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Faithful or fearless: directors' and officers' liability insurance and management discussion and analysis tone manipulation

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ABSTRACT

We examine whether directors' and officers' liability insurance (D&O insurance) influences managers' strategic tone manipulation of management discussion and analysis. We find that D&O insurance is positively associated with upward tone manipulation. This association is more pronounced for firms with greater litigation risk or highly-motivated and overconfident managers. Additionally, we document more favorable short-term returns and intensive reversals responding to positive tones issued by D&O insurance-covered firms. Besides, D&O insurance-shielded managers may inflate the tone by reducing risk-factor information disclosures. Overall, our results support that D&O insurance can trigger managers' unethical manipulations by reducing their expected personal legal liability.

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directors' and officers' liability insurance; management discussion and analysis; tone manipulation

1. Introduction

In recent years, the upwardly biased tone in financial reporting, especially in the management discussion and analysis (MD&A) sections, has gradually become a common means of disclosure manipulation by managers, which also attracts much scholarly attention.[1] Optimistic tone manipulation is characterized by the deviation between an over-optimistic tone and actual firm performance (Huang, Teoh, and Zhang 2014). The upward manipulation of MD&A tone may satisfy managers' self-interests (Bochkay, Chychyla, and Nanda 2019). For instance, by opportunistically inflating the tone of disclosures, managers can induce favorable market responses (Davis and Tama-Sweet 2012; Huang, Teoh, and Zhang 2014), facilitate profitable insider trading (Xu and Qi 2022), and maximize their equity-based compensation (Arslan-Ayaydin, Boudt, and Thewissen 2016).

However, corporate executives, as primary contributors to the content and quality of corporate information disclosures, bear significant costs for manipulating the tone of such communications. Existing evidence underscores the ex-post costs of tone manipulation, including legal penalties, personal financial losses, and reputational damage due to the release of false or misleading information (Schleicher and Walker, 2010; Rogers, Van Buskirk, and Zechman 2011). Nevertheless, motivated by the economic theory of crime (Becker 1968) that an unethical behavior (e.g. managerial manipulation) is preferred and conducted if the expected benefits exceed the expected costs, we propose our argument pivoting towards a focus on the ex-ante costs of tone manipulation. By evaluating these ex-ante costs, it may help deter opportunistic behavior preemptively rather than merely imposing ex-post penalties. Prioritizing ex-ante costs holds managers

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accountable beforehand, thereby discouraging potential wrongdoers from engaging in unethical practices. To our best knowledge, it remains largely unexplored whether the personal legal liability motive, a typical ex-ante cost for managers, matters in the decision of tone manipulation.

In this paper, we try to fill this gap by examining whether D&O liability insurance coverage, as a good proxy for managers' personal legal liability mitigation, will affect upward MD&A tone manipulation. D&O insurance has been introduced into executives' compensation contracts to alleviate personal legal liability and derivative costs. Specifically, it transfers the civil compensation liability of directors and officers due to work mistakes or misconduct to the insurance company and presumably reduce their expected costs of immoral manipulation (Bird, Borochin, and Knopf 2015).

The impact of D&O insurance on optimistic tone manipulation depends on whether it is effective to reduce the expected costs of manipulation. We argue that two possible hypotheses exist concurrently. On the one hand, D&O insurance may trigger aggressive upward-tone manipulation of MD&A sections, and we call it *managerial opportunism hypothesis*. Prior literature suggests that D&O insurance is positively associated with managerial opportunism because D&O insurance provides directors and officers with protection against legal liability and can potentially lead to moral hazard (Kim 2015). Compared with financial information, which needs to be audited before the release, the MD&A sections in annual reports require neither third-party verification nor ex-ante audit; thus, it is more elastic, less verifiable, and easier to be manipulated. Consequently, managers are more likely to do upward-tone manipulation of MD&A, significantly when their legal liability is reduced by D&O insurance. On the other hand, D&O insurance could also play a monitoring role in corporate governance because insurers can serve as additional independent supervisors overseeing the firm's misconduct, such as unfaithful information disclosure (Yuan, Sun, and Cao 2016). Due to such stringent monitoring, a drastic increase in the cost of strategic tone manipulation is expected (we call it *monitoring hypothesis*). Since both explanations may exist, research will be needed to determine whether the *managerial opportunism* or the *monitoring hypothesis* of D&O insurance dominates in the effect on upward-tone manipulation.

Our study investigates the relationship between D&O insurance and strategic tone manipulation in MD&A disclosures, using China's A-share publicly listed companies as our sample. China serves as an intriguing setting for our research due to two main reasons.

First, D&O insurance is a rapidly growing concept in emerging markets like China, yet it remains underdeveloped.[2] In its early stage of evolution in China, D&O insurance introduces unique market dynamics that may not be observable in more mature markets. For instance, the absence of established norms coupled with inadequate legal systems might instigate insured parties to exploit such vulnerabilities for their self-interests. Additionally, insurance companies in China may face challenges due to their nascent experience in the formulation of D&O insurance contract clauses and supervision of managers. This situation potentially undermines the supervisory capacity of D&O insurance, thereby exacerbating managerial opportunism, especially within the context of China's frail internal and external corporate governance mechanisms. Besides, by comprehending the role of D&O insurance in an emerging market such as China, other markets at similar nascent stages of D&O insurance development can preempt potential challenges and opportunities when integrating well-established corporate governance mechanisms from western countries. This understanding empowers these markets to assess the role of D&O insurance from a perspective that aligns more accurately with their unique development realities.

Second, China provides an ideal setting for causal inferences. Unlike listed companies in western countries such as United States and Canada, most of which are covered by D&O insurance, such coverage is not widespread in China. In 2002, the China Securities Regulatory Commission (CSRC) allowed listed companies to purchase liability insurance for directors for the first time. By the end of 2019, less than 400 A-listed companies in China's stock market had bought D&O insurance. Although in 2020 a revised People's Republic of China (PRC) Securities Law (hereafter 'New Securities Law') spurs D&O insurance demand, D&O insurance coverage rate for China's listed

companies is still below 20% at present. This setting enables us to effectively adopt identification strategies including the propensity score matching (PSM) and difference-in-differences (DID) models to draw causal inferences.

Using data on China's A-share listed firms throughout 2007–2021, this paper shows that D&O insurance is positively associated with aggressive optimistic tone manipulation. Our results indicate that the protection offered by insurance insulates directors and officers from the threat of litigation and personal financial liability, consistent with the *managerial opportunism hypothesis*. This positive association remains unchanged even after the enforcement of New Securities Law in 2020. A threat to our inference is that the reason why a firm pays for D&O insurance suffers from omitted-variable bias, which can affect both the self-selection process and the ultimate outcome variable. Therefore, we tackle the potential problems in a few ways. First, we re-estimate the baseline regression with firm fixed effects to address potential bias induced by stable unobservable firm characteristics. Second, we utilize PSM analysis to reduce self-selection bias due to observable variables. Third, we perform a difference-in-differences regression with propensity-score matched samples (PSM-DID) to further control for between-group differences that are time-invariant and unobservable. Last, we use the three-stage least squares model (3SLS) with an instrumental variable to isolate the effect of D&O insurance on tone manipulation from omitted-variable-based endogeneity.

We also substantiate our main findings with cross-sectional evidence. We start by investigating the effect of firm-level litigation risk. Prior studies suggest that the expected costs of offering biased disclosures would be exorbitant when subject to high litigation risks. Hence we predict and find that the association between D&O insurance and upward-tone manipulation is more prominent when firms possess higher litigation risk. Next, as we assume that most managers are motivated to manipulate the tone upward, we provide direct supportive evidence that the effect of D&O insurance is more pronounced in firms whose managers are highly-motivated to improve firms' images of the performance. Last, considering the effect of executive personality traits, we also examine the role of CEO overconfidence. We find that positive relationship between D&O insurance and tone manipulation is more robust for firms with over-confident CEOs.

Finally, we show further evidence that the abnormal tone is due to agency costs rather than incremental information supply. More specifically, we find that investors tend to over-respond to a positive tone issued by insured firms in the short-term, but stock return reverses over a longer window. This result confirms that dominant role of an abnormal optimistic tone driven by D&O insurance is to mislead investors. Besides, as for the economic mechanism tests, we show that the intensity of risk-factor disclosures, especially for the preview part of the MD&A, is negatively related to D&O insurance, suggesting that managers inflate tone by disclosing less risk-factor information.

We contribute several findings to the existing literature. First, we add to the budding literature on determinants of tone manipulation in MD&A. While existing studies have explored the role of corporate fundamentals (Huang, Teoh, and Zhang 2014), audit committee (Lee and Park 2019), managerial characteristics (Davis et al. 2015; Zhang, Ping, and Yang 2022), peer-based performance comparison (Goel and Madadian 2023), and self-interest incentives (Arslan-Ayaydin, Boudt, and Thewissen 2016; D'Augusta and DeAngelis 2020), our work presents a novel perspective. We demonstrate that D&O insurance, typically thought to encourage diligence and enhance corporate governance, might instead incite aggressive upward-tone manipulation. Our findings indicate that the abnormal tone stems from agency costs, not incremental information supply. Thus, we suggest that external governance measures like D&O insurance, while designed to enhance corporate governance, may inadvertently instigate agency issues under certain circumstances.

