Directors' and officers' liability insurance and accounting conservatism: empirical evidence from China

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Abstract

Purpose – This study analyses Chinese data to revisit the relationship between directors' and officers' (D&O) insurance and accounting conservatism, aiming to investigate the impact of investors' legal protection on the function of D&O insurance.

Design/methodology/approach – The study sample included all A-share firms listed on the Shanghai and Shenzhen Stock Exchanges from 2006 to 2019. Multiple regression was used to investigate the association between D&O insurance and accounting conservatism. The Heckman two-stage model and the propensity score matching method were used to check the robustness of the main results.

Findings – D&O insured companies exhibited greater accounting conservatism. The higher the indemnity limit, the more conservative a firm's earnings reporting. The positive correlation was stronger when investor protection was relatively weak. The impact of D&O insurance on accounting conservatism was stronger for companies with weaker internal or external supervision mechanisms.

Originality/value – The study findings show that D&O insurance plays a positive role in the governance of listed companies when investors' legal protection is weak, which supports the effective supervision hypothesis of D&O insurance.

Keywords Accounting conservatism, Investor protection, Directors' and officers' liability insurance, External supervision, Internal supervision

Paper type Research paper

1. Introduction

Directors' and officers' (D&O) insurance is purchased by a firm to protect all directors and officers from the legal liabilities incurred by their professional activities on behalf of the firm in the event of litigation by stakeholders (Yuan *et al.*, 2016). With a rapid increase in shareholder litigation against firms, executives and board members in recent years, D&O insurance has become common worldwide, evoking arguments for and against the managerial opportunism and external supervision hypotheses regarding its economic consequences (Yuan *et al.*, 2016; Huang *et al.*, 2021).

The managerial opportunism hypothesis holds that D&O insurance may lead to more opportunistic behaviour on the part of D&Os by reducing the deterrent power of litigation, which reduces firms' risk of default and information asymmetry (Chung and Wynn, 2008; Lin *et al.*, 2011, 2013; Li and Liao, 2014; Chi and Weng, 2014; Chen *et al.*, 2016; Weng *et al.*, 2017; Jia and Tang, 2018; Wang *et al.*, 2022). Internal corporate governance and accounting

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conservatism negatively correlate with D&O insurance purchase/coverage (Jia and Tang, 2018; Chung and Wynn, 2008). Companies whose D&Os have greater D&O insurance coverage are less likely to appoint reputable auditors (Chi and Weng, 2014) and more likely to restate financial reports (Weng *et al.*, 2017) and overinvest (Li and Liao, 2014), resulting in lower loan spreads (Lin *et al.*, 2013) and equity costs (Chen *et al.*, 2016). When such companies are acquirers, they pay higher acquisition premiums and exhibit lower acquisition synergies (Lin *et al.*, 2011). Conversely, the external supervision hypothesis holds that D&O insurance can improve corporate governance by introducing the insurer as an external supervisor (O'Sullivan, 1997; Yuan *et al.*, 2016; Chang and Chen, 2018; Huang *et al.*, 2021; Li *et al.*, 2022). Specifically, empirical evidence indicates that independent directors covered by D&O insurance are more likely to dissent (Li *et al.*, 2022) and that companies with D&O insurance experience lower levels of overall earnings management (the sum of real and accrual-based earnings management), stock price crash risks and corporate idiosyncratic risks (Yuan *et al.*, 2016; Chang and Chen, 2018; Huang *et al.*, 2021).

Overall, research on the impact of D&O insurance appears to have produced mixed results, and most is based on developed capital markets governed by common law, such as Canada, the USA and the UK. China provides a unique setting with a legal system based on civil law and a growing D&O insurance market with available data. Thus, studies using Chinese data have been increasing. In China, D&O insurance has positive effects on firm innovation (Wang *et al.*, 2020) and independent director dissension (Li *et al.*, 2022) but negatively influences the meeting attendance of independent directors (Jia and Tang, 2018), corporate idiosyncratic risks (Huang *et al.*, 2021) and labour investment efficiency (Wang *et al.*, 2022). The insufficient and inconclusive findings in the Chinese context motivated us to explore the consequences of D&O insurance in depth.

