock price crashing. Jin and Myers (2006), using a multinational sample from 1990 to 2001, found information asymmetry was related to higher opacity. Similarly, rises of stock price implicitly raises the risk of stock price crashing. Contrarily, if managers pursue informational transparency (reduced opacity), it ought to lower the probability of stock price crashing. Timely, honest disclosures of bad news, as against their accumulated hiding, ought to avoid stock price from collapse. Therefore, we propose our second hypothesis:

H2. The higher the information opacity, the stronger is the correlation between managerial tax aggressiveness and risk of stock price crashing.

As an external governance mechanism, the market environment itself can play a certain role in corporate governance (Luo and Du, 2014). In China, there are variations in the degree to which a specific region within the country is market oriented. The quality of accounting information published by listed corporations is dependent on the degree of marketization (Liu *et al.*, 2013). In regions with a higher degree of marketization, good legal environment, less government intervention and effective property rights protection determine the market to play a basic role of the allocation of resources (including accounting information). In this market environment, the earnings management behavior of enterprise is easy to be identified by the market, which could only exacerbate agency conflicts of the parties to the contract and increase agency costs, and enterprises may face higher accounting information litigation risk and cost. To reduce agency costs, litigation risk and cost considerations, enterprises will choose to disclose the high-quality accounting information. Obviously, the higher degree of marketization constrains the behavior of an enterprise's earnings management. However, in regions with a lower degree of marketization, incomplete legal system, more government intervention and inefficient property rights protection determine the market it is very difficult to play its dual role. In this market environment, the ability that the market recognizes and reflects accounting information is weak and a legal system is not complete and reduces the accounting information litigation risk and cost. Therefore, the enterprise does not have the power to disclose the high-quality accounting information, and the lower degree of marketization reduces the earnings management constraints. Thus, with a higher degree of market orientation, more information on the company's characteristics is made available, and such informational transparency reduces the risk of a future stock price collapse (Shi *et al.*, 2014). Additionally, Li *et al.* (2012) found the degree to which management retains earnings to vary with market orientation. In the Eastern region of higher market orientation with greater external governance and rule of law, management is less inclined to retain earnings. Gao and Song (2007) found that transparency on earnings also matters. Such transparency leads to less tendency of management to hide bad news. This means a lower risk of stock price to crash. Thus, we propose our third hypothesis:

H3. The higher the market orientation, the weaker the correlation between managerial tax aggressiveness and risk of stock price crashing.

External investors are concerned about the potential of expropriation behind the tax aggressive activities. Thus, they will urge for strong institutional monitoring and controls to reduce the accumulation of hidden negative news. Institutional investors have a certain role in improving the governance of listing corporations in China (Bo and Wu, 2009; Ye *et al.*, 2009; Shi and Tong, 2009; Weng and Wu, 2007). Institutional investors' shareholding can play an active role in corporate information transparency

(Ye *et al.*, 2009). So, could the risk of stock price collapse be avoided? Interestingly, Kim *et al.* (2011) found that strong, external, institutional supervision weakened the relationship between managerial tax aggressiveness and the risk of stock price crashing. This shows the need for continuing, sustained institutional controls through tight, good monitoring. Thus, we propose our fourth hypothesis:

H4. The stronger the institutional monitoring, the weaker the correlation between managerial tax aggressiveness and the risk of stock price crashing.

We present in Figure 1 a summary of our extensive arguments leading to *H1* as the primary hypothesis and *H2*, *H3* and *H4* being factors that moderates the core relationship of managerial tax aggressive behavior and riskiness of a stock price crash.

In the following section, we outline our detailed research design.

3. Research design

3.1 Measurement of the main variables

3.1.1 Crash risk. Following Chen *et al.* (2001), Hutton *et al.* (2009) and Kim *et al.* (2011), we use three methods to calculate crash likelihood for each firm in each year: CRASH and negative conditional return skewness (NCSKEW) as dependent variables are used to regression analysis and down-to-up volatility (DUVOL) is used to check on robustness.

3.1.1.1 CRASH. CRASH is an indicator variable that equals 1 for a firm–year that experiences one or more crash weeks (as defined below) during the fiscal year period and 0 otherwise. To measure firm-specific crash risk, we first estimate firm-specific weekly returns for each firm and year. Specifically, the firm-specific weekly return, denoted by *W*, is defined as the natural log of one plus the residual return from the expanded market regression equation (1). We include the lead and lag terms for the market index return to allow for non-synchronous trading (Dimson, 1979);

$$R_{i,t} = \alpha_i + \beta_{1,i} R_{m,t-2} + \beta_{2,i} R_{m,t-1} + \beta_{3,i} R_{m,t} + \beta_{4,i} R_{m,t+1} + \beta_{5,i} R_{m,t+2} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is the return of stock *i* in week *t* and $R_{m,t}$ is the return of value-weighted market index from a share in week *t*. The firm-specific weekly return for firm *i* in week *t* ($W_{i,t}$) is measured by the natural log of one plus the residual return in equation (1), that is:

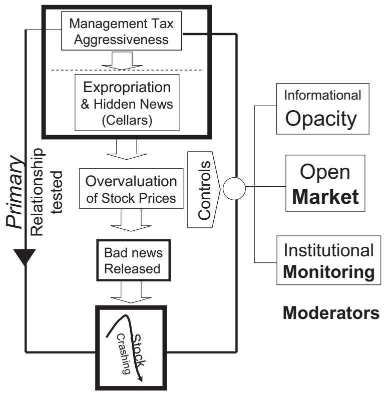

Figure 1. Our agency-grounded theoretical framework

$$W_{i,t} = ln\,(1 + \varepsilon_{i,t}) \tag{2}$$

We define crash weeks in a given fiscal year for a given firm as those weeks during which the firm experiences firm-specific weekly returns 3.09 standard deviations below the mean firm-specific weekly returns over the entire fiscal year, with 3.09 chosen to generate a frequency of 0.1 per cent in the normal distribution (Pan *et al.*, 2011).

3.1.1.2 Negative conditional return skewness. Our second measure of crash risk is NCSKEW. NCSKEW is calculated as:

$$NCSKEW_{i,t} = \frac{-n(n-1)^{\frac{3}{2}}\sum W_{i,t}^{3}}{(n-1)(n-2)(\Sigma W_{i,t}^{2})^{\frac{3}{2}}} \tag{3}$$

Specifically, we calculate NCSKEW for a given firm in a fiscal year. We do this by taking the negative of the third moment of firm-specific weekly returns for each sample year and then divide it by the standard deviation of firm-specific weekly returns raised to the third power. NCSKEW represents a tendency toward the stock price crash. Greater NCSKEW values indicate negative skewness, the more serious the situation, the more probable the crash risk.

3.1.1.3 Down-to-up volatility. Our third measure of crash risk is DUVOL. DUVOL is the natural logarithm of the ratio of the standard deviation in the "down" weeks to the standard deviation in the "up" weeks.

$$DUVOL_{i,t} = \frac{\log\,((n_{up}-1)\Sigma_{down}W_{(i,t)}^{2})}{((n_{down}-1)\Sigma_{up}W_{(i,t)}^{2})} \tag{4}$$

Where n_{up} and n_{down} are the number of up and down weeks in year t. This is used to describe the stock price volatility. An "up" week is when the return is higher than the annual mean. A "down" week is when the return is lower than the annual mean. A larger DUVOL indicates a greater tendency of the stock price crash.

3.1.2 Managerial tax aggressiveness. Managerial tax aggressiveness is any corporate activity reducing a firm's explicit tax liability (Hanlon and Heitzman, 2010). We use three measures to capture managerial tax aggressiveness adopted in prior literature.