Second, we extend the long-standing stream of literature that examines the economic consequences of D&O insurance. Prior studies have devoted considerable attention to the effect of D&O insurance on strategic manipulation of hard (financial) data, including restatements of accounting numbers (Lin et al. 2013) and opportunistic earnings forecast (Wynn 2008). Given that managerial

discretion in hard financial information is even more strictly limited under the threat of ever-improving regulations, managerial propensity to manipulate soft information, such as MD&A disclosures, is of great concern. To our knowledge, the relationship between D&O insurance and strategic soft information manipulation is rare. To fill the gap created by this crucial but long-neglected topic, we contribute to the literature by paying attention to the effect of D&O insurance on tone manipulation in MD&A. Besides, China is marked by an underdeveloped capital market, an unsound legal system, and booming insurance services.[3] Hence, we provide new insight into the governance role of D&O insurance on corporate disclosure practices in emerging markets, especially when compared with findings based on the developed market (e.g. Lin et al. 2013; Lin, Officer, and Zou 2011). Our findings enrich and complement the evidence on the effect of D&O insurance on corporate disclosure practices in emerging markets. Specifically, different from Yuan, Sun, and Cao (2016) and Li, Yang, and Zhu (2022), we reveal the potential dark side of D&O insurance in Chinese capital market, namely, promoting the manipulation of non-financial information.

We organize the remainder of this paper as follows. Section 2 reviews the related studies and develops the primary hypotheses. Section 3 demonstrates the research design. Section 4 presents the results of the primary analyses. Section 5 conducts cross-sectional tests, and Section 6 provides additional analyses, including the effect on market reactions and economic mechanism tests. Section 7 presents our conclusions.

2. Literature review and hypothesis development

2.1. Literature review

2.1.1. Strategic tone manipulation of disclosures

Extant studies find that the linguistic tone of narrative disclosures significantly impacts the capital market, and the literature mainly concentrates on two perspectives.

First, scholars find that the linguistic tone of narrative disclosure can provide incremental information to the market. Generally, a positive tone is regarded as an effective forecast of the firm's excellent performance by management with an information advantage (Tetlock, Saar-Tsechansky, and Macskassy 2008). Mayew, Sethuraman, and Venkatachalam (2015) show that the tone of MD&A sections provides significant explanatory power in predicting the halt of going concerns. These findings are based on the theory that the disclosure tone represents managers' assessments of financial performance and supplements relevant information absent in the quantitative financial reports.

Second, budding literature also finds that managers strategically manipulate the disclosure tone to alter individuals' perceptions about financial performance. Without hard constraints from disclosure rules or audit supervision, the transmission and violation of narrative disclosure costs are relatively low. As a result, the managerial manipulation of narrative disclosures has become increasingly popular in recent years (Li 2010). Davis and Tama-Sweet (2012) report that managers increase disclosure tone optimism before exercising options when litigation risk is low. Huang, Teoh, and Zhang (2014) show that managers are more likely to manage the tone upward when they have incentives to increase stock prices or mask poor operating performance. Moreover, their market test results indicate that investors are misled by strategic tone manipulation.

To summarize, the disclosure tone may supplement credible information about expected future performance by managers, and it is aligned with the managerial incentive to reduce information asymmetry. In contrast, to alter users' perceptions about the firm's business condition, managers also have incentives to use their discretion to manipulate opportunistically such disclosure tone. However, studies on determinants of MD&A disclosures tone manipulation are pretty limited. Lee and Park (2019) find that the financial expertise of an audit committee effectively prohibits tone manipulation in MD&A. D'Augusta and DeAngelis (2020) show that accounting conservatism constrains upward-tone manipulation in MD&A. To the best of our knowledge, however, no

existing studies examine how the exemption mechanisms, which directly relate to managerial negligence or misconduct in their work, affect tone manipulation. We try to address this gap by examining the effect of D&O insurance on the level of tone manipulation.

2.1.2. The role of D&O insurance

There are two main strands of literature on the role of D&O insurance. One view is that D&O insurance plays a monitoring role because the existing scrutiny by D&O insurers would thoroughly monitor corporate governance (Holderness 1990). Specifically, D&O insurers observe the corporate features during underwriting, developing an informational advantage through corporate or external investigations (Holderness 1990). Core (2000) reports that insurers can precisely assess the risks of the insured firms and control management behavior by pricing the insurance and drawing up relevant contract clauses.

The positive relationship between D&O insurance and corporate governance is concordant with the *monitoring hypothesis*. For example, Yuan, Sun, and Cao (2016) find that purchasing D&O insurance mitigates future stock price crash risk, as better external monitoring by insurers reduces information asymmetry. The literature suggests that D&O insurance also benefits firms by improving abnormal profit performance (Kalelkar and Nwaeze 2015) and increasing firm value (Hwang and Kim 2018), among other things.

However, most recent studies discuss the managerial opportunism reflected by D&O insurance rather than its monitoring role. This view argues that D&O insurance insulates directors and officers from the threat of litigation and personal financial liability resulting from their bad decisions on behalf of the corporation (Core 1997), leading to moral hazard problems (Lin, Officer, and Zou 2011). Under the *managerial opportunism hypothesis*, D&O insurance leads to more aggressive and optimistic financial reporting and disclosures. Chung and Wynn (2008) find that managers report fewer conservative earnings when protected by D&O insurance. Furthermore, Kim (2015) and Lin et al. (2013) find that firms with D&O insurance are more likely to have accounting restatements. Apart from the deterioration in corporate information disclosure quality, prior work also finds that D&O insurance is associated with poor M&A decisions (Lin, Officer, and Zou 2011) and higher financing costs (Chen, Li, and Zou 2016; Lin et al. 2013). Overall, D&O insurance can introduce managerial opportunism and destroy firm value.

To summarize, this body of literature suggests that the effect of D&O insurance is two-fold. On the one hand, it provides more effective external monitoring and plays a governance role for firms. On the other hand, with the protection of D&O insurance, managers are more willing to engage in opportunistic behavior and act recklessly or be guilty of negligence in decision-making.

2.2. Hypothesis development

Based on the literature and the *managerial opportunism hypothesis* of D&O insurance, we identify that the less legal liabilities encourage managers covered by D&O insurance to be more likely to manipulate tone upward in their self-interest. By manipulating the MD&A tone upward, managers can mask poor financial performances, sell shares at prices strategically inflated by the overly optimistic tone and assist the insider trading (Arslan-Ayaydin, Boudt, and Thewissen 2016; Xu and Qi 2022). However, such managerial information disclosure strategies may lead to heavy litigation costs (Skinner 1994). For example, SEC Rule 10b−5 in the U.S makes it unlawful for any person '*to make any untrue statement of a material fact or to omit to state a material fact necessary in order to make the statements mad*,' and managers shall preempt negative news in response to litigation threats (Skinner 1994). Combining the self-interest incentives with related litigation risk, we find it reasonable to infer that as long as managers do not have adequate legal liabilities, they tend to disclose less negative news and make more optimistic disclosures. Previous work provides evidence that when managers are protected by D&O insurance, they are more willing to report less bad news to avoid unfavorable

stock responses afterward (Wynn 2008). Based on the same logic, aggressive financial reporting and disclosure manipulations may be triggered by the provision of D&O insurance because managers' wealth is insulated from the consequences of these aggressive reporting decisions (Chung, Hillegeist, and Wynn 2015). To summarize, although overly optimistic statements increase the probability of lawsuits against managers (Rogers, Van Buskirk, and Zechman 2011), D&O insurance may buffer the litigation risk for managers and remove the benefit of the litigation threat for agency costs, thereby encouraging the optimistic tone manipulation by managers.

In contrast, the *monitoring role hypothesis* of D&O insurance suggests that with strict monitoring from insurers, managers are less likely to manipulate the disclosure tone intentionally. Insurers can offer the same or better monitoring services compared to the shareholder at a lower cost (Holderness 1990). Hence, they may solve managers' moral hazard problems and reduce information asymmetry between firms and insurers. Unlike other stakeholders, insurers, as professional and independent risk management organizations, can accurately assess the insured firm's governance risks and discipline managers' unethical or unlawful behavior through the design of insurance contract terms, premiums, and compensation limits (Core 2000). Moreover, insurance contracts are based on the principles of 'Utmost Good Faith' and 'Duty of Disclosure.' In this context, these principles indicate that insured companies are legally required to make full disclosure of information material to the risk they want to cover. Furthermore, during the coverage period, insurers will supervise and discipline the managers with authority granted in the relevant provisions of the insurance contract. Even after a lawsuit has been filed, they will inquire and investigate the managers in-depth and determine the exact settlement amount of claims based on the results of their investigation. In addition, managers' reputational losses can also be further amplified by insurance companies. Specifically, if a company covered with D&O insurance intends to hire them, whose reputation has been damaged by their previous tone manipulation behavior, the insurance company may promptly notify the potential employer to increase future premium amounts or even refuse to renew coverage (Griffith 2006). In other words, D&O insurance may increase the reputational costs of managers to some extent, reduce their potential competitiveness in the labor market, and thereby constrain their tone manipulation behavior. In this case, insurers should manage to effectively detect manipulation behavior in financial reporting, even in the MD&A section, discouraging and restraining managers from strategic tone manipulation.