Accounting conservatism is regarded as a vital convention in financial accounting (Yuan *et al.*, 2022). Being one of the most influential and desirable attributes of financial reporting, conditional conservatism is generally defined as the choice of accounting policies or tendencies that require a higher degree of verification to recognize earnings reflecting "good news" than "bad news" as economic losses (Basu, 1997; Watts, 2003). Litigation is thought to partly explain conservative financial reporting because managers have an incentive to report conservatively to reduce the risk of legal liability (Basu, 1997; Holthausen and Watts, 2001; Watts, 2003; Chung and Wynn, 2008). As D&O insurance reduces D&Os' legal liability, it can decrease accounting conservatism (Chung and Wynn, 2008). Contracting is another explanation of conservative reporting. Insurance companies cannot participate directly in the daily management of insured companies and face information asymmetry that increases the demand for accounting conservatism on the part of D&O-insured companies. This study fills this gap by re-examining the combined effects of D&O insurance in China.

Using a sample of Chinese companies listed on the Shanghai and Shenzhen Stock Exchanges from 2006 to 2019, we studied the effects of purchase behaviours and D&O insurance indemnity limits on accounting conservatism. Our analyses indicate that conservatism is greater among firms purchasing D&O insurance and firms with higher indemnity limits. Our results are robust to various economic specifications, including the Heckman two-stage model and the propensity score matching (PSM) method. Our findings also suggest that the positive relationship between D&O insurance and conservatism became stronger after security law amendments, which supports our conjecture that the legal environment modulates the impact of D&O insurance. Additional analyses using supervisors' ownership and internal control quality as proxy variables for internal supervision, the proportions of total and short-term loans as proxies for creditors' external

supervision and the proportion of management ownership and selling, general and administrative expenses over revenue ratio (SG&A) as proxies for the agency problem show that the positive relationship between D&O insurance and accounting conservatism is stronger when other supervision mechanisms are weak and when the agency problem is serious.

This paper contributes to the literature in the following ways. First, we add new evidence of the supervisory role of D&O insurers. Most previous studies conducted in jurisdictions with strong investor protection and well-developed D&O insurance markets support the opportunism hypothesis. Conversely, our empirical evidence from China indicates that the supervision effect dominates in jurisdictions with weak investor protection and developing D&O insurance markets. Second, we show that accounting reporting preference is another channel through which D&O insurers can supervise insured companies and prevent the risks facing them. Prior studies have focused on non-financial corporate governance mechanisms, such as internal control quality, corporate social responsibility disclosure and independent directors (Yuan *et al.*, 2016; Li *et al.*, 2022). We show that D&O insurers can also affect firms' financial mechanisms. Third, we contribute to the literature on the determinants of accounting conservatism. Although many factors that affect accounting conservatism, including firm characteristics (Pae *et al.*, 2005), institutional factors (Iatridis, 2012) and corporate governance characteristics (Lafond and Roychowdhury, 2008; Sultana *et al.*, 2015), have been investigated, few have been studied from the perspective of insurance. Chung and Wynn (2008) found a negative relationship between D&O insurance and earnings conservatism in Canada. Conversely, we provide evidence that D&O insurance can increase Chinese listed companies' accounting conservatism. Finally, we document the substitution effects of different supervision mechanisms, showing that the supervisory role of D&O insurance companies is stronger when other supervision mechanisms are relatively weak. To the best of the authors' knowledge, the substitution effect of D&O insurers and creditors documented in this study has not been previously explored.

The remainder of this paper is structured as follows. Section 2 introduces the institutional background and presents our research hypotheses. Section 3 presents the research design, including the sample construction, research model and variables used. Section 4 reports our main results and Section 5 presents the results of further analyses. Section 6 concludes the paper.