3.1.2.1 SHELTER. Aggressive and complex tax sheltering activities are one clear indicator. Following Wilson (2009), we take the predicted probability of engaging in tax shelters (SHELTER) computed as:

$$\begin{aligned} \text{SHELTER} = {} & -4.86 + 5.20 \times \text{BTD} + 4.08 \times |\text{DAP}| - 1.41 \times \text{LEV} \\ & + 0.76 \times \text{AT} + 3.51 \times \text{ROA} + 1.2 \times \text{FOREIGN INCOME} \\ & + 2.43 \times \text{R\&D} \end{aligned} \tag{5}$$

Where BTD is the total book–tax difference; |DAP| is the absolute value of discretionary accruals from the performance-adjusted modified cross-sectional Jones model; LEV is long-term debt divided by total assets; AT is the log of total assets; ROA is pre-tax earnings divided by total assets; FOREIGN INCOME is an indicator variable set equal to one for firm-years that report foreign income and zero otherwise and R&D is research and development expenses divided by lagged total assets. A higher value of SHELTER is consistent with a greater level of tax aggression.

3.1.2.2 Current effective tax rate. Following Cheng *et al.* (2012), *Current* effective tax rate *(ETR)* is computed as:

$$\text{ETR} = (\text{Income tax expense} - \text{Deferred income tax expense})/\text{EBIT} \tag{6}$$

EBIT is earnings before interest and tax. A lower *Current ETR* indicates that firms are effectively avoiding more current income taxes than firms with a higher *Current ETR*.

3.1.2.3 Cash effective tax rate. Following prior literature (Dyreng *et al.*, 2008, 2010; Cheng *et al.*, 2012; McGuire *et al.*, 2012, 2014), our second measure of managerial tax aggressiveness, *Cash ETR (C_ETR)*, is defined as follows:

$$\text{C\_ETR} = \text{Cash payment of taxes/Profit before tax} \tag{7}$$

Cash ETR captures all tax strategies that save cash taxes paid in a year, and a lower *Cash ETR* indicates greater tax aggressive.

3.1.3 Information opacity. Following Hutton *et al.* (2009), Pan *et al.* (2011) and Sun (2013), we calculate information opacity (OPACITY) as the sum of the previous three years accruals earnings management. Calculated as follows:

Step 1:

$$\frac{\text{TACC}_{i,t}}{\text{TA}_{i,t-1}} = \frac{\alpha_1}{\text{TA}_{i,t-1}} + \frac{\alpha_2 \Delta \text{S}_{i,t}}{\text{TA}_{i,t-1}} + \frac{\alpha_3 \text{PPE}_{i,t}}{\text{TA}_{i,t-1}} + \varepsilon_{i,t} \tag{8}$$

Step 2:

$$\text{DA}_{i,t} = \frac{\text{TACC}_{i,t}}{\text{TA}_{i,t-1}} - \frac{\alpha_1}{\text{TA}_{i,t-1}} - \frac{\alpha_2 (\Delta \text{S}_{i,t} - \Delta \text{R}_{i,t})}{\text{TA}_{i,t-1}} - \frac{\alpha_3 \text{PPE}_{i,t}}{\text{TA}_{i,t-1}} \tag{9}$$

Step 3:

$$\text{OPACITY}_{i,t} = |\text{DA}_{i,t-1}| + |\text{DA}_{i,t-2}| + |\text{DA}_{i,t-3}| \tag{10}$$

Where OPACITY is the information opaque. TACC is the total accrual profit, which is equal to the net income minus cash flow from operating activities. TA is the total assets. ΔS is the increments of main business income, PPE is the net fixed assets and ΔR is the increments of account receivable. DA is the discretionary accruals.

3.1.4 Marketization environment. According to existing literature, we use the relative index of the Chinese marketization (MKT), as prepared by Fan *et al.* (2011): "China Market Index – Regions marketization relative process Report in 2011" to reflect the market environment given the registered place of listed companies. The higher marketization score of the region, the more market oriented the environment.

3.1.5 External institutional investor monitoring. We take institutional investor as the proxy for external monitoring mechanisms. The variable INST is the ownership level of institutional investor (Bo and Wu, 2009; Kim *et al.*, 2011). Institutional investors are more sophisticated than individual investors and act as external monitors of the firm (Bo and Wu, 2009; Ye *et al.*, 2009; Shi and Tong, 2009).

3.2 Estimation models

The models below are used to test our hypotheses:

$$CRASH_t = \alpha_0 + \alpha_1 TAX\,AGGRESSIVE_{t-1} + \alpha_2 DTURN_{t-1} + \alpha_3 NCSKEW_{t-1} + \alpha_4 SIGMA_{t-1} + \alpha_5 RET_{t-1} + \alpha_6 SIZE_{t-1} + \alpha_7 MB_{t-1} + \alpha_8 LEV_{t-1} + \alpha_9 ROA_{t-1} + \alpha_{10} ACCM_{t-1} + \sum \alpha_m IND + \sum \alpha_n YEAR + \varepsilon_t \quad (11)$$

$$NCSKEW_t = \beta_0 + \beta_1 TAX\ AGGRESSIVE_{t-1} + \beta_2 DTURN_{t-1} + \beta_3 NCSKEW_{t-1} + \beta_4 SIGMA_{t-1} + \beta_5 RET_{t-1} + \beta_6 SIZE_{t-1} + \beta_7 MB_{t-1} + \beta_8 LEV_{t-1} + \beta_9 ROA_{t-1} + \beta_{10} ACCM_{t-1} + \sum \beta_m IND + \sum \beta_n YEAR + \varepsilon_t \quad (12)$$

$$CRASH_t = \alpha_0 + \alpha_1 TAX\,AGGRESSIVE_{t-1} + \alpha_2 OPACITY_{t-1} + \alpha_3 OPACITY_{t-1} * TAX\,AGGRESSIVE_{t-1} + \alpha_4 DTURN_{t-1} + \alpha_5 NCSKEW_{t-1} + \alpha_6 SIGMA_{t-1} + \alpha_7 RET_{t-1} + \alpha_8 SIZE_{t-1} + \alpha_9 MB_{t-1} + \alpha_{10} LEV_{t-1} + \alpha_{11} ROA_{t-1} + \alpha_{12} ACCM_{t-1} + \sum \alpha_m IND + \sum \alpha_n YEAR + \varepsilon_t \quad (13)$$

$$NCSKEW_t = \beta_0 + \beta_1 TAX\,AGGRESSIVE_{t-1} + \beta_2 OPACITY_{t-1} + \beta_3 OPACITY_{t-1} * TAX\,AGGRESSIVE_{t-1} + \beta_4 DTURN_{t-1} + \beta_5 NCSKEW_{t-1} + \beta_6 SIGMA_{t-1} + \beta_7 RET_{t-1} + \beta_8 SIZE_{t-1} + \beta_9 MB_{t-1} + \beta_{10} LEV_{t-1} + \beta_{11} ROA_{t-1} + \beta_{12} ACCM_{t-1} + \sum \beta_m IND + \sum \beta_n YEAR + \varepsilon_t \quad (14)$$

$$CRASH_t = \alpha_0 + \alpha_1 TAX\,AGGRESSIVE_{t-1} + \alpha_2 MKT_{t-1} + \alpha_3 MKT_{t-1} * TAX\,AGGRESSIVE_{t-1} + \alpha_4 DTURN_{t-1} + \alpha_5 NCSKEW_{t-1} + \alpha_6 SIGMA_{t-1} + \alpha_7 RET_{t-1} + \alpha_8 SIZE_{t-1} + \alpha_9 MB_{t-1} + \alpha_{10} LEV_{t-1} + \alpha_{11} ROA_{t-1} + \alpha_{12} ACCM_{t-1} + \sum \alpha_m IND + \sum \alpha_n YEAR + \varepsilon_t \quad (15)$$