Overall, whether a firm will engage more in optimistic tone manipulation under the coverage of D&O insurance is ultimately an empirical question,[4] and we state our hypothesis in the null form:

H1: *Ceteris paribus*, the provision of D&O insurance has no significant effect on optimistic tone manipulation.

3. Research design

3.1. Data

For this study, we collect the data on D&O insurance purchases and the annual reports disclosed by A-listed companies in China's stock market for 2007–2021 to investigate whether directors' and officers' liability insurance (D&O insurance) will constrain or exacerbate tone manipulation in the MD&A portion of the annual reports. The current accounting standards in China, known as the 'New Accounting Standards', came into effect on 1 January 2007. To ensure consistency in accounting terms before and after the implementation of these standards, the sample period for this study begins in 2007. Then, we exclude (1) financial services firms and (2) firm-year observations with missing

information for the control variables. The above procedure yields our sample of 23,148 firm-year observations representing 3,170 unique firms (including 720 firms that have purchased D&O insurance at least once during the sample period and 2,450 firms that have never purchased D&O insurance during the sample period).

We use the Chinese Research Data Services (CNRDS) database and the China Stock Market and Accounting Research (CSMAR) database as primary sources for D&O insurance coverage at the firm level, financial data, and other basic information of sample firms. We obtain the data on MD&A linguistic tone from the CNINFO website. To reduce the influence of outliers, we winsorize all the continuous variables at 1% and 99%.

3.2. Variable definitions

3.2.1. Measures of tone manipulation

Huang, Teoh, and Zhang (2014) define tone manipulation as the choice of the tone level in a qualitative text that is incommensurate with the underlying quantitative fundamentals of the firm. We follow Huang, Teoh, and Zhang (2014) and construct our measure of upward-tone manipulation, *ABTONE*, as the signed residual from the following regression[5]:

$$\begin{aligned} TONE_{i,t} = {} & \alpha_0 + \alpha_1 EARN_{i,t} + \alpha_2 RET_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 BTM_{i,t} + \alpha_5 STDEARN_{i,t} \\ & + \alpha_6 STDRET_{i,t} + \alpha_7 AGE_{i,t} + \alpha_8 BUSSEG_{i,t} + \alpha_9 LOSS_{i,t} \\ & + \alpha_{10} DEARN_{i,t} + \alpha_{11} AFE_{i,t} + \alpha_{12} AF_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

In Equation (1), subscripts i and t denote the firm and year, respectively. Abnormal positive tone (*ABTONE*) is the residual of Equation (1) and is our measure of tone manipulation. Given that managers' assessment of firm performance is contingent upon profitability and earnings benchmarks, we include profitability (*EARN*) and benchmark estimates (*LOSS*, *DEARN*, and *AFE*). We include *RET* and *BTM* to capture information about the growth and the present value of future cash flows. We also add analyst earnings forecasts (*AF*) as a proxy for future financial performance that can influence the tone of financial reports. Further, volatility of stock returns (*STDRET*) and volatility of earnings (*STDEARN*) could also impact the tone. *AGE* is used to capture the company's life cycle, while business segments (*BUSSEG*) proxies for corporate operating complexities. In the existing literature, there are two measures that are used to proxy for linguistic tone in MD&A sections, and the key difference between them is the way to calculate the denominator of *TONE*. First, in accordance with Davis and Tama-Sweet (2012), we define the net tone (*TONE1*) as the difference between words denoting positive implications and words denoting negative implications and divide it by the total number of words used in MD&A sections. Second, following the study of Price et al. (2012), we alternatively define the net tone (*TONE2*) as the difference between the words denoting positive and negative sentiment divided by the sum of positive and negative words.

Appendix A provides detailed definitions of all abbreviations of variables mentioned in this section. We include industry fixed effects and year fixed effects to control the effect of industry patterns and time trends. We cluster observations by firms in all the regression estimations to eliminate autocorrelation.

3.2.2. Measures of D&O insurance

Following prior literature (Li, Yang, and Zhu 2022; Yuan, Sun, and Cao 2016), we construct a dummy variable, *DOI*, to examine how the purchase of D&O insurance influences managers' tone manipulation. For each firm-year observation, *DOI* equals 1 if a firm takes out D&O liability insurance in a given year and 0 otherwise.

3.3. Empirical model

To examine how D&O insurance coverage affects upward-tone manipulation in annual reports, we estimate the following model:

$$ABTONE_{i,t} = \beta_0 + \beta_1 DOI_{i,t} + \beta CONTROLS_{i,t} + YEAR\ FE + INDUSTRY\ FE + \varepsilon_{i,t} \quad (2)$$

where the dependent variable (*ABTONE*) is measured by two means. *ABTONE1* (*ABTONE2*) indicates that we employ *TONE1* (*TONE2*) to calculate the abnormal part of the tone.

Following the extant literature (e.g. D'Augusta and DeAngelis 2020; Huang, Teoh, and Zhang 2014; Lee and Park 2019), we include a set of control variables associated with abnormal tone in MD&A sections. For example, according to the agency theory, an effective structure of the corporate governance system has a mitigating effect on tone manipulation behavior, thus we control for board size (*BOARD*) and ownership concentration (*TOP1*). Moreover, we control for earnings volatility (*STDEARN*), operating cash flow volatility (*STDCASH*) and stock return volatility (*STDRET*) to capture operating volatility. As existing work suggests that external monitoring efforts are effective in restraining opportunistic behavior, we further control for the number of analysts following (*ANALYST*), institutional investor shareholding (*INSTOWN*), and the credibility of the auditing firm (*BIG4*). We also control for several determinants of *ABTONE*, including firm size (*SIZE*), financial performance (*LOSS*), financial risk (*LEV*), and growth ability (*BTM*). As for CEO-specific control variables, we control for CEO-chairman duality (*DUAL*) and CEO equity ownership (*CEOOWN*).

4. Empirical results

4.1. Summary statistics

Panel A of Table 1 displays the distribution of D&O insurance coverage within the sample by year. Generally, the insurance coverage ratio grew slowly from 2007 to 2019, and the intention to purchase D&O insurance has been rising rapidly since 2020. The institutional background behind this phenomenon is that a new Securities Law came into effect in March 2020, further distinguishing the legal duties of the directors and officers in listed companies for information disclosure. Specifically, it specifies that if disclosures contain false records, misrepresentations, or major omissions, the maximum penalty for information disclosure obligors surges from 300,000 yuan ($47,010) since 1998 to 10,000,000 yuan ($1,567,000). This drastic increase in the penalty value also reflects some level of China's poor legal and institutional environment before 2020, indicating that the violation cost of disclosure manipulative behavior in China is far lower than that in developed countries on average.

Panel B of Table 1 presents an overview of the sample. Among the 23,148 firm-year observations, 9.7% are covered by D&O insurance during the sample period, which shows that compared with publicly traded firms in the U.S., Chinese listed firms have not been fully aware of the importance of such insurance in protecting the directors and officers from the risks of the rising numbers of lawsuits. The mean (median) value of *ABTONE1* and *ABTONE2* is 0.001 (0.001) and 0.003 (0.002), respectively, which indicates that the linguistic tone in the MD&A sections of Chinese listed firms is, in general, relatively optimistic. In addition, the distribution of other variables falls within a reasonable range; however, we will not go into significant detail here.

In order to intuitively show the influence of D&O insurance on optimistic tone manipulation, we conduct a univariate analysis of differences in abnormal tone between the sample firms, partitioned on whether or not the firm is covered by D&O insurance. Panel C shows that the mean (median) value of *ABTONE1* is −0.005 (−0.004) for firms without D&O insurance, but 0.058 (0.062) for firms with D&O insurance coverage; both the mean and median differences between the two groups are statistically significant ($p < 0.01$),

Table 1. Descriptive statistics of the main variables.