2. Institutional background and hypothesis development

2.1 Institutional background

China's stock market has been developing within a legal system based on civil law, which provides shareholders with less legal protection than common-law markets, such as those in the USA and the UK (La Porta *et al.*, 1997, 1998). Class action lawsuits are not well developed in China. According to Chung and Wynn (2008, p. 139), "the 'fraud on the market' theory adopted in the U.S. eliminates the need to establish individual reliance on any particular misrepresentation by the company for class action certification, facilitating securities fraud class actions". In China, although private securities litigation (PSL) has been allowed since the Supreme People's Court issued a notice on January 15, 2002, and has been strengthened to some extent after security law was amended in 2005, it is still difficult for ordinary people to sue because the prepositional procedure stipulates that only companies punished by the China Securities Regulatory Commission (CSRC) can be sued. Moreover, the loser of a lawsuit is required to pay at least a portion of the winner's legal costs, announcement costs, notification fees, counsel fees, etc. This "loser pays" rule discourages investors from filing

lawsuits. Furthermore, there is no strong financial incentive for lawyers to actively solicit potential clients to represent in class action lawsuits.

The effort to strengthen investor protection has never stopped in China. Both corporate law and security law were amended to increase investor protection (Zou *et al.*, 2008) in 2005 and came into effect on January 1, 2006. Minor revisions were made in 2013 and 2014. Major revisions were then made to security law from 2015 to 2019 and came into force in 2020. Three major changes were related to D&O liability and investor protection. First, detailed regulations that imposed stricter requirements for systematic information disclosure were included in a separate chapter. Second, investor protection was revised in a separate chapter to improve the investor protection system. Third, the penalties for D&Os were increased. From 2013 to 2019, markets' expectations of these changes' impacts grew.

2.2 Hypothesis development

A typical D&O insurance contract:

- provides litigation costs for claims made against individual D&Os for wrongful acts [1] committed on behalf of a company; and
- reimburses the company for its indemnification payments [2].

Theoretically, the purchase of D&O insurance can have two effects: the managerial opportunism effect and the supervision effect.

According to the managerial opportunism effect, D&O insurance fosters unintended opportunistic behaviour on the part of executives because it weakens the deterrent effect of shareholder litigation. In this case, D&O insurance may encourage executives to report more aggressively to achieve performance targets and increase their own wealth (Lafond and Roychowdhury, 2008; Iwasaki and Otomasa, 2018), resulting in less accounting conservatism (Chung and Wynn, 2008).

According to the supervision effect, insurers have the incentive to supervise D&Os after a D&O insurance contract has been signed (Mayers and Smith, 1982) to prevent risks, besides conducting due diligence before signing the contract (Chalmers *et al.*, 2002; Boyer and Stern, 2012, 2014; Cao and Narayanamoorthy, 2014). This is because insurance contracts bring insurers asymmetric benefits and risks. To keep insured firms from concealing key information which may trigger compensation, insurers require insured companies to take reasonable precautions to reduce the negative impact of information asymmetry. Moreover, many D&O insurance contracts stipulate that "the insurer can inspect the situation of the insured company's compliance with the provisions of the related paragraph and put forward written suggestions to the applicant and the insured to eliminate unsafe factors and hidden dangers, and the applicant and the insured should earnestly implement them" [3]. If an insured company's D&Os violate policies, the insurance company will raise the premium, reject their application in the next period or even terminate the contract. These measures could lead to greater accounting conservatism for at least two reasons. First, insured companies have an incentive to be conservative because accounting conservatism indicates a low risk, which is helpful for obtaining a lower premium (Zhang, 2008). Second, pressure from D&O insurers makes insured companies disclose bad news in a timely manner (Yuan *et al.*, 2016), which is recorded by the accounting system more quickly, thereby also increasing accounting conservatism.