$$NCSKEW_t = \beta_0 + \beta_1 TAX\,AGGRESSIVE_{t-1} + \beta_2 MKT_{t-1} + \beta_3 MKT_{t-1} * TAX\,AGGRESSIVE_{t-1} + \beta_4 DTURN_{t-1} + \beta_5 NCSKEW_{t-1} + \beta_6 SIGMA_{t-1} + \beta_7 RET_{t-1} + \beta_8 SIZE_{t-1} + \beta_9 MB_{t-1} + \beta_{10} LEV_{t-1} + \beta_{11} ROA_{t-1} + \beta_{12} ACCM_{t-1} + \sum \beta_m IND + \sum \beta_n YEAR + \varepsilon_t \quad (16)$$

$$CRASH_t = \alpha_0 + \alpha_1 TAXAGGRESSIVE_{t-1} + \alpha_2 INST_{t-1} + \alpha_3 INST_{t-1} * TAXAGGRESSIVE_{t-1} + \alpha_4 DTURN_{t-1} + \alpha_5 NCSKEW_{t-1} + \alpha_6 SIGMA_{t-1} + \alpha_7 RET_{t-1} + \alpha_8 SIZE_{t-1} + \alpha_9 MB_{t-1} + \alpha_{10} LEV_{t-1} + \alpha_{11} ROA_{t-1} + \alpha_{12} ACCM_{t-1} + \sum \alpha_m IND + \sum \alpha_n YEAR + \varepsilon_t \quad (17)$$

$$NCSKEW_t = \beta_0 + \beta_1 TAXAGGRESSIVE_{t-1} + \beta_2 INST_{t-1} + \beta_3 INST_{t-1} * TAXAGGRESSIVE_{t-1} + \beta_4 DTURN_{t-1} + \beta_5 NCSKEW_{t-1} + \beta_6 SIGMA_{t-1} + \beta_7 RET_{t-1} + \beta_8 SIZE_{t-1} + \beta_9 MB_{t-1} + \beta_{10} LEV_{t-1} + \beta_{11} ROA_{t-1} + \beta_{12} ACCM_{t-1} + \sum \beta_m IND + \sum \beta_n YEAR + \varepsilon_t \quad (18)$$

$TAXAGGRESSIVE_{t-1}$, $OPACITY_{t-1}$, MKT_{t-1} and $INST_{t-1}$ are the main independent variables. The dependent variable is $CRASH_t$ and $NCSKEW_t$, which are the proxies of stock price crash risk.

To test *H1*, α_1 in Model (11) and β_1 in Model (12) are used to explain the relation between *TAX AGGRESSIVE* and risk of stock price crashing. For testing test *H2*, α_3 in Model (13) and β_3 in Model (14) are used to illustrate the moderation effect of information opacity on the relation between *TAX AGGRESSIVE* and risk of stock price crashing. Similarly for testing *H3*, α_3 in Model (15) and β_3 in Model (16) are used to illustrate the moderation effects of market environment on the relation between *TAX AGGRESSIVE* and stock price crash risk. Also, to test *H4*, α_3 in Model (17) and β_3 in Model (18) are used to illustrate the moderation impacts of institutional monitoring on the relation between *TAX AGGRESSIVE* and stock price crash risk.

A set of control variables are instituted to control their possible effects on dependent variables. $DTURN_{t-1}$ is the detrended average monthly stock turnover in year $t-1$. This is Chen *et al.*'s (2001) key variable of interest, a proxy for differences of opinion among investors. They find that this detrended turnover variable is positively related to future risk of stock price crashing. $NCSKEW_{t-1}$ is the negative skewness of firm-specific weekly returns in year $t-1$. Firms with high return skewness in year $t-1$ are likely to have high return skewness in year t as well. $SIGMA_{t-1}$ is the standard deviation of firm-specific weekly returns over the fiscal year $t-1$. More volatile stocks are more likely to experience stock price crashes in the future (Chen *et al.*, 2001). RET_{t-1} is the arithmetic average of firm-specific weekly returns in year $t-1$. Stocks with high past returns are more likely to crash. $SIZE_{t-1}$ is the log of the market value of equity in year $t-1$. Both Chen *et al.* (2001) and Hutton *et al.* (2009) report a positive relationship between size and risk of stock price crashing. MB_{t-1} is the market value of equity divided by the book value of equity in year $t-1$. Growth stocks are more likely to be experiencing future stock price crashes (Chen *et al.*, 2001; Hutton *et al.*, 2009). The variable LEV_{t-1} is the total long-term debt divided by total assets. ROA_{t-1} is income before extraordinary items divided by lagged total assets. Hutton *et al.* (2009) show that financial leverage and operating performance are both negatively related to risk of stock price crashing. $ACCM_{t-1}$ is Hutton *et al.* (2009) measure of accrual manipulation. This is the key variable of interest for these authors: they found a positive relationship between

ACCM and risk of stock price crashing. We also control the industry (IND) and year (YEAR) fixed effect.

3.3 Data and sample construction

To investigate the relationship between managerial tax aggressiveness and risk of stock price crashing risk, we retain only listed corporate firms with valid data across all the related models. Our database is sufficiently large for us to institute controls in the testing of our hypotheses. This procedure yields a final sample of 9,702 observations between 2008 and 2013. These include listed companies on the Shanghai Stock Exchange and Shenzhen Stock Exchange. Finance, financial and capital market data are sourced from the China Capital Market and Accounting Research and RESET financial database. The database is then set up to specifically meet our empirical research goals. This required a reworking of the variables, and next, we describe our sample in detail.

Table 1 shows the sample distribution by industry: our sample is skewed highly toward manufacturing (57.40 per cent) with representation by trade (7.58 per cent), real estate (7.27 per cent), information technology (IT) (5.96 per cent), utilities (4.47 per cent), transportation (4.07 per cent), mining (3.43 per cent) and the remaining corporations, comprising only 9.83 per cent, are from travel (3.15 per cent), construction (2.55 per cent), agriculture (1.59 per cent), conglomerates (1.30 per cent) and publishing and media (1.24 per cent).

4. Empirical results

4.1 Descriptive statistics

Table II reports the descriptive statistics for all variables. As seen in Table II, the mean value of CRASH is 0.067, suggesting that 6.7 per cent of firm–years' experience at least one crash event. The average value of NCSKEW is −0.345 with median (−0.320): with little difference between the two implying a more uniform distribution. Our mean is

Industry	2008	2009	2010	2011	2012	2013	Total	(%)
A	19	22	21	25	33	34	154	1.59
B	41	52	54	58	62	66	333	3.43
C	670	759	806	892	1,129	1,313	5,569	57.40
D	69	69	74	72	74	76	434	4.47
E	29	34	35	41	49	59	247	2.55
F	57	60	63	67	73	75	395	4.07
G	59	65	71	93	131	159	578	5.96
H	110	115	118	120	133	139	735	7.58
J	97	112	119	123	125	129	705	7.27
K	39	44	44	50	61	68	306	3.15
L	12	15	17	19	26	31	120	1.24
M	22	23	21	20	20	20	126	1.30
Total	1,224	1,370	1,443	1,580	1,916	2,169	9,702	
%	12.62	14.12	14.87	16.29	19.75	22.36		

Notes: A = agriculture; B = mining; C = manufacturing; D = utilities; E = construction; F = transportation; G = IT; H = trade; J = real estate; K = travel; L = publishing and media; M = conglomerates