Panel A: The distribution of D&O insurance coverage within the sample from 2007 to 2021

	(1) The accumulated number of D&O insurance buyers	(2) Total number of listed firms within our sample	(1)/(2)
2007	40	665	6.02%
2008	54	823	6.56%
2009	66	1047	6.30%
2010	75	1188	6.31%
2011	81	1208	6.71%
2012	94	1319	7.13%
2013	99	1439	6.88%
2014	105	1676	6.26%
2015	124	1861	6.66%
2016	129	1983	6.51%
2017	142	1960	7.24%
2018	157	2066	7.60%
2019	183	1959	9.34%
2020	297	2115	14.04%
2021	603	1839	32.79%

Panel B: Descriptive statistics

	Obs	Mean	S.D.	P1	P25	Median	P75	P99
DOI	23148	0.097	0.296	0.000	0.000	0.000	0.000	1.000
ABTONE1	23148	0.001	0.691	−1.594	−0.457	0.003	0.448	1.691
ABTONE2	23148	0.001	0.695	−1.600	−0.459	0.002	0.450	1.700
SIZE	23148	23.082	1.114	21.023	22.295	22.920	23.723	26.538
LEV	23148	0.459	0.198	0.069	0.307	0.459	0.610	0.894
LOSS	23148	0.089	0.284	0.000	0.000	0.000	0.000	1.000
BTM	23148	0.617	0.257	0.116	0.417	0.609	0.815	1.177
STDCASH	23148	0.051	0.036	0.007	0.026	0.041	0.064	0.201
STDEARN	23148	0.047	0.073	0.002	0.014	0.026	0.049	0.546
STDRET	23148	0.131	0.060	0.043	0.089	0.119	0.159	0.362
TOP1	23148	35.014	15.163	8.780	23.040	33.020	45.425	74.980
BOARD	23148	2.299	0.248	1.609	2.197	2.303	2.485	2.944
ANALYST	23148	1.533	1.196	0.000	0.000	1.609	2.565	3.807
INSTOWN	23148	0.076	0.077	0.000	0.017	0.052	0.110	0.355
BIG4	23148	0.074	0.261	0.000	0.000	0.000	0.000	1.000
CEOOWN	23148	3.498	9.059	0.000	0.000	0.000	0.410	45.270
DUAL	23148	0.228	0.420	0.000	0.000	0.000	0.000	1.000
SOE	23148	0.451	0.498	0.000	0.000	0.000	1.000	1.000

Panel C: Univariate results

	DOI = 1 (*N* = 2249)		DOI = 0 (*N* = 20899)		Differences	
					t-test in means	Wilcoxon test in medians
	Mean	Median	Mean	Median	t-value	z-value
ABTONE1	0.058	0.058	−0.005	−0.004	4.151	4.070
ABTONE2	0.062	0.061	−0.006	−0.005	4.399	4.409

Note: Table 1 reports the descriptive statistics for the sample used for our baseline regression. Panel A shows the distribution of D&O insurance coverage of our sample from 2007 to 2021. Panel B displays the descriptive statistics for the regression sample. Panel C reports the univariate test results of the mean (median) value differences between insured and uninsured firms. See Appendix A for variable definitions.

and the results of *ABTONE2* are generally similar. These initial findings about the relationship between D&O insurance coverage and tone manipulation suggest that the purchase of D&O insurance is related to more aggressive optimistic tone manipulation and are consistent with the *managerial opportunism hypothesis*. It is, however, noteworthy that the univariate comparisons do not consider other factors that affect tone manipulation.

4.2. Main results

Table 2 presents the results of the baseline OLS regression. In columns (1) and (2), we report the effect of D&O insurance on managers' upward-tone manipulation. The coefficients of *DOI* on optimistic tone manipulation are significantly positive for both measures of abnormal tone. Moreover, our findings are economically significant. For example, in column (1), the coefficient of *DOI* is 0.117, indicating that a one-standard-deviation increase in the *DOI* (0.296) is associated with a $0.296 \times 0.117 = 0.035$ increase in the upward-tone manipulation, which translates to a roughly 5.07% increase relative to the standard-deviation of *ABTONE1* (0.691). Our results indicate that D&O insurance coverage is positively associated with optimistic tone manipulation.

Meanwhile, potential endogenous issue may arise from omitting time-invariant firm-specific (Arslan-Ayaydin, Boudt, and Thewissen 2016; Davis et al. 2015). Thus we re-estimate the regression of Equation (2) using the fixed effects model and report the results in columns (3) and (4) of Table 2. The coefficients on *DOI* are positive and significant at the 1% level. This implies that our results are not driven by the presence of time-invariant firm-specific omitted variables.[6]

After the enforcement of the new Securities Law in 2020, we observe a sharp increase in the number of D&O insurance purchasing. Possibly, our results may not hold when external monitoring becomes stricter. To test whether the detrimental effect of D&O insurance continues to exist after 2020, we add an interaction term *DOI*×*NEWLAW* in Equation (2), where *NEWLAW* is a dummy variable that equals 1 if the observation is in or after the year of 2020 and 0 otherwise. In columns (5) and (6), we find that the coefficients of *DOI*×*NEWLAW* are insignificant, but the coefficients of *DOI* are still significantly positive, further indicating that the unexpected detrimental effect of D&O insurance still exists even though the regulatory scrutiny becomes stringent.

4.3. Identification tests

The above results show that the purchase of D&O insurance is positively associated with optimistic tone manipulation. However, the results could be driven by the endogeneity of D&O insurance purchases. First, we recognize that our main results suffer from self-selection bias because the decision of firms to purchase D&O insurance may not be random and may instead be determined by specific corporate characteristics or factors. Second, endogeneity is also possible between the purchase of D&O insurance and optimistic tone manipulation. Besides, some omitted variables (e.g. executive characteristics or corporate development strategies) may impact the decisions to purchase D&O insurance and tone manipulation simultaneously. All of the factors mentioned earlier may bias our inference. Therefore, we adopt the following three methods to alleviate the omitted-variable-based endogeneity mentioned above.

4.3.1 Propensity-matching procedure and difference-in-difference (DID) analysis

We implement a PSM procedure to alleviate the possibility of self-selection bias. Specifically, we use a logit model to regress the *DOI* dummy variable on the same set of control variables shown in Equation (2). Then we use the predicted propensity score to match each observation with a *DOI* dummy variable that equals 1 to a unique observation with a *DOI* dummy variable that equals 0 in the same year. We perform the one-to-one nearest neighborhood matching without replacement. Our matched sample includes 2,205 observations in the treatment group ($DOI = 1$) and 2,205 observations in the control group ($DOI = 0$). The results of covariate balance checks are reported in Panel A of Table 3, and we find that the mean values of covariates are similar between the treated and control groups. The regression results derived from the propensity-score-matched sample are reported in Panel A of Table 3. The coefficients on *DOI* are positive and statistically significant at the 1% level, consistent with Table 2.

Table 2. D&O insurance and tone manipulation.

	Baseline Model		Fixed Effects Model		The effect of the New Securities Law	
	ABTONE1	*ABTONE2*	*ABTONE1*	*ABTONE2*	*ABTONE1*	*ABTONE2*
	(1)	(2)	(3)	(4)	(5)	(6)
DOI	0.117***	0.118***	0.140***	0.141***	0.105***	0.107***
	(3.60)	(3.63)	(4.10)	(4.13)	(2.84)	(2.88)
*DOI*NEWLAW*					0.063	0.060
					(1.45)	(1.37)
SIZE	−0.027**	−0.021*	0.148***	0.154***	−0.026**	−0.021*
	(−2.08)	(−1.68)	(7.68)	(7.92)	(−2.07)	(−1.67)
LEV	−0.103*	(0.07)	(0.02)	0.01	−0.102*	−0.072
	(−1.79)	(−1.26)	(−0.33)	(0.09)	(−1.78)	(−1.25)
LOSS	0.063***	0.062***	0.080***	0.077***	0.063***	0.062***
	(3.42)	(3.34)	(5.73)	(5.53)	(3.41)	(3.33)
BTM	0.232***	0.203***	0.373***	0.345***	0.232***	0.202***
	(4.91)	(4.26)	(8.22)	(7.47)	(4.90)	(4.25)
STDCASH	−0.558**	−0.589**	0.396*	0.33	−0.557**	−0.588**
	(−2.25)	(−2.35)	(1.84)	(1.49)	(−2.25)	(−2.34)
STDEARN	0.04	(0.08)	(0.10)	−0.243**	0.035	−0.085
	(0.38)	(−0.77)	(−0.93)	(−2.17)	(0.34)	(−0.80)
STDRET	(0.02)	(0.08)	−0.403***	−0.480***	−0.021	−0.078
	(−0.19)	(−0.72)	(−5.14)	(−6.05)	(−0.20)	(−0.73)
TOP1	−0.002***	−0.002***	0.00	0.00	−0.002***	−0.002***
	(−2.73)	(−3.00)	(0.03)	(−0.26)	(−2.73)	(−3.00)
BOARD	0.02	0.02	0.075***	0.070***	0.019	0.016
	(0.60)	(0.50)	(3.15)	(2.94)	(0.59)	(0.49)
ANALYST	0.063***	0.061***	0.034***	0.033***	0.063***	0.061***
	(7.63)	(7.32)	(5.31)	(5.17)	(7.64)	(7.33)
INSTOWN	0.254**	0.211*	0.409***	0.352***	0.254**	0.211*
	(2.21)	(1.83)	(4.51)	(3.81)	(2.21)	(1.83)
BIG4	−0.134***	−0.138***	(0.08)	(0.06)	−0.131***	−0.136***
	(−3.22)	(−3.31)	(−1.48)	(−1.23)	(−3.17)	(−3.26)
CEOOWN	0.003***	0.003***	0.00	0.00	0.003***	0.003***
	(3.12)	(2.94)	(0.03)	(0.11)	(3.15)	(2.96)
DUAL	0.01	0.02	0.02	0.02	0.014	0.015
	(0.65)	(0.69)	(0.91)	(1.00)	(0.65)	(0.69)
SOE	−0.150***	−0.147***	0.071*	0.073*	−0.150***	−0.147***
	(−6.01)	(−5.85)	(1.67)	(1.71)	(−6.01)	(−5.85)
_cons	0.499*	0.42	−3.906***	−4.005***	0.496*	0.418
	(1.82)	(1.54)	(−8.88)	(−9.00)	(1.81)	(1.53)
Industry FE	Yes	Yes	No	No	Yes	Yes
Firm FE	No	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.081	0.079	0.583	0.581	0.081	0.079
N	23148	23148	22949	22949	23148	23148

Note: Table 2 presents the results of the baseline OLS regression (Eq. (2)). In columns (1) and (2), industry and year fixed effects are included in the regression model, and we show the effect of D&O insurance on managers' upward-tone manipulation. Columns (3) and (4) report the re-estimation results with the firm fixed effects model. Columns (5) and (6) report the effect of the New Securities Law enforced in 2020. *NEWLAW* is a dummy variable that equals 1 if the observation is in or after the year of 2020, and 0 otherwise.