We believe that these two effects coexist but that the supervision effect is predominant in China for three reasons. First, shareholder litigation is not a well-developed supervision

mechanism (La Porta *et al.*, 1997, 1998; Chen *et al.*, 2013), although it has been improving. Two factors restrict the power of shareholder litigation: one is the prepositional procedure that requires sued companies to be punished by the CSRC, and the other is the burden of proof borne by the plaintiff. Second, the effect of D&O insurance on decreasing the deterrent effect of litigation is negligible when the power of shareholder litigation is weak. Thus, we argue that D&O insurance may not induce serious moral hazards in China, where PSL is very limited. Third, insurers have a strong incentive to supervise the insured because of the high insurance amounts involved (Yuan *et al.*, 2016) and their inadequate legal protection (Allen *et al.*, 2005). Therefore, we put forward the following hypotheses:

H1a. Ceteris paribus, companies purchasing D&O insurance exhibit greater accounting conservatism than companies without D&O insurance.

H1b. Ceteris paribus, the higher the D&O insurance coverage, the more the accounting conservatism.

As previously mentioned, D&O insurance companies have an incentive to supervise insured companies to minimize their payout obligations. This incentive is stronger when investor protection is weak (Yuan *et al.*, 2016). Moreover, executives' incentive to behave opportunistically is less affected by D&O insurance when investor protection is weak. As discussed in Section 2.1, China amended its security law to improve investor protection starting in 2013. Thus, we define the period 2013–2019 as the post-amendment period and propose the following hypotheses:

H2a. Ceteris paribus, the positive association between D&O insurance and accounting conservatism is stronger before than after the security law amendments.

H2b. Ceteris paribus, the positive association between D&O insurance coverage and accounting conservatism is stronger before than after the security law amendments.

3. Research design

3.1 Sample and data

Our initial sample comprised all A-share firms listed on the Shanghai and Shenzhen Stock Exchanges from 2006 to 2019. We set 2006 as the start of the study period because the revised corporate law came into effect on January 1, 2006, after which the duties of loyalty and due diligence of directors, supervisors and managers to companies were specified, and shareholders were empowered to take legal action against directors and managers for their wrongdoings, which builds the foundation that D&O insurance can play a role. The initial sample included firms that simultaneously disclosed their purchases of D&O insurance and the indemnity limits thereof. After eliminating companies in the financial and insurance sector, Special Treatment companies with abnormal financial situations and companies with missing data, the final sample included 24,985 firm-year observations. We manually collected D&O insurance data from disclosed resolutions of boards' and shareholders' meetings and annual reports. All other data were from the China Stock Market Accounting Research database.

The sample distribution is presented in Table 1. Panel A shows the sample distribution by year. Over the sample period, the raw number of sample firms that purchased D&O insurance increased from 6 to 136. Their proportion increased from around 0.63%

Panel A: Sample distribution by year

Year(s)	No.	No.	Percentage
2006	953	6	0.63
2007	954	11	1.15
2008	1,050	26	2.48
2009	1,117	31	2.78
2010	1,218	33	2.71
2011	1,578	40	2.53
2012	1,872	50	2.67
2013	1,911	53	2.77
2014	1,868	49	2.62
2015	1,977	63	3.19
2016	2,223	67	3.01
2017	2,444	81	3.31
2018	2,880	98	3.40
2019	2,940	136	4.63
2006–2019	24,985	744	2.98

Panel B: Sample distribution by industry

Categories of industry	No. of firm-years	No. of firm-years with D&O insurance	Percentage of firm-years with D&O insurance (%)
Transportation (G)	883	66	7.47
Real estate (K)	1,308	91	6.96
Media (R)	377	19	5.04
Mining (B)	669	31	4.63
Energy supply (D)	1,040	47	4.52
Electronics (C39–40)	2,227	82	3.68
Construction (E)	704	23	3.27
Food (C13–16)	1,076	32	2.97
Pharmaceutical products (C27)	1,700	47	2.76
Machinery (C34–38)	4,951	121	2.44
Metal (C30–33)	2,035	49	2.41
Other service (H, J, L, M, N, O, P, Q)	1,232	27	2.19
Gas and chemistry (C25–26, 28–29)	2,474	49	1.98
Retail and wholesale (F)	1,415	24	1.70
Printing (C22–24)	362	6	1.66
Information technology (I)	1,767	23	1.30
Apparel (C17–19)	614	6	0.98
Furniture (C20–21)	151	1	0.66
Total	24,985	744	2.98