Table I.
Total sample breakdown by industry and year

Variable	N	Mean	Standard	Minimum	Median	Maximum
$CRASH_t$	9,702	0.067	0.252	0.000	0.000	1.000
$NCSKEW_t$	9,702	−0.345	0.914	−2.934	−0.320	1.916
$DUVOL_t$	9,700	−0.309	0.808	−2.308	−0.308	1.767
$SHELTER_{t-1}$	9,702	14.188	2.735	9.432	13.620	24.118
ETR_{t-1}	9,702	0.173	0.186	−0.103	0.162	0.611
C_ETR_{t-1}	9,702	0.154	0.165	−0.072	0.143	0.532
$INST_{t-1}$	9,602	0.184	0.190	0.000	0.118	0.761
MKT_{t-1}	9,702	8.322	1.943	3.540	8.540	11.800
$OPACITY_{t-1}$	7,465	2.505	1.702	0.186	2.101	8.048
$DTURN_{t-1}$	9,702	6.216	2.063	0.209	5.970	17.948
$NCSKEW_{t-1}$	9,702	−0.330	0.914	−3.006	−0.298	1.950
$SIGMA_{t-1}$	9,702	0.068	0.024	0.029	0.063	0.143
RET_{t-1}	9,702	0.345	1.005	−0.766	−0.012	4.180
$SIZE_{t-1}$	9,702	22.320	1.106	20.338	22.151	25.826
MB_{t-1}	9,702	1.957	1.139	0.935	1.581	7.395
LEV_{t-1}	9,702	0.473	0.215	0.047	0.483	1.016
ROA_{t-1}	9,702	0.045	0.059	−0.177	0.040	0.237
$ACCM_{t-1}$	9,702	0.741	0.568	0.011	0.613	2.643

Table II.
Descriptive statistics

relatively larger in comparison with the literature. This suggests our sample to be *more* crash prone than previous studies. The minimum DUVOL is −2.308 and maximum is 1.767, indicating that the risks of stock price crashing to differ across the companies within the sample. We are the first to adopt SHELTER for research in China: it is significantly higher than overseas. Clearly, the average level China's managerial tax aggressiveness is higher than overseas, foreign companies. Mean *ETR* is 0.173 less than the nominal tax rate 0.25, indicating a lower *ETR* burden on most companies. Minimum *C_ETR* is −0.103 and maximum is 0.532, while the average was only 0.154, indicating a big difference in the cash paid toward taxes between companies. The descriptive statistics results of *ETR* and *C_ETR* are similar with Sun (2013), indicating with a lower *ETR* of the companies, the higher avoidance. *SIZE* is significantly larger than other control variables; this is probably due to the use of the market value rather than the book value. The mean value of INST is 0.184, indicating that 18.4 per cent share is controlled by external institutional investors. There is a large difference between minimum and maximum in terms of marketization (MKT), suggesting major gaps across regions of China. OPACITY is in line with expectations. Due to missing data, the samples for DUVOL, INST and OPACITY are less than other variables.

Table III shows the *CRASH* distribution by year and industry. In Table III, we found a total of 650 corporations having crashes of their stock prices that occurred mostly in 2012 (25.23 per cent) with the least occurrences in year 2009 (3.38 per cent). Manufacturing corporations crashed the most (60.15 per cent), followed by trade (8.00 per cent) and IT (6.46 per cent). If we compare the industry crash percentage with industry sample percentage, there are some changes in the ranking. For example, in Column C, manufacturing is 60.15 per cent, supposedly the highest. However, after adjusting for the relative sample size (57.4 per cent: 5,569/9,702), it is marginally higher: differential 2.75 per cent, and still ranks first. For K travel, it is 4.15 per cent, but the relative sample size it is 3.15 per cent: differential is 1 per cent and ranks second. In the

Table III. Distribution of CRASH by year and industry

Panel A. Distribution of CRASH by year

	2008	2009	2010	2011	2012	2013	Total
Crash	122	22	82	135	164	125	650
Percentage by total	18.77	3.38	12.62	20.77	25.23	19.23	100

Panel B. Distribution of CRASH by industry

	A	B	C	D	E	F	G	H	J	K	L	M	Total
Crash	9	24	391	26	12	11	42	52	40	27	9	7	650
Crash percentage	1.38	3.69	60.15	4.00	1.85	1.69	6.46	8.00	6.15	4.15	1.38	1.08	100
Industry sample percentage	1.59	3.43	57.4	4.47	2.55	4.07	5.96	7.58	7.27	3.15	1.24	1.30	100
Differential %	−0.21	0.26	2.75	−0.47	−0.70	−2.38	0.50	0.42	−1.12	1.00	0.14	−0.22	
Industry sample	154	333	5569	434	247	395	578	735	705	306	120	126	9,702
Percentage	5.84	7.21	7.02	5.99	4.86	2.78	7.27	7.07	5.67	8.82	7.50	5.56	6.70

Notes: A = agriculture; B = mining; C = manufacturing; D = utilities; E = construction; F = transportation; G = IT; H = trade; J = real estate; K = travel; L = publishing and media; M = conglomerate case of G IT, it is 6.46 per cent with a relative sample size of 5.96 per cent: differential 0.50 per cent, and ranks third. However, compared the crash number with industry sample number, we have new finding that the top three industry of crash ratio are travel (8.82 per cent), publishing and media (7.50 per cent) and IT (7.27 per cent).

4.2 Correlation coefficients

Table IV shows the Pearson correlation coefficients between variables. Two CRASH risk measures are highly inter-correlated (0.409). Correlations of three managerial tax aggressiveness measures (proxies) are as expected: *SHELTER* negatively with ETR and *C_ETR*, and *ETR* is positively correlated with *C_ETR*. Both measures of future CRASH risk are positively correlated with SHELTER and negatively correlated with *ETR* and *C_ETR*. This is consistent with our predictions that companies high on managerial tax aggressiveness tend toward higher, future CRASH risk. ACCM and managerial tax aggressiveness are found to be correlated. Also, *ACCM* was positively related to the future CRASH risk: similar to the findings by Hutton *et al.* (2009). The remaining control variables such as DTURN, NCSKEW, RET, SIZE and MB are, as expected, positively correlated with CRASH. LEV and ROA are both negatively correlated with CRASH. With these coefficients mostly less than 0.4, this indicates no serious issue of multicollinearity.

4.3 Regression analyses

4.3.1 Managerial tax aggressiveness and risk of stock price crashing. Table V reports the results of the *H1*. Part A of Table V presents the coefficient estimates for equation (11), using logistic regressions with *CRASH* as the dependent variable. In Part A, each of the three columns present the regression results, with each of three proxies for managerial tax aggressiveness as our test variable. As shown in Column 1, when *SHELTER* (predicted probability of tax sheltering computed using Wilson's (2009) model) is used as our test variable, the coefficient of *SHELTER* is highly significant with an expected positive sign (0.281 with t = 2.31). This significantly positive relation between the probability of engaging in complex tax shelters and future crash risk is consistent with *H1*. This suggests that complex tax shelters provide self-interested managers with opportunities, means and masks to both conceal negative information and divert company resources for extended periods. These are actions that, in turn, lead to increasing the risk of stock price crashing.

In Column 2, where ETR is used as a proxy for tax aggression, the coefficient of *ETR* is highly significant with an expected negative sign (−0.137 with t = −3.59), which is also consistent with *H1*. This suggests that a company having a *lower* ETR will increase the risk of future stock price crashing. In other words, a company where the management embarks on tax avoidance behavior (keeping to lower ETRs), the future risk of stock price crashing is increased. Investors ought to be on a lookout for companies involved in lowering the tax rate: managers therein may be hiding bad news as well as other activities for self-benefit. These activities may involve diverting or division of the company's assets. The incomes derived from these actions often far exceed the salaries that managers receive as payment for managing the corporations. Only when the stock price crashes, outside investors are able to discover the truth about these managerial actions.