The parentheses report the t-statistics, and standard errors are clustered by firm. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

Next, we try to mitigate the estimation bias caused by time-invariant and unobservable between-group differences with a PSM-DID analysis (Heckman, Ichimura, and Todd 1998) of new D&O insurance buyers and non-buyers. Utilizing this approach, we can directly compare a new D&O insurance buyer's change in abnormal tone over a chosen window with a propensity-score matched control firm that is similar to the new D&O insurance buyer on other observable dimensions but has never purchased D&O insurance. To be specific, we compare the change in new D&O insurance buyers' tone manipulation behavior over a relatively short period (three years) around the first year of purchase with that in non-buyers over the same period. For each

Table 3. PSM procedure.

Panel A: The covariate balance checks of PSM (for OLS estimation)

	Mean before PSM				*Mean after PSM*			
	(1)	(2)	(3)=(1)-(2)		(4)	(5)	(6)=(4)-(5)	
	DOI = 0	*DOI* = 1	Diff.	t-value	*DOI* = 0	*DOI* = 1	Diff.	t-value
SIZE	22.990	23.939	−0.949***	−39.68	23.843	23.895	−0.052	−1.35
LEV	0.453	0.519	−0.066***	−15.02	0.520	0.516	0.004	0.70
LOSS	0.088	0.097	−0.009	−1.43	0.092	0.095	−0.004	−0.41
BTM	0.607	0.716	−0.110***	−19.34	0.704	0.712	−0.008	−0.98
STDCASH	0.051	0.047	0.004***	5.20	0.046	0.047	−0.001	−1.01
STDEARN	0.047	0.045	0.003	1.64	0.044	0.045	−0.001	−0.29
STDRET	0.132	0.124	0.008***	5.98	0.126	0.124	0.002	1.02
TOP1	34.894	36.134	−1.240***	−3.69	35.475	36.160	−0.685	−1.45
BOARD	2.292	2.359	−0.067***	−12.21	2.355	2.355	−0.001	−0.10
ANALYST	1.511	1.740	−0.229***	−8.65	1.681	1.721	−0.040	−1.06
INSTOWN	0.076	0.077	−0.001	−0.61	0.077	0.076	0.000	0.10
BIG4	0.052	0.276	−0.224***	−39.82	0.249	0.261	−0.012	−0.93
CEOOWN	3.714	1.494	2.220***	11.07	1.611	1.523	0.087	0.53
DUAL	0.235	0.167	0.068***	7.33	0.174	0.167	0.007	0.60
SOE	0.433	0.625	−0.192***	−17.50	0.613	0.618	−0.005	−0.31

Panel B: Analysis with matched sample (for OLS estimation)

	OLS Analysis with PSM Procedure	
	(1)	(2)
	ABTONE1	*ABTONE2*
DOI	0.111***	0.111***
	(3.27)	(3.26)
Controls	Included	Included
Industry FE	Yes	Yes
Year FE	Yes	Yes
adj. R^2	0.096	0.096
N	4410	4410

Note: Table 3 denotes the results using the PSM procedure. Panel A reports the results of covariate balance checks. Panel B displays the results of the OLS model (Eq. (2)) regarding the impact of D&O insurance on optimistic MD&A tone manipulation based on the propensity score-matched sample.

As Equation (2) of Table 2, the control variables are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Industry and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

new D&O insurance buyer in a year, we select a non-buyer with the closest propensity score in the same year and the same industry as the matched control firm. We consider a three-year window around the first year of purchase and include the observations for both new D&O insurance buyers and non-buyers falling in the window [−3, +3] as the sample for the PSM-DID analysis.

We first exclude new buyers who canceled their D&O insurance within the sample period, and we require each firm to have at least one usable observation before the first year of purchase. Then, we use the one-to-one nearest neighborhood matching method without replacement to match each new D&O insurance buyer to the non-buyers in the same year and industry. To calculate the propensity scores, we select all control variables to form covariates. The results of the balance check are shown in Panel A of Table 4. After the PSM procedure, we construct the following model to perform the DID analysis.

$$ABTONE_{i,t} = \mu_0 + \mu_1 POST_{i,t} \times NEWBUYER_{i,t} + \mu CONTROLS_{i,t} + YEAR\ FE + FIRM\ FE + \zeta_{i,t} \quad (3)$$

Table 4. PSM-DID analysis.

Panel A: The covariate balance checks of PSM (for DID estimation)

	Mean before PSM				*Mean after PSM*			
	(1)	(2)	(3)=(1)-(2)		(4)	(5)	(6)=(4)-(5)	
	DOI = 0	*DOI* = 1	Diff.	t-value	*DOI* = 0	*DOI* = 1	Diff.	t-value
SIZE	22.990	23.939	−0.949***	−39.68	23.660	23.714	−0.054	−1.55
LEV	0.453	0.519	−0.066***	−15.02	0.487	0.484	0.003	0.72
LOSS	0.088	0.097	−0.009	−1.43	0.089	0.094	−0.005	−0.65
BTM	0.607	0.716	−0.110***	−19.34	0.641	0.648	−0.007	−1.09
STDCASH	0.051	0.047	0.004***	5.20	0.046	0.048	−0.002	−1.37
STDEARN	0.047	0.045	0.003	1.64	0.052	0.053	−0.001	−0.34
STDRET	0.132	0.124	0.008***	5.98	0.128	0.126	0.002	1.11
TOP1	34.894	36.134	−1.240***	−3.69	32.482	33.071	−0.589	−1.04
BOARD	2.292	2.359	−0.067***	−12.21	2.339	2.340	−0.001	−0.27
ANALYST	1.511	1.740	−0.229***	−8.65	1.547	1.585	−0.038	−1.14
INSTOWN	0.076	0.077	−0.001	−0.61	0.077	0.077	0.000	0.14
BIG4	0.052	0.276	−0.224***	−39.82	0.259	0.263	−0.004	−0.87
CEOOWN	3.714	1.494	2.220***	11.07	1.662	1.565	0.097	1.52
DUAL	0.235	0.167	0.068***	7.33	0.191	0.183	0.008	1.02
SOE	0.433	0.625	−0.192***	−17.50	0.534	0.584	−0.050	−0.28

Panel B: Analysis with matched sample (for DID estimation)

	PSM-DID Analysis	
	(1)	(2)
	ABTONE1	*ABTONE2*
*POST*NEWBUYER*	0.048**	0.043**
	(2.20)	(1.98)
Controls	Included	Included
Firm FE	Yes	Yes
Year FE	Yes	Yes
adj. R^2	0.825	0.827
N	3695	3695

Note: Table 4 shows the results of the PSM-DID analysis. Specifically, we consider a three-year window around the first year of purchase. We include the observations for both new D&O insurance buyers and non-buyers falling in the window [−3, +3] as the sample for the PSM-DID analysis. Each new D&O insurance buyer is matched to the non-buyers in the same year and industry. Panel A denotes the results of covariate balance checks. Panel B displays the results of DID model (Eq. (3)). *NEWBUYER* is an indicator variable that equals 1 if a firm is a new D&O insurance buyer in the analysis window, and 0 otherwise; *POST* is also an indicator variable that equals 1 if the observation is in or after the year of D&O insurance purchase, and 0 otherwise.

The control variables in Equation (3) are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Firm and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

where *NEWBUYER* is an indicator variable that equals one if a firm is a new D&O insurance buyer in the analysis window and zero otherwise; *POST* is also an indicator variable that equals one if the observation is in or after the year of D&O insurance purchase, and zero otherwise. *CONTROLS* are control variables, as listed in Equation (2). We estimate this model using firm and year fixed effects. Thus we only include the interaction term *POST*×*NEWBUYER* in the PSM-DID model.