Table 1.
Sample distribution by year and by industry

Notes: This table shows the sample distribution over the sample period of 2006 through 2019 (Panel A) and by industry (Panel B). The industry classification is based on China Securities Regulatory Commission (CSRC)'s Guidelines for the Industry Classification of Listed Companies published in 2012. In brackets are the CSRC codes for industry

at the start of the study period to 4.63% in 2019. Over the study period, 744 of the 24,985 samples purchased D&O insurance, which translates to 2.98% – quite close to Jia *et al.*'s (2019) estimate. Panel B of Table 1 shows the sample distribution by industry. Transportation and real estate sectors were the largest buyers of D&O insurance. The media industry ranked third in terms of percentage. In terms of raw numbers, the machinery, real estate and electronics sectors were the top three purchasers.

3.2 Model and variables

To test the influence of D&O insurance on accounting conservatism, we constructed Model 1, with firm- and year-fixed effects included:

$$\begin{aligned}\text{Model 1}: Cscore_{i,t} = {} & \beta_0 + \beta_1 \times Purchase_{i,t}/Coverage_{i,t} + \beta_2 \times Size_{i,t} + \beta_3 \times MTB_{i,t} \\ & + \beta_4 \times Lev_{i,t} + \beta_5 \times ROA_{i,t} + \beta_6 \times Growth_{i,t} + \beta_7 \times Age_{i,t} \\ & + \beta_8 \times Top1_{i,t} + \beta_9 \times Inst_{i,t} + \beta_{10} \times Mshare_{i,t} + \beta_{11} \times SOE_{i,t} + \beta_{12} \\ & \times Boardsize_{i,t} + \beta_{13} \times Indep_{i,t} + \beta_{14} \times Dual_{i,t} + \beta_{15} \times Cross_{i,t} + \varepsilon\end{aligned}$$

where *Cscore* is the accounting conservatism score developed by Khan and Watts (2009), and *Purchase* equals 1 if firm *i* purchased D&O insurance in year *t* and 0 otherwise. Companies whose board and/or shareholders' meeting resolutions did not explicitly propose not renewing their D&O insurance after an initial purchase were considered continuous purchasers. For example, if Firm A disclosed buying D&O insurance in year *t* did not disclose D&O information in year $t + 1$, and announced that it stopped buying D&O insurance in year $t + 2$, then *Purchase* equalled 1 in years *t* and $t + 1$ and 0 in year $t + 2$. *Coverage* is the natural logarithm of 1 plus the indemnity limit in yuan. Following Gong and Luo (2018), we also controlled for firm characteristics that may affect accounting conservatism. We used size (*Size*), market-to-book ratio (*MTB*), leverage (*Lev*), return on assets (*ROA*) and sales growth (*Growth*) to measure firms' financial conditions. We also controlled for firm age (*Age*) to measure firms' information environments. Furthermore, we used the shareholding of the largest shareholder (*Top1*), fund ownership (*Inst*), management ownership (*Mshare*), proportion of state-owned stocks (*SOE*), board size (*Boardsize*), independent board ratio (*Indep*) and a dummy variable of CEO duality (*Dual*) to measure corporate governance. We also included a dummy variable indicating cross-listing (*Cross*) because cross-listing firms may face different levels of litigation risk (Chung and Wynn, 2008). Detailed variable definitions are provided in the Appendix.

4. Empirical analyses

4.1 Descriptive statistics

Table 2 shows the descriptive statistics of the main variables. The minimum *Cscore* was −0.5410, and the maximum *Cscore* was 0.9613, indicating significant variation in accounting conservatism among companies. The lower *Cscore* quartile was negative, indicating that the financial reports in over 25% of the sample observations are not conservative. This is different from the findings of Khan and Watts (2009), who reported more than 75% conservative observations among US firms, but similar to the results of Isaboke and Chen (2019), who also found a negative lower quartile using Chinese data. The mean *Purchase* was 0.0298, suggesting that 2.98% of the sample firms purchased D&O insurance, which is slightly lower than the percentage estimated by Yuan *et al.* (2016) because we excluded observations in which companies purchased D&O insurance but did not disclose indemnity limits [4]. The maximum *Coverage* value was 20.4356, amounting to about 750m yuan.