Table IV.
Correlation

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	1.000													
B	0.409***	1.000												
C	0.064***	0.068***	1.000											
D	−0.023**	−0.011*	−0.21**	1.000										
E	−0.018*	−0.024***	−0.050	0.501***	1.000									
F	0.024*	0.034*	0.202***	0.001	0.008	1.000								
G	0.004***	0.028**	0.019*	−0.001	0.018*	−0.033***	1.000							
H	−0.027	0.009*	−0.088***	−0.020**	0.033***	−0.043	0.289***	1.000						
I	0.042***	0.069	0.049	−0.021**	−0.034***	−0.207**	−0.134	−0.087*	1.000					
J	0.033***	0.120*	0.449***	0.086***	0.032**	0.097***	−0.199***	0.254*	−0.070*	1.000				
K	0.07***	0.066***	−0.206*	−0.082	−0.027***	−0.087***	−0.016	0.004***	0.345***	0.091***	1.000			
L	−0.002*	−0.015	0.088**	0.084***	0.139*	0.121	−0.115***	0.100*	0.124***	−0.158**	0.342***	1.000		
M	−0.007**	−0.055**	0.116***	0.055**	−0.121***	0.078*	0.020	0.084**	−0.113	0.211**	0.154**	−0.388*	1.000	
N	0.006**	0.044**	−0.917*	0.05***	0.058**	0.213	0.068**	0.078	0.008***	−0.115***	0.175	0.120***	−0.043*	1.000

Notes: *t* statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively; A = $CRASH_t$; B = $NCSKEW_t$; C = $SHELTER_{t-1}$; D = ETR_{t-1}; E = C_ETR_{t-1}; F = $DTURN_{t-1}$; G = $NCSKEW_{t-1}$; H = $SIGMA_{t-1}$; I = RET_{t-1}; J = $SIZE_{t-1}$; K = MB_{t-1}; L = LEV_{t-1}; M = ROA_{t-1}; N = $ACCM_{t-1}$

Table V. Tax aggressive and stock price crash risk

Variable	Part A Dependent variable: CRASH			Part B Dependent variable: NCSKEW		
	SHELTER	*ETR*	*C_ETR*	*SHELTER*	*ETR*	*C_ETR*
$TAX\ AGGRESSIVE_{t-1}$	0.281** (2.31)	−0.137*** (−3.59)	−0.263* (−1.76)	0.370*** (−2.67)	−0.227** (−2.17)	−0.107** (−2.51)
$DTURN_{t-1}$	0.267* (1.90)	0.012* (1.69)	0.521*** (6.07)	0.267* (1.90)	0.012* (1.69)	0.521*** (6.07)
$NCSKEW_{t-1}$	0.032* (1.77)	0.015 (1.41)	0.028*** (4.73)	0.032* (1.77)	0.015 (1.41)	0.028*** (4.73)
$SIGMA_{t-1}$	4.25*** (3.78)	3.77* (1.80)	5.07* (1.76)	4.25*** (3.78)	3.77* (1.80)	5.07* (1.76)
RET_{t-1}	0.473** (1.97)	0.962 (1.03)	0.435** (2.12)	0.473** (1.97)	0.962 (1.03)	0.435** (2.12)
$SIZE_{t-1}$	0.034 (1.55)	0.065** (2.38)	0.032* (1.89)	0.034 (1.55)	0.065** (2.38)	0.032* (1.89)
MB_{t-1}	0.315* (1.87)	0.067*** (2.59)	0.021** (2.52)	0.315* (1.87)	0.067*** (2.59)	0.021** (2.52)
LEV_{t-1}	−0.168 (−1.39)	−0.173** (−2.05)	−0.152*** (−4.77)	−0.168 (−1.39)	−0.173** (−2.05)	−0.152*** (−4.77)
ROA_{t-1}	−0.078 (−0.56)	−0.066** (−2.00)	0.082* (1.70)	−0.078 (−0.56)	−0.066** (−2.00)	0.082* (1.70)
$ACCM_{t-1}$	0.048* (1.71)	0.017*** (4.83)	−0.123** (−2.31)	0.048* (1.71)	0.017*** (4.83)	−0.123** (−2.31)
N	9,702	9,702	9,702	9,702	9,702	9,702
F	22.12	20.18	23.51	22.12	20.18	23.51
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.108	0.034	0.061			
Adjusted-R^2				0.108	0.034	0.061

Notes: t statistics in parentheses; *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively

Column 3 of Part A in Table V presents the results of the logistic regression with *C_ETR* (proxy for managerial tax aggressiveness). Consistent with *H1*, we find that the coefficient of *C_ETR* to be negative (-0.263 with $t = -1.76$). This finding suggests that firms with lower effective cash tax rates have higher risk of stock price crashing. In other words, the likelihood of future stock price crashes is significantly higher for such firms: those paying over an extended period a low amount of cash taxes per dollar of pre-tax earnings. This is what the investment community should be aware in using ETRs for judging a firm's operating efficiency.

Meanwhile, the regression results of the most control variables are as expected. First, consistent with Chen *et al.* (2001), the coefficient of DTURN is significantly positive: differences of opinion among investors do increase the risk of future of stock price crashing. NCSKEW, SIGMA, RET, SIZE and MB are also positively risk related. These results are consistent with Chen *et al.* (2001). Second, in line with Hutton *et al.* (2009), we find negative coefficients for both LEV and ROA. Third, the coefficient of ACCM is significantly positive: stocks of companies with more accrual manipulation are more likely in the future to crash.

Part B of Table V reports the results of ordinary least square (OLS) regressions for equation (12), where NCSKEW is used as the dependent variable. As shown in Table V, the firm-specific negative NCSKEW in year t is negatively related to ETR and C_ETR in year $t - 1$ and positively related to SHELTER in year $t - 1$: these are consistent with the results as reported in Part A of Table V. These findings reinforce *H1*: firms with lower ETR, a lower C_ETRs and higher likelihood of using tax shelters are the more prone to crashing. Their firm-specific return distributions are more negatively skewed. As the results in Panel B are similar to those reported in Panel A, for brevity, we do not repeat our interpretation here. Overall, the results in Table V strongly support our *H1*, that managerial tax aggressiveness is positively correlated with risk of future stock price crashing. These results are robust: three alternative proxies for managerial tax aggressiveness and two alternative measures of risk of stock price crashing. Furthermore, our results hold even after having controlled for the accrual manipulation measure of Hutton *et al.* (2009), the investor heterogeneity of Chen *et al.* (2001) and the other potential determinants of risk in stock price crashing.

4.3.2 Role of information opacity. Table VI reports the results of *H2*: managerial tax aggressiveness and risk of stock price crashing risk as moderated by information opacity. To avoid multicollinearity, we removed *ACCM* as a control variable as *OPACITY* is measured by the past three years of accruals in earnings management. Due to missing data, the sample is reduced. In testing *H3*, we estimate equations (13) and (14) with results in Table VI. Part A of Table VI presents the logistic regression results with *CRASH* as the dependent variable. Consistent with *H1*, SHELTER (managerial tax aggressiveness) is significantly positive correlated; coefficients of ETR and C_ETR are highly significant negative. Coefficient of *OPACITY* × *SHELTER* (0.523 with $t = 6.18$) is significant and positive, which is consistent with *H2*. Moreover, the positive association between managerial tax aggressiveness and risk of stock price crashing is stronger for firms with higher levels of information opacity. For *ETR* and *C_ETR* (proxies of managerial tax aggressiveness), the coefficients of *OPACITY* × *ETR* (-0.265 with $t = -1.83$) and *OPACITY* × *C_ETR* (-0.232 with $t = -1.71$) are significant with an expected