The results derived from the PSM-DID analysis are reported in Panel B of Table 4. The coefficients on *POST*×*NEWBUYER* are positive and significant, suggesting that compared to non-buyers, new buyers of D&O insurance experience an increase in optimistic tone manipulation following their purchase.

4.3.2 Instrumental variable approach

Despite controlling for many variables in Equation (2), unobserved variables may still impact our results. To mitigate this, we adopt the instrumental variables (IV) approach. We use the natural logarithm of the distance between a firm's headquarters and the nearest airport

Table 5. Endogeneity problems caused by omitted variables: 3SLS-IV.

	DOI (1)	*ABTONE1* (2)	*ABTONE2* (3)
AIRPORT	0.132***		
	(4.29)		
DOI		0.397**	0.457**
		(2.34)	(2.39)
Controls	Included	Included	Included
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	23148	23148	23148
Model fits:			
Test of weak instrument (Kleibergen-Paap rk Wald F statistic)		20.423***	
Test of under identification (Kleibergen-Paap rk LM statistic)		20.432***	
Over identification		No	
Test of endogeneity (Wu-Hausman)		18.121***	

Note: Table 5 reports the results of the 3SLS-IV model (Eq. (4)). *AIRPORT* is the natural logarithm of distance between the firm's headquarters office and the nearest airport.

As Equation (2) of Table 2, the control variables are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Industry and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

(*AIRPORT*) as an exogenous instrument, as proposed by Li, Yang, and Zhu (2022). The idea is that airport proximity could facilitate personal visits by insurance sales representatives, potentially influencing the firm's insurance decisions. However, it's unlikely that this proximity would directly affect firm-specific information disclosure, which is primarily driven by financial performance and managerial judgment (Asay, Libby, and Rennekamp 2018). No existing study conclusively links airport proximity and managerial opportunism. Therefore, the *AIRPORT* variable satisfies the relevance and orthogonality criteria, qualifying it as an ideal instrument for our study.

It is worth noting that the explanatory variable *D&O* is a dummy variable, but the employment of the two-stage least squares method (2SLS) cannot generate an unbiased estimation. Thus the optimal choice is the three-stage least square (3SLS) regression (Wooldridge 1996). We first build the model as a set of simultaneous equations, as shown in Equation (4). $I_{i,t}$ is an unobservable variable, reflecting the propensity to purchase D&O insurance for firm i during the fiscal year t, which takes a value of one when $I_{i,t}$ is greater than or equal to an unobservable threshold I^* and zero otherwise. $X_{i,t}$ represents a set of control variables. $\varepsilon \sim N(0, \sigma)$, $\delta \sim N(0, \sigma)$, and the covariance between ε and δ can take values other than zero.

$$\begin{cases} ABTONE_{i,t} = \tau_0 + \tau_1 DOI_{i,t} + \tau X_{i,t} + \varepsilon_{i,t} \\ I_{i,t} = \gamma_0 + \gamma_1 TREATY_{PORTS i,t} + \gamma X_{i,t} + \delta_{i,t} \\ DOI_{i,t} = \ 1 \ if \ I_{i,t} \geq I^*, or \ 0 \ if \ I_{i,t} < I^* \end{cases} \quad (4)$$

We present the results in Table 5. The diagnostic statistics are shown in the bottom panel. Wu-Hausman's test for endogeneity is significant at 1% level, which confirms the exogeneity of our instrument. Kleibergen-Paap Wald rk F and Kleibergen-Paap rk LM statistics are also significant at 1% level, indicating that our instrumental variable is neither weak nor underidentified. Column (1) shows that the *AIRPORT* variable predicts *DOI* significantly. Columns (2) and (3) display that the coefficients of the instrumented D&O insurance variable are positive and significant. The findings are in line with our main results,[7] alleviating the omitted-variable-based endogeneity.

5. Cross-sectional tests

In this section, we conduct additional analyses to explore the cross-sectional variation in the relationship between the purchase of D&O and optimistic tone manipulation.

5.1. The effect of litigation risk

When the firm's litigation risk is high, it is more costly and risky for managers to provide biased information to investors (Kim, Wang, and Zhang 2019). Besides, prior literature also finds that building systems for outsiders to monitor firms, such as investor protection systems, can effectively reduce managerial opportunism (Lin et al. 2013). However, D&O insurance insulates managers from the litigation threat and personal financial liability. More to the point, it offsets the benefits of the litigation threats. Therefore, we expect to observe a stronger relationship between the purchase of D&O insurance and optimistic tone manipulation for firms facing higher litigation risk. Following Kim and Skinner (2012), we measure a firm's litigation risk in fiscal year t as follows:

$$\begin{aligned} LITIGATION_{i,t} = & -7.883 + 0.556 \times FPS_{i,t} + 0.518 \times SIZE_{i,t-1} + 0.982 \times GROWTH_{i,t-1} \\ & + 0.379 \times RET_{i,t-1} - 0.108 \times SKEWRET_{i,t-1} + 25.635 \times STDRET_{i,t-1} \\ & + 7 \times 10^{-7} \times TURNOVER_{i,t-1} \end{aligned} \quad (5)$$

where *FPS* is a dummy variable that equals one if the firm is in the biotech, computer, electronics, or retail sector and zero otherwise; detailed definitions of other variables can be found in Appendix A. We employ a dummy variable *LIT_RISK* to proxy corporate litigation risk and *LIT_RISK* equals one if the index *LITIGATION* of a firm exceeds the median across all the samples, and zero otherwise. In columns (1) and (2) of Table 6, the coefficients on *LIT_RISK* are negative and significant, suggesting that managers have a higher propensity to make overly optimistic disclosures. What's more, the coefficients on *DOI*LIT_RISK* are significantly positive, denoting that the effect of D&O insurance is more prominent for firms with higher litigation risk. These results support our conjecture.

Recognizing that litigation risk may differ significantly between new buyers of D&O insurance and non-buyers, we replace the full sample with the matched sample obtained from the PSM-DID analysis. The untabulated results of our re-estimation imply that the effect of D&O insurance is more pronounced for new-buyers with higher litigation risk in the year before the first-time purchasing D&O insurance, consistent with the results derived from the full sample regression.

5.2. The role of short-term incentives

Next, we examine the role of managers' short-term incentives of tone manipulation. If the increases in tone manipulation for firms with D&O insurance are symptomatic of heightened managerial opportunism, then we should expect a more pronounced effect when managers have greater short-term incentives to engage in optimistic tone manipulation. Short-term performance pressures put a heavy load on managers. For instance, Huang, Teoh, and Zhang (2014) find that managers are highly motivated to manage earnings and employ abnormal tones simultaneously to deal with earnings pressure. Therefore, the pressure to meet or beat earnings expectations is appropriate to proxy the short-term incentive of upward-tone manipulation.

To examine the role of short-term incentives of tone manipulation, we use an indicator variable (*INCENTIVE*) to capture firms that just meet or beat analyst forecasts. Specifically, *INCENTIVE* equals one for firms that meet or beat the consensus analyst forecast by two cents or less, and zero otherwise. Furthermore, we calculate the consensus analyst forecast with each analyst's latest forecast within [−360, −10] days of the earnings announcement date.

Table 6. Cross-sectional analyses.

	Litigation Risk		Short-term Incentive		Managerial Over-confidence	
	ABTONE1 (1)	*ABTONE2* (2)	*ABTONE1* (3)	*ABTONE2* (4)	*ABTONE1* (5)	*ABTONE2* (6)
DOI	0.121***	0.122***	0.118***	0.119***	0.075**	0.076**
	(7.49)	(7.50)	(3.41)	(3.43)	(2.13)	(2.15)
*DOI*LIT_RISK*	0.064**	0.062**				
	(2.12)	(2.04)				
*DOI*INCENTIVE*			0.137**	0.141**		
			(2.07)	(2.14)		
*DOI*OVER_CON*					0.129**	0.127**
					(2.19)	(2.15)
LIT_RISK	−0.024**	−0.024**				
	(−2.21)	(−2.20)				
INCENTIVE			−0.008	−0.005		
			(−0.42)	(−0.25)		
OVER_CON					0.082***	0.082***
					(4.23)	(4.16)
Controls	Included	Included	Included	Included	Included	Included
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.082	0.08	0.08	0.079	0.08	0.078
N	23148	23148	19683	19683	17566	17566

Note: Table 6 represents the results of cross-sectional tests. Columns (1) and (2) show the effect of litigation risk. Columns (3) and (4) report the role of managers' short-term incentives. Columns (5) and (6) denote the impact of managerial overconfidence. We use *LIT_RISK, INCENTIVE*, and *OVER_CON* to measure corporate litigation risks, heightened short-term incentives of managers, and managerial overconfidence, respectively. *LIT_RISK* is a dummy variable that equals 1 if the firm-level *LITIGATION* (obtained from Equation (5) exceeds the median across all the samples and 0 otherwise. *INCENTIVE* is a dummy variable that equals 1 for firms that meet or beat the consensus analyst forecast by two cents or less and 0 otherwise. *OVER_CON* is a dummy variable that equals 1 if the relative proportion of executive compensation of a firm is above the sample median value, and 0 otherwise.
As Equation (2) of Table 2, the control variables are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Industry and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

In columns (3) and (4) of Table 6, the coefficients of *DOI*INCENTIVE* are significantly positive, supporting our conjecture. Overall, the results suggest that with the protection of D&O insurance, managers manipulate the tone more aggressively to fulfill short-term motivations.