The correlations between *Cscore* and *Purchase* and between *Cscore* and *Coverage* were 0.0141 and 0.0147, respectively, and were significant at the 5% level. This result is consistent with *H1a* and *H1b*.

4.2 Multivariate analyses

Table 3 reports the main regression results. The estimated coefficient of *Purchase* was significantly positive at the 5% (10%) level without (with) control variables, indicating that

Variable	*N*	Mean	SD	Min	Q1	Median	Q3	Max
Cscore	24,985	0.0135	0.2592	−0.5410	−0.0498	0.0085	0.0904	0.9613
Purchase	24,985	0.0298	0.1700	0	0	0	0	1
Coverage	24,985	0.5270	3.0126	0.0000	0.0000	0.0000	0.0000	20.4356
Size	24,985	22.0639	1.2534	19.5677	21.1622	21.8946	22.7849	25.9293
MTB	24,985	3.5981	2.9480	0.6563	1.7462	2.7064	4.3923	18.3710
Lev	24,985	0.4364	0.2048	0.0553	0.2734	0.4342	0.5917	0.8867
ROA	24,985	0.0397	0.0552	−0.2163	0.0149	0.0371	0.0661	0.1916
Growth	24,985	0.2022	0.4748	−0.5704	−0.0075	0.1200	0.2846	3.2644
Age	24,985	2.2596	0.6593	0.6931	1.7918	2.3979	2.8332	3.2958
Top1	24,985	0.3520	0.1498	0.0893	0.2329	0.3319	0.4548	0.7500
Inst	24,985	0.0401	0.0592	0.0000	0.0015	0.0146	0.0534	0.2895
Mshare	24,985	0.1203	0.1935	0.0000	0.0000	0.0011	0.1971	0.6789
SOE	24,985	0.0704	0.1634	0.0000	0.0000	0.0000	0.0024	0.7284
Boardsize	24,985	2.1486	0.2001	1.6094	2.0794	2.1972	2.1972	2.7081
Indep	24,985	0.3714	0.0532	0.2000	0.3333	0.3333	0.4286	0.5714
Dual	24,985	0.2442	0.4296	0	0	0	0	1
Cross	24,985	0.0230	0.1498	0	0	0	0	1

Table 2.
Variable statistics

Notes: This table presents descriptive statistics on the variables used in our main analyses. All variables except for the dummies are winsorized at the 1st and the 99th percentiles. *N* is the number of observations. SD is the standard deviation. Definitions of the variables are provided in the Appendix

Variable	(1) *Cscore*	(2) *Cscore*	(3) *Cscore*	(4) *Cscore*
Purchase	0.0090** (2.12)	0.0073* (1.90)		
Coverage			0.0005** (2.29)	0.0004** (2.03)
Size		0.0222*** (25.96)		0.0222*** (25.95)
MTB		−0.0017*** (−7.01)		−0.0017*** (−7.01)
Lev		−0.0046 (−1.43)		−0.0046 (−1.43)
ROA		−0.0102 (−1.00)		−0.0102 (−0.99)
Growth		−0.0006 (−0.82)		−0.0006 (−0.82)
Age		−0.0220*** (−12.50)		−0.0220*** (−12.50)
Top1		−0.0074 (−1.50)		−0.0074 (−1.51)
Inst		0.0141** (2.39)		0.0141** (2.39)
Mshare		0.0135*** (3.36)		0.0135*** (3.37)
SOE		−0.0086*** (−3.32)		−0.0086*** (−3.32)
Boardsize		−0.0005 (−0.15)		−0.0005 (−0.15)
Indep		0.0125 (1.32)		0.0125 (1.33)
Dual		0.0005 (0.52)		0.0005 (0.52)
Cross		0.0167** (2.23)		0.0165** (2.19)
Constant	−0.5071*** (−267.84)	−0.9309*** (−48.77)	−0.5071*** (−267.90)	−0.9308*** (−48.77)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	24,985	24,985	24,985	24,985
Adjusted R^2	0.976	0.978	0.976	0.978