Table VI. Tax aggressive, information opacity and stock price crash risk

Variable	Part A Dependent variable: CRASH SHELTER	ETR	C_ETR	Part B Dependent variable: NCSKEW SHELTER	ETR	C_ETR
$TAX\ AGGRESSIVE_{t-1}$	1.318** (2.53)	−0.121*** (−4.88)	−0.068** (−2.31)	0.659* (1.95)	−0.551*** (−4.36)	−0.034** (−2.14)
$OPACITY_{t-1}$	−0.321* (−1.77)	0.035** (2.32)	0.562 (−0.84)	0.361** (2.33)	0.324** (1.99)	−0.215 (−1.34)
$OPACITY_{t-1} \times TAX\ AGGRESSIVE_{t-1}$	0.523*** (6.18)	−0.265* (−1.83)	−0.232* (−1.71)	0.039*** (6.34)	−0.121* (−1.75)	−0.134** (−2.03)
$DTURN_{t-1}$	1.038 (1.48)	0.782*** (6.19)	0.962* (1.75)	0.033* (1.86)	0.125*** (6.54)	0.218 (1.43)
$NCSKEW_{t-1}$	0.032*** (8.34)	0.064* (1.79)	0.034** (2.07)	0.032** (2.48)	0.197* (1.91)	0.031*** (8.64)
$SIGMA_{t-1}$	16.035* (1.89)	12.317** (2.31)	14.651 (1.06)	2.347* (1.88)	3.640 (0.69)	4.261*** (4.91)
RET_{t-1}	3.248** (2.44)	4.267* (1.68)	5.261* (1.74)	0.317** (2.51)	0.413* (1.79)	0.513* (1.77)
$SIZE_{t-1}$	0.139* (1.69)	0.264* (1.78)	0.367*** (7.15)	0.021* (1.95)	0.032*** (8.16)	0.065** (2.01)
MB_{t-1}	0.054*** (5.86)	−0.981 (−1.35)	0.038** (2.49)	0.562** (2.53)	0.623* (2.47)	0.741* (1.72)
LEV_{t-1}	−0.034* (−1.71)	−0.086*** (−4.69)	−0.078 (−0.15)	−0.031* (−1.78)	−0.038*** (−7.46)	−0.046** (−2.37)
ROA_{t-1}	0.035 (0.76)	−0.032* (−1.93)	0.017** (2.19)	0.475 (1.52)	0.351* (1.80)	0.512 (0.91)
N	7,465	7,465	7,465	7,465	7,465	7,465
F	16.67	18.06	18.45	19.54	23.55	24.56
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.024	0.037	0.051			
Adjusted-R^2				0.034	0.047	0.078

Notes: *t* statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

negative sign. Clearly, information opacity results in a stronger positive correlation between managerial tax aggressiveness and risk in the future of stock price crashing. With a higher opacity of a company's information, it is more difficult for stockholders and investors to access corporate information. Thus, will result in asymmetric information and the company's share price could not reflect the true situation. Withholding bad news, the stock price would be higher than it is justifiable. The continuation of such a situation will eventually lead to a critical time when the stock price comes crashing down.

Part B of Table VI presents the OLS regression results with *NCSKEW* as the proxy for risk of stock price crashing. We find all the coefficients of both the main and interaction terms are significant with expected signs in all cases. The above results are, overall, consistent with *H2*. For the sake of brevity, we do not repeat our interpretation here.

4.3.3 Role of market environment. The relationship between managerial tax aggression and risk of future stock crashing is attenuated by higher market orientation (marketization), as hypothesized in *H3*. In testing *H3*, we estimate equations (15) and (16) with the results shown in Table VII. Market index (*MKT*) acts as proxy for market orientation. Consistent with *H1*, the coefficient of SHELTER (managerial tax aggressiveness) is significantly positive; coefficients of ETR and C_ETR are highly significant negative. Consistent with *H3*, coefficients of $MKT \times SHELTER$ (−0.684 with $t = -5.48$) is significant and negative. In other words, the positive association between managerial tax aggressiveness and risk of stock price crashing is less pronounced given higher marketization. For *ETR* and *C_ETR* (proxies of managerial tax aggressiveness), the coefficients of $MKT \times ETR$ (0.153 with $t = 2.41$) and $MKT \times C\_ETR$ (0.098 with $t = 1.68$) are significant with an expected positive sign. The above results are, overall, consistent with *H3*. Clearly, the higher marketization results in a diminishing in the positive correlation between managerial tax aggressiveness and the risk of stock price crashing.

Part B of Table VII presents the OLS regression results when *NCSKEW* is the proxy of risk of stock price crashing. Coefficients of main and interaction terms are significant with expected signs in all cases: only one case ($MKT \times ETR$) is insignificant. Overall, the above results are consistent with *H3*.

4.3.4 Role of institutional investor. To test *H4*, we estimate equations (17) and (18). Table VIII presents the results, using shareholding by institutional investors as a proxy for external, institutional monitoring. Part A of Table VIII presents the logistic regression results, with *CRASH* as the dependent variable. Consistent with *H1*, the coefficient of SHELTER (managerial tax aggressiveness) is significantly positive; coefficients of ETR and C_ETR are highly significant negative. Coefficients of $INST \times SHELTER$ (−0.037 with $t = -6.16$) is significant and negative, which is consistent with *H4*. Clearly, the negatively associated managerial tax aggressiveness and risk of stock price crashing is less pronounced given the institutional monitoring. For ETR and C_ETR (proxies of managerial tax aggressiveness), the coefficients of $INST \times ETR$ (0.032 with $t = 1.91$) and $INST \times C\_ETR$ (0.115 with $t = 2.07$) are significant with an expected positive sign. The above results are, overall, consistent with *H4*. Part B of Table VIII presents the OLS regression results when *NCSKEW* is the proxy of crash risk. Coefficients of main and the interaction terms are significant with expected signs in all cases.

Table VII. Tax aggressive, market environment and stock price crash risk

Variable	Part A Dependent variable: CRASH SHELTER	ETR	C_ETR	Part B Dependent variable: NCSKEW SHELTER	ETR	C_ETR
$TAX\ AGGRESSIVE_{t-1}$	0.645*** (3.71)	−0.136** (−4.94)	−0.108*** (−2.66)	0.623** (2.41)	−0.133* (−1.88)	−0.145** (−2.31)
MKT_{t-1}	1.356** (2.16)	−0.681 (−1.31)	0.715* (1.68)	0.036 (1.35)	1.027** (2.06)	0.982*** (5.37)
$MKT_{t-1} \times TAX\ AGGRESSIVE_{t-1}$	−0.684*** (−5.48)	0.153** (2.41)	0.098* (1.68)	−0.684* (−1.78)	0.235 (1.13)	0.862* (1.77)
$DTURN_{t-1}$	0.315** (2.30)	0.236 (1.37)	0.665* (1.68)	0.358* (1.84)	0.698*** (3.88)	0.512 (1.56)
$NCSKEW_{t-1}$	0.013*** (6.72)	0.032* (1.68)	0.241** (2.26)	0.006*** (9.38)	0.012* (1.76*	0.215** (2.08)
$SIGMA_{t-1}$	0.012* (1.71)	0.047** (2.49)	0.324 (1.60)	0.782* (1.92)	1.824** (2.19)	−2.357 (−0.35)
RET_{t-1}	0.610 (1.23)	0.429* (1.90)	0.521*** (7.16)	0.823* (1.88)	0.934* (1.80)	1.864** (2.43)
$SIZE_{t-1}$	0.067** (2.17)	0.046* (1.73)	0.064** (2.42)	0.321** (2.04)	0.215* (1.93)	0.057 (1.54)
MB_{t-1}	0.732* (1.91)	1.324 (1.46)	0.935** (2.39)	0.128 (0.73)	0.452** (2.49)	1.754* (1.72)
LEV_{t-1}	−0.017* (−1.89)	−0.236*** (−3.64)	−0.431** (−2.17)	−0.351** (−1.79)	−0.287*** (−7.64)	−0.431*** (−6.71)
ROA_{t-1}	−0.335** (−2.39)	−0.512 (−1.43)	−0.416** (−2.31)	0.068 (1.31)	−0.365* (−1.69)	−0.065** (−2.16)
$ACCM_{t-1}$	0.061 (0.43)	0.107** (1.99)	0.157* (1.83)	−0.032 (−0.69)	0.035* (1.70)	0.089** (2.57)
N	9,702	9,702	9,702	9,702	9,702	9,702
F	25.12	18.62	19.02	23.03	17.15	18.36
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
$Pseudo\text{-}R^2$	0.099	0.092	0.081			
$Adjusted\text{-}R^2$				0.075	0.065	0.088