5.3. The effect of CEO overconfidence

Finally, we investigate how the effect of D&O insurance coverage on optimistic tone manipulation varies with CEO overconfidence. Overconfident CEOs have excessively positive views of their own skills to address difficulties and tend to underestimate the risks and uncertainties (Banerjee et al. 2018). In this case, even though intentional wrongdoing is protected beyond insurance, these overconfident CEOs may be more likely to overestimate D&O insurance's mitigating effect on litigation threats. Thereby they may underestimate the potential losses (expected costs) arising from strategic tone-manipulation-related lawsuits. Thus, we expect the adverse effect of D&O insurance is more prominent for firms with over-confident CEOs. Following Huang et al. (2011), the proxy for CEO overconfidence is the relative proportion of executive compensation (*OVER_CON*). It is an indicator variable that equals one if a firm's relative proportion of executive compensation is above the sample median value and zero otherwise. We display our results in columns (5) and (6) of Table 6. The coefficients on *OVER_CON* are significantly positive, indicating that over-confident CEOs are more likely to manipulate the MD&A tone upward. More importantly, consistent with our conjecture, the coefficient on *DOI*OVER_CON* is significantly positive.

Together, the results designate a damped positive relationship between D&O insurance coverage and the upward-tone manipulation for firms with overconfident CEOs.

6. Further analysis

6.1. The effect of D&O insurance on market reaction to tone of MD&A

There is extensive literature showing that disclosure with an optimistic tone brings is positively priced by the market (Jegadeesh and Wu 2013), and Huang, Teoh, and Zhang (2014) further show that the market over-reacts to the abnormal tone in the short-term, then corrects itself with an adverse price reaction afterward. The underlying hypothesis of Huang's work is that the abnormal tone is mainly derived from manipulative motivates. If so, D&O insurance-driven overly optimistic tone shall mislead investors, too.

However, as the abnormal upward tone reflects what has not been disclosed in the basic information, it is also possible that the abnormal optimistic tone contains incremental information for investors' decision-making because fundamental data cannot wholly manifest a firm's management situation and plans. That is, an alternative explanation for our main results may exist.

Specifically, we evaluate the short-term and long-term market response to rule out the alternative explanation. If abnormal upward tone mainly comes from managerial self-interests incentives, we expect a more favorable market reaction for the tone disclosed by firms with D&O insurance and also a more decisive return reversal afterward. On the contrary, if the dominant role of abnormal tone is informative, we shall not observe any long-run reversal. Specifically, we employ the following model to test our conjecture:

Table 7. The effect of D&O insurance on the market reaction to the tone of MD&A.

	CAR[−3, 3]		*BHAR[4, 30]*	
	(1)	(2)	(3)	(4)
*DOI*TONE1*	0.392*		−0.206***	
	(1.66)		(−2.92)	
*DOI*TONE2*		0.325**		−0.179***
		(2.02)		(−3.09)
TONE1	0.164**		−0.080***	
	(2.28)		(−2.88)	
TONE2		0.007		−0.000
		(0.12)		(−0.01)
DOI	0.001	0.002	−0.000	−0.000
	(0.73)	(0.91)	(−0.53)	(−0.78)
Controls	Included	Included	Included	Included
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
adj. R^2	0.026	0.026	0.083	0.082
N	21690	21690	21687	21687

Note: Table 7 presents the results of the moderating effect of D&O insurance on market reaction to the tone of MD&A. To find out whether D&O insurance-driven abnormal optimistic tone of MD&A provides is misleading or informative, we examine how investors react to the tone of firms covered by D&O insurance. In columns (1) and (2), the dependent variable *CAR*[−3, 3] is the 7-day cumulative abnormal return beginning on three-day before the announcement day of annual reports and ending three days after the announcement. In columns (3) and (4), the dependent variable *BHAR*[4, 30] is the 27-day buy-and-hold abnormal returns starting the fourth day after earnings announcements.

As Equation (2) of Table 2, the control variables are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Industry and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

Table 8. D&O insurance and the intensity of risk-factor disclosure.

	RISK_MDA	*RISK_BACK*	*RISK_FORWARD*
	(1)	(2)	(3)
DOI	−0.013*	−0.013	−0.089***
	(−1.83)	(−0.62)	(−6.33)
Controls	Included	Included	Included
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
adj. R^2	0.545	0.195	0.045
N	21859	21859	21859

Note: Table 8 presents the effect of D&O insurance on the intensity of risk-factor disclosure of MD&A. In column (1), the dependent variable RISK_MDA is measured as the number of words surrounding a synonym for 'risk' or 'uncertainty' in the MD&A section and divided by the total number of words in the MD&A, multiplied by 100. In columns (2) and (3), the dependent variables are the intensity of risk factor disclosure of the review part (RISK_BACK) and the preview part (RISK_FORWARD), respectively.

As Equation (2) of Table 2, the control variables are included in all regressions but are not reported here to save space. The parentheses report the t-statistics, and standard errors are clustered by firm. Industry and year fixed effects are controlled in all columns, and ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

$$MARKETREACTION_{i,t} = \varphi_0 + \varphi_1 TONE_{i,t} \times DOI_{i,t} + \varphi_2 TONE_{i,t} + \varphi_3 DOI_{i,t} + \varphi CONTROLS_{i,t} + YEAR\ FE + INDUSTRY\ FE + \varepsilon_{i,t} \quad (6)$$

where *MARKETREACTION* represents either of the following proxies for market reactions (*CAR [−3, 3]*, *BHAR*[4, 30]). Specifically, to calculate the cumulative abnormal return (*CAR*[−3, 3]) over the 7-day period beginning on three-day before the announcement day of annual reports and ending three days after the announcement, we employ the market-adjusted model. In order to find out whether there are long-term reversal of stock returns, we also calculate the 27-day buy-and-hold abnormal returns (*BHAR*[4, 30]) starting the fourth day after earnings announcements. *TONE* represents either of our two proxies for MD&A tone (*TONE1*, *TONE2*), as shown in Equation (1).[8] *CONTROLS* are control variables, as listed in Equation (2).

As shown in columns (1) and (2) of Table 7, the coefficients of *DOI*TONE1* and *DOI*TONE2* are significantly positive, suggesting that the extra market reaction to the tone is driven by the abnormal proportion of tone, which can be significantly boosted by D&O insurance. In contrast, the coefficients of *DOI*TONE1* and *DOI*TONE2* in columns (3) and (4) become significantly negative, showing that investors misled by disclosure tone do more corrections about their initial pricing for firms with D&O insurance, who possess a higher level of abnormal tone, in average. Overall, these results further confirm that the abnormal optimistic tone is driven by managerial self-interests motivates and may not be regarded as informative.

6.2. Economic mechanisms: risk-factor information concealment

Although the determinants of tone manipulation are widely studied, how managers manipulate the tone upward has not been fully explored. In this section, we propose that one possible way is to disclose fewer risks.[9] Notably, the MD&A section comprises preview and review sections, and the function of risk information in each subsection differs significantly. The primary function of the review section is to review the operating activities and performance in the past fiscal year. The preview section, by contrast, is designed to report the firm's development plan, concentrating more on disclosing forward-looking information. To separately examine the effects of D&O insurance on the intensity of risk-factor disclosure of the review and preview section, we split the MD&A section

into two parts. And we expect to observe a more significant impact of D&O insurance on the preview section because future-related risk matters more to investors.

The intensity of risk factor disclosure in the MD&A section (*RISK_MDA*) is measured as the number of words surrounding a synonym for 'risk' or 'uncertainty' in the MD&A section and divided by the total number of words in the MD&A, multiplied by 100. Following the same methodology, we also calculate the intensity of risk factor disclosure of the review part (*RISK_BACK*) and the preview part (*RISK_FORWARD*). We replace the dependent variable in Equation (2) with either of our three proxies for the intensity of risk factor disclosure, and report the regression results in Table 8. As shown in columns (1) to (3), D&O insurance reduces the overall intensity of risk-factor disclosure in the MD&A section. More importantly, the effect on the intensity of risk-factor disclosure only holds in the preview section. When turning into the review section, the impact disappears. Overall, the results further suggest that D&O insurance makes it more convenient for managers to disclose less forward-looking risks, leading to an overly optimistic tone.

7. Conclusion

This paper aims to examine the effect of D&O insurance on optimistic tone manipulation and the sequential capital market consequences. Using a large sample of A-share listed companies in China's stock market from 2007 to 2021, we document a positive association between D&O insurance and MD&A upward-tone manipulation, and the effect of D&O insurance is more pronounced in firms that exhibit greater litigation risk, and whose managers are short-term goal motivated or overconfident. Given that D&O insurance suggests a more significant abnormal proportion of tone, we predict and show that investors tend to particularly overly respond to positive tone for firms with D&O insurance coverage and reversals of return are also more intense. Finally, we find the provision of D&O insurance reduces forward looking risk-factor disclosures, ultimately leading to overly optimistic tone.