Notes: t statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

Table VIII.
Tax aggressive, institutional investor and stock price crash risk

Variable	Part A Dependent variable: CRASH			Part B Dependent variable: NCSKEW		
	SHELTER	*ETR*	*C_ETR*	*SHELTER*	*ETR*	*C_ETR*
$TAX\ AGGRESSIVE_{t-1}$	0.832*** (−4.26)	−0.341** (−2.40)	−0.502*** (−4.69)	0.314** (2.18)	−0.131*** (−4.43)	−0.012* (−1.69)
$INSI_{t-1}$	0.312** (−2.32)	−0.032 (−1.16)	0.254* −1.81	0.138** (2.03)	0.067* (1.83)	0.126 (0.82)
$INST_{t-1} \times TAX\ AGGRESSIVE_{t-1}$	−0.037*** (−6.16)	0.032* (1.91)	0.115** (2.07)	−0.127* (−1.80)	0.073** (2.12)	0.103* (1.71)
$DTURN_{t-1}$	0.042* (1.67)	0.031 (0.19)	0.058** (2.21)	0.329* (1.72)	0.452 (1.44)	1.035** (2.50)
$NCSKEW_{t-1}$	0.052** (2.03)	0.041* (1.68)	0.061* (1.79)	0.013* (1.88)	0.236*** (7.32)	0.065** (2.17)
$SIGMA_{t-1}$	13.105** (2.38)	10.356* (1.76)	8.750*** (8.21)	2.367** (2.16)	1.364** (2.30)	3.150* (1.78)
RET_{t-1}	2.190*** (2.60)	1.036** (2.07)	2.751* (1.90)	0.341 (1.35)	0.561* (1.79)	0.079** (1.98)
$SIZE_{t-1}$	0.062** (1.98)	0.018 (0.27)	0.135** (2.10)	0.019* (1.93)	0.036*** (10.55)	0.061* (1.89)
MB_{t-1}	0.041*** (5.03)	0.061** (2.26)	0.104* (1.69)	0.023*** (3.45)	0.168* (1.80)	0.065 (0.62)
LEV_{t-1}	−0.326* (−1.75)	−0.235** (−2.18)	−0.326 (−0.65)	−0.062* (−1.65)	−0.071 (−1.36)	−0.103** (−2.03)
ROA_{t-1}	−0.311 (−1.54)	−0.632*** (−5.35)	−1.354*** (−6.08)	0.048 (1.57)	−0.125** (−2.01)	−0.021 (−0.26)
$ACCM_{t-1}$	0.406* (1.83)	0.321** (2.31)	0.015 (0.08)	0.101 (0.33)	0.091* (1.71)	0.235** (2.49)
N	9,602	9,602	9,602	9,602	9,602	9,602
F	20.32	19.57	18.67	20.37	19.88	21.06
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
$Pseudo\text{-}R^2$	0.032	0.048	0.016			
$Adjusted\text{-}R^2$				0.081	0.091	0.103

Notes: *t* statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

4.4 Robustness checks

For robustness of the empirical results, we use *DUVOL* as alternative proxy of risk of stock price crashing. Table IX reports the robustness test results of *H1* and *H2*. Part A of Table IX shows that *SHELTER* (0.013 with t = 2.37) is highly significant with an expected positive sign. Coefficients of *ETR* (−0.136 with t = −1.83) and *C_ETR* (−0.208 with t = −2.45) are both highly significant with negative sign: this is consistent with *H1*. Managerial tax aggressiveness in lowering effective tax and cash tax rates often lead to higher risks in stock price crashing. The coefficients of the control variables are generally consistent with the findings of prior studies, in which *RET*, *SIZE* and *LEV* are significantly higher. Part B of Table IX shows the results of that managerial tax aggressiveness to be stronger positively associated with future crash risk with the higher opacity of information. We find that *OPACITY* × *SHELTER* (0.003 with t = 2.49) is significantly positive, *OPACITY* × *ETR* (−0.038 with t = −1.73) and *OPACITY* × *C_ETR* (−0.005 with t = −1.76) are significantly negative, which more powerfully verify *H2*.

Table X reports the robustness test results of *H3* and *H4*.

Part A of Table X shows the results of the positive relation between tax aggression and future crash risk can be attenuated for firms with a high level market process. *MKT* × *SHELTER* (−0.002 with t = −2.24) is significantly negative, *MKT* × *ETR* (0.030 with t = 1.75) and *MKT* × *C_ETR* (0.003 with t = 2.49) are significantly positive, which more powerfully verify *H3*. That the higher the degree of market process, the weaker positive correlation between the tax aggressive and stock price crash risk.

Part B of Table X shows the robustness test results of *H4*, the positive relation between tax aggression and future crash risk can be attenuated for firms with effective external monitoring. *INST* × *SHELTER* (−0.004 with t = −1.76) is significantly negative, *INST* × *ETR* (0.299 with t = 1.89) and *INST* × *C_ETR* (0.057with t = 1.69) are significantly positive. The above results are, overall, consistent with *H4*. It can be understood as in the effective external monitoring and the management of tax aggression by hiding bad news will be subject to constraints, which make the continued accumulation of bad news situation weakened, thus reducing the risk of future stock price crash.

In summary, the four hypotheses robustness test results indicate that conclusion is robust.

5. A theory of managerial tax aggressiveness

As can be seen from Figure 2, our theory on managerial tax aggressiveness, as reinforced empirically by an extensive database, is discovered from the findings that are of importance, especially to top management, and managerial tax aggression results in dire economic consequences for stockholders (shareholders). These actions are often wrongly justified for enhancing shareholder value but they actually risk corporate collapse. Moreover, information opacity exerts a positive moderation effect on the relation between them. The higher the information opacity, the stronger the positive correlation between tax aggression and stock price crash risk. Therefore, good information environments will weaken the positive relations between tax aggressive and stock price crash risk. The government needs to strengthen the information disclosure and the law enforcement supervision. The Chinese Government has recently come to build a number of information disclosure systems, but they did not fulfill the

Table IX.
Robustness checks for *H1* and *H2* (alternative measure of crash risk)

Variable	Part A: *H1* Dependent variable: DUVOL *SHELTER*	*ETR*	*C_ETR*	Part B: *H2* Dependent variable: DUVOL *SHELTER*	*ETR*	*C_ETR*
$TAX\ AGGRESSIVE_{t-1}$	0.013** (2.37)	−0.136* (−1.83)	−0.208** (−2.45)	0.015** (2.23)	−0.026* (−1.81)	−0.009* (−1.77)
$OPACITY_{t-1}$				0.065*** (3.11)	0.028*** (3.10)	0.028*** (4.10)
$OPACITY_{t-1} \times TAX$						
$AGGRESSIVE_{t-1}$				0.003** (2.49)	−0.038* (−1.73)	−0.005* (−1.76)
$DTURN_{t-1}$	0.124*** (4.21)	0.324** (2.34)	0.021 (0.67)	0.134* (1.76)	0.035 (1.21)	0.017** (2.46)
$NCSKEW_{t-1}$	0.032* (1.90)	0.002*** (8.18)	0.015* (1.81)	0.006 (0.57)	0.014* (1.92)	0.004 (0.39)
$SIGMA_{t-1}$	0.003* (1.78)	−0.002 (−0.02)	0.019** (2.35)	0.812*** (3.38)	−0.036 (−0.30)	0.040*** (3.20)
RET_{t-1}	0.103** (2.91)	0.025** (2.83)	0.034* (1.77)	0.028*** (2.83)	0.040*** (4.35)	0.026*** (2.73)
$SIZE_{t-1}$	0.099*** (12.05)	0.100*** (12.26)	0.132*** (10.35)	0.125*** (10.39)	0.108*** (10.74)	0.123*** (11.17)
MB_{t-1}	0.110 (1.53)	0.101* (1.76)	0.136** (2.18)	0.038*** (3.98)	0.015* (1.87)	0.036*** (3.90)
LEV_{t-1}	−0.055** (−1.97)	−0.058** (−2.07)	−0.031*** (−5.64)	−0.051 (−0.90)	−0.055* (−1.76)	−0.059* (−1.80)
ROA_{t-1}	−0.152* (−1.89)	−0.150* (−1.87)	−0.148* (−1.76)	−0.050 (−0.25)	−0.119* (−1.86)	−0.10** (−2.33)
$ACCM_{t-1}$	0.103** (2.31)	−0.061 (−1.24)	0.045* (1.73)			
N	9,700	9,700	9,700	7,463	7,463	7,463
F	19.36	15.15	16.05	21.85	20.01	22.27
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.020	0.031	0.034	0.031	0.028	0.031