Overall, we provide new insights into the effect of D&O insurance and also contribute to the ongoing discussion about the determinants of corporate information manipulation strategies. We also believe that our findings have essential policy implications for the optimum development of D&O insurance in emerging economies. A key feature of emerging economies is that the large number of investors are less-sophisticated and nonprofessional, and these ordinary investors are more likely to rely on soft information than hard financial data (Baginski et al. 2016). Thus managers are motivated to manipulate the tone upward to affect investors' decisions, particularly when the litigation threats are mitigated by insurance. We suggest that to regulate firms in emerging countries, more explicit rules should be made to refine managerial legal liabilities, especially when managers are shielded by D&O insurance.

Notes

1. Anecdotal evidence suggests that it is not rare that managers are punished and bear substantial financial losses for making overly optimistic disclosures. In the USA, a 2018 complaint against Biogen company and individual defendants, including George Scangos (Biogen's CEO), contains the allegation that Biogen executives 'made statements about risks and future sales of Tecfidera (a significant source of revenue for Biogen) were misleading because they were unduly optimistic and minimized the impact of adverse events.' Concerning China, the China-based technology company Xunlei Limited was hit with a class action in 2015. According to court documents, more than six organizations or individuals, including Xunlei's CEO, were accused of over-optimistic disclosures failing to remind investors of possible risks and uncertainties, and knowingly misleading investors. A relevant part of Xunlei's CEO stated: '*We are **very optimistic** that our bandwidth [inaudible] technologies are stable and scalable. We are **confident** Project Crystal will reduce bandwidth costs on our VIP member service.*'

2. Despite a 425% increase in the number of A-share listed companies taking out D&O insurance between 2017 and 2021, coverage rates remained below 20% in 2021. In contrast, D&O insurance coverage exceeded 90% in developed countries like the United States back in 2001.
3. Notably, in China, the disclosure requirements of MD&A were enforced until 2001, but nobody was ever disciplined or prosecuted for misleading MD&A disclosures, not to mention upward-tone manipulation.
4. Besides, D&O insurance policies often exclude fraudulent, intentionally wrongful, and illegal behavior, which can counteract the benefits of D&O insurance for both connivance and monitoring effects. Managers who engage in such manipulations may not receive coverage for legal liabilities, which may not deter them from continuing manipulative behavior. Exclusion clauses may also reduce insurer motivation and effectiveness in supervising managers. Insurers may refuse to pay compensation based on the exclusion clause if a manager's manipulations misguide investors and are defined as unlawful.
5. The logic of estimating abnormal tone is similar to the discretionary-accruals models. The tone can be decomposed into a normal component, which reflects the reasonable description of basic information that underlies a firm's financial and economic position. The abnormal component is the residual of Eq. (1), representing the strategic manipulation of tone.
6. Following previous literature (deHaan 2021), the firm fixed effects model can capture the within-firm variation in the provision of D&O insurance. As there are some new buyers of D&O insurance each year, introducing the firm fixed effects in Eq. (2) can ensure that within-firm variation over time does not refute our conclusion.
7. In the untabulated robustness tests, our results remain robust when we replace the 3SLS-IV model with 2SLS-IV model or treatment effect model.
8. We need to explain why we include *TONE* rather than *ABTONE* in Eq. (6). All else equal, we assume that firm *i* is covered with D&O insurance and firm *j* is not insured. The MD&A tone of firm *i* and *j* are $TONE_{1,i}$ and $TONE_{1,j}$, respectively, and $TONE_{1,i}$ and $TONE_{1,j}$ take equal values. According to the results obtained from our main test (Table 2), the provision of D&O is positively associated with the abnormal component of tone (i.e. *ABTONE*). So that it is reasonable to infer that the abnormal portion of $TONE_{1,i}$ is greater than that of $TONE_{1,j}$. In this case, when *DOI* equals 1, *DOI*×*TONE* can represent a higher level of abnormal tone. However, if we use *DOI*×*ABTONE*, we cannot draw the exact inference.
9. The case of Xunlei company shows that managers use an overly optimistic tone to overstate their real prospects, and investors are misled by their disclosures because an abnormal upward tone comes along with possible risk concealment.

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Appendix

Appendix A: Variable definition

Variable	Definition
Dependent variables	
TONE1	(positive words − negative words)/total words in MD&A
TONE2	(positive words − negative words)/(positive words + negative words)
ABTONE1	Abnormal value of *TONE1*, calculated as the residual from the regression of *TONE1* on the determinants of the Huang, Teoh, and Zhang (2014) tone management model, as in Eq. (1)
ABTONE2	Abnormal value of *TONE2*, calculated as the residual from the regression of *TONE2* on the determinants of the Huang, Teoh, and Zhang (2014) tone management model, as in Eq. (1)
CAR[−3, 3]	The 7-day cumulative market-adjusted abnormal return beginning on three-day before the announcement day of annual reports and ending three days after the announcement
BHAR[4, 30]	The 27-day buy-and-hold abnormal returns starting the fourth day after earnings announcements
RISK_MDA	The number of words surrounding a synonym for 'risk' or 'uncertainty' in MD&A section and divided by the total number of words in the MD&A, multiplied by 100
RISK_BACK	The number of words surrounding a synonym for 'risk' or 'uncertainty' in MD&A section and divided by the total number of words in the review part, multiplied by 100
RISK_FORWARD	The number of words surrounding a synonym for 'risk' or 'uncertainty' in MD&A and divided by the total number of words in the preview part, multiplied by 100
Dependent variables	
DOI	A dummy variable that equals 1 if a firm purchases D&O insurance in the current fiscal year, and 0 otherwise
Control variables	
AF	The median of most recent analysts' forecasts related to the earnings of year t + 1, scaled by stock price at the end of the fiscal year
AFE	Difference between actual EPS and the median of most recent analysts' forecasts, scaled by stock price at the end of the fiscal year
AGE	Natural logarithm of listing years
ANALYST	Natural logarithm of the most recent value, before the earnings announcement, of the number of analysts following the firm
BIG4	A dummy variable that equals 1 if the firm is audited by one of the Big Four accounting firms, and 0 otherwise
BOARD	Natural logarithm the number of directors plus 1
BTM	Book-to-market ratio of equity, calculated by the book value of equity divided by the market value of equity at the end of fiscal year
BUSSEG	Natural logarithm of the number of business segments plus 1, or 1 if the item is missing from CSMAR
CEOOWN	Percentage of shares held by the CEO at the beginning of the year
DEARN	Change in earnings before extraordinary items scaled by lagged total assets
DUAL	A dummy variable that equals 1 if a CEO also serves as the board chair, and 0 otherwise
EARN	Earnings before extraordinary items scaled by lagged total assets
INSTOWN	Percentage of a firm's shares held by institutional investors at the end of the fiscal year
LEV	Total liabilities divided by total assets
LOSS	A dummy variable that equals 1 if *EARN* is negative, and 0 otherwise
NEWLAW	A dummy variable that equals 1 if the observation is in or after the year of 2020, and 0 otherwise
RET	Stock return calculated over the fiscal year
SIZE	Natural logarithm of the book value of total assets at the end of fiscal year
SOE	A dummy variable that equals 1 if a firm is a state-owned enterprise, and 0 otherwise
STDCASH	Standard deviation of net cash flow calculated over the last five years, with at least three years of data required
STDEARN	Standard deviation of *EARN* calculated over the last five years, with at least three years of data required
STDRET	Standard deviation of monthly stock returns over the fiscal year
TOP1	Percentage of shares held by the largest shareholders at the beginning of the year
Other variables	
FPS	A dummy variable that equals 1 if the firm is in the biotech, computer, electronics, or retail sector, and 0 otherwise
GROWTH	Sales less lagged sales scaled by total assets
INCENTIVE	A dummy variable that equals 1 if a firm meets or beats the consensus analyst forecast by two cents or less, and 0 otherwise
LIT_RISK	A dummy variable that equals 1 if firm-level *LITIGATION* (obtained from Eq. (5)) exceeds the median across all the samples, and 0 otherwise
NEWBUYER	A dummy variable that equals 1 if a firm is a new D&O insurance buyer in the analysis window, and 0 otherwise

(*Continued*)

Variable	Definition
OVER_CON	A dummy variable that equals 1 if the relative proportion of executive compensation of a firm is above the sample median value, and 0 otherwise
AIRPORT	Natural logarithm of distance between the firm's headquarters office and the nearest airport
POST	A dummy variable that equals 1 if the observation is in or after the year of D&O insurance purchase, and 0 otherwise
SKEWRET	Skewness of monthly stock returns over the fiscal year
TURNOVER	Trading volume accumulated over the the fiscal year scaled by beginning of the year shares outstanding