Notes: *t* statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

Table X. Robustness test for *H3* and *H4* (alternative measure of crash risk)

Variable	Part A: *H3* Dependent variable: DUVOL *SHELTER*	*ETR*	*C_ETR*	Part B: *H4* Dependent variable: DUVOL *SHELTER*	*ETR*	*C_ETR*
$TAX\ AGGRESSIVE_{t-1}$	0.022* (1.84)	−0.266* (−1.79)	−0.022** (−2.11)	0.002* (1.81)	−0.076* (−1.93)	−0.014** (−1.99)
MKT_{t-1}	0.009 (0.45)	−0.17** (−2.41)	−0.011** (−2.32)			
$MKT_{t-1} \times TAX\ AGGRESSIVE_{t-1}$	−0.002** (−2.24)	0.030* (1.75)	0.003** (2.49)			
$INST_{t-1}$				0.071 (0.74)	−0.042** (−2.16)	−0.040 (−0.71)
$INST_{t-1} \times TAX\ AGGRESSIVE_{t-1}$				−0.004*(−1.76)	0.299* (1.89)	0.057* (1.69)
$DTURN_{t-1}$	0.120* (1.73)	0.061** (2.17)	0.014 (1.23)	0.012* (1.81)	−0.024 (−0.61)	0.021** (2.40)
$NCSKEW_{t-1}$	−0.006 (−0.72)	0.021** (2.36)	0.016* (1.85)	0.013** (2.09)	0.023* (1.70)	−0.003 (−0.33)
$SIGMA_{t-1}$	−0.015 (−0.12)	0.714* (1.84)	0.731* (1.89)	0.010* (1.69)	0.865** (2.36)	0.853** (2.33)
RET_{t-1}	0.017** (2.14)	0.015* (1.67)	0.015* (1.66)	0.026*** (3.03)	0.014* (1.72)	0.014 (1.60)
$SIZE_{t-1}$	0.090*** (10.45)	0.112*** (11.57)	0.112*** (11.54)	0.100*** (12.06)	0.108*** (11.38)	0.108*** (11.41)
MB_{t-1}	0.014** (2.02)	0.020** (2.32)	0.020** (2.35)	0.013* (1.74)	0.020** (2.43)	0.021** (2.45)
LEV_{t-1}	−0.069** (−2.51)	−0.139*** (−2.80)	−0.137*** (−2.77)	−0.053* (−1.86)	−0.114** (−2.37)	−0.111** (−2.32)
ROA_{t-1}	−0.133* (−1.93)	−0.069** (−2.41)	0.057* (1.79)	−0.184* (−1.77)	0.128 (0.74)	−0.109* (−1.81)
$ACCM_{t-1}$	−0.002 (−0.93)	0.046*** (3.04)	0.047*** (3.07)	−0.007* (−1.73)	0.051*** (3.44)	0.052*** (3.54)
N	9,700	9,700	9,700	9,600	9,600	9,600
F	19.96	20.18	20.05	18.69	20.62	20.92
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R^2	0.023	0.024	0.024	0.021	0.024	0.025

Notes: *t* statistics in parentheses; *, ** and *** indicate statistical significance at the 10, 5, and 1% levels, respectively

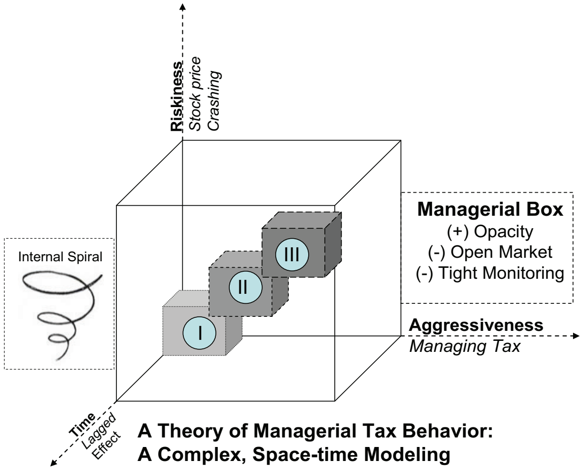

Figure 2.
A theory of managerial tax behavior

role as expected. The relevant regulations did not significantly reduce the impact of information opacity on the market. Thus, the laws must be strictly enforced and lawbreakers must be prosecuted, and the market should strengthen the law enforcement supervision, as well as efficiently standardize the moral hazard problems of the management.

External monitoring mechanisms, such as market environment, mean that institutional investor can play a better governance role through improving information disclosure. Market process of a company location will weaken the relationship between the tax aggression and the stock price crash risk. As an emerging market economy country, China's market-oriented reform has a long way to go; the government needs to further accelerate marketization process and develop the moderate effort of market. The higher the degree of market process, the higher the level of law rule and market regulation is, then the greater protection investors will have, which will be beneficial to improve the information quality and reduce the impact of information asymmetry, so as to reduce the risk of stock price crash. Moreover, the positive association between tax aggression and crash risk is also attenuated by external institutional investor, which could be viewed as evidence corroborating the agency theory explanation for the association. The results may provide a solution mechanism to the stock price crash risk. Similarly, the more effective the external monitoring is, the lower is the risk of stock price crash, and the probability of investor losses will be reduced. The government needs to further expand the size of institutional investors, making it the dominant force in the capital market. With the experience of developed countries, institutional investors can play an important role in improving corporate governance and take part in stabilizing the market. Institutional investors in China have formed a certain scale after a leapfrog development. But compared with the market value and the proportion of foreign institutional investors, there is still a big gap. Therefore, to make institutional investors play a bigger and more positive role, the government should improve their operational quality and continue to develop them.

6. Conclusion

Based on China's institutional background, this paper uses a sample consisting of 9,702 firm–year observations between 2008 and 2013 to empirically investigate the impact of tax aggression on the stock price crash risk and the moderation effect of market information opacity, environment and institutional investor on the relation between tax aggression and stock price crash risk.

Using multiple comprehensive measures of tax aggression and stock price crash risk, we find that first tax aggression and stock price crash risk is positively related, that is, tax aggression is usually accompanied by the management's personal profit expropriation and hiding bad news. With higher tax aggression levels, the risk of stock price crash is higher.

Second, the higher the information opacity, the stronger the positive correlation between tax aggression and the risk of the stock price crash. When the information is opaque, the cost of hiding information for the management is low, and then the management is more inclined to hide and accumulate bad news, which will increase the risk of future stock price crash.

Third, the higher the market process, the positive correlation between tax aggression and the risk of the stock price crash will be weaker. In areas of high marketization, the investor protection will be stronger, as will the rule of law, market supervision, thus the cost of hiding bad news will be higher, which will reduce the phenomenon of hiding bad news by management and improve the quality of information, so as to reduce the risk of future stock price crash.

Fourth, the stronger institutional investor supervision, the weaker the positive correlation between tax aggression and the risk of stock price crash is. Institutional investors effectively improve corporate governance, which can reduce the management's expropriation and behavior of hiding bad news in the process of tax aggression, thereby inhibiting the future of the stock price crash risk.

This paper provides empirical evidence on the relationship between tax aggression and stock price crash risk and expands the research area of stock price crash risk. Moreover, it is among the first to explain the theory behind and investigate the effect of information opacity and the external monitoring mechanisms, such as market environment and institutional investors, on the relations between tax aggression and stock price crash risk in China's context. These findings contribute significantly to understanding the economic consequence of a firm's tax aggressive behavior from the perspective of stock price crash risk.

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