Table 3.
D&O Insurance and accounting conservatism

Notes: This table presents results using annual data over the sample period of 2006–2019. All variables are as defined in the Appendix. All regressions include firm- and year-fixed effects; standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

purchasing D&O insurance significantly increased firms' accounting conservatism. The coefficient was 0.73% when control variables were added, which suggests that the *Cscore* of companies with D&O insurance was 54% higher than the mean value, representing an economically meaningful difference. The coefficient of *Coverage* was also significantly positive at the 5% level whenever control variables were added or not, indicating that the higher the indemnity limit, the greater the accounting conservatism. In terms of economic significance, for every 1% increase in the indemnity limit, the *Cscore* increased by 0.04% (control variables added), accounting for 3% of its mean. Overall, these results support *H1a* and *H1b*, suggesting that the monitoring role of D&O insurance dominated the effect of moral hazard caused by D&O insurance in China, where shareholder litigation had a limited impact on D&Os' wealth and decision-making.

Table 4 reports the results of the analysis testing *H2a* and *H2b*. As shown in Panel A of Table 4, the coefficients of *Purchase* and *Coverage* were significantly positive at the 5% and 1% levels, respectively, during the period before the security law amendments (2006–2012), when investor protection was relatively weak. Conversely, the coefficient of *Purchase* was not significantly positive, and the coefficient of *Coverage* was significantly positive only at the 10% level during the post-amendment period (2013–2019), when investor protection was relatively strong. This suggests that the monitoring role of D&O insurance was dominant during both periods. Moreover, the coefficients of *Purchase* and *Coverage* in the pre-amendment period were almost twice their coefficients in the post-amendment period, with the differences being statistically significant at the 1% level, according to Chow tests. In line with *H2a* and *H2b*, this suggests that the monitoring role of D&O insurers was stronger during the pre-amendment period, when investor protection was relatively weak. A robustness test using Fan and Wang's index as a proxy for investor protection (Yuan *et al.*, 2016) showed that the results confirming *H2a* and *H2b* were robust (Panel B of Table 4).

4.3 Endogeneity

There may have been an endogeneity issue in our main regression. On the one hand, insurers' supervision made insured companies report earnings more conservatively. On the other hand, conservative earnings reports may have helped firms pass insurers' reviews and become eligible to purchase D&O insurance. To investigate this potential endogeneity issue, we used the Heckman two-stage approach and the PSM method (Chung and Wynn, 2008; Yuan *et al.*, 2016). We also included some possibly omitted variables not included in Model 1.

4.3.1 Heckman two-stage approach. In the first stage, we used Model 2 to predict the D&O insurance purchase probability. We used the mean D&O insurance purchased at the industry level (*AVG*) as an exogenous variable. The higher the proportion of D&O insurance purchased in the industry to which a firm belonged, the higher the firm's purchase probability. We added *Size*, *MTB*, *Lev*, *ROA*, *Growth*, *Mshare*, *Indep* and discretionary accrual (*DA*) as control variables and controlled for industry- and year-fixed effects (Chung and Wynn, 2008; Cao and Narayanamoorthy, 2014; Yuan *et al.*, 2016):

$$\begin{aligned}\text{Modle 2}: P\left(Purchase_{i,t}=1\right) = {} & \alpha_0+\alpha_1\times AVG_{i,t}+\alpha_2\times Size_{i,t}+\alpha_3\times MTB_{i,t}\\ & +\alpha_4\times Lev_{i,t}+\alpha_5\times ROA_{i,t}+\alpha_6\times Growth_{i,t}+\alpha_7\\ & \times Mshare_{i,t}+\alpha_8\times Indep_{i,t}+\alpha_9\times DA_{i,t}+\epsilon\end{aligned}$$

The inverse Mills ratio (*Mills*) obtained in the first stage was added to Model 1 in the second stage. The regression results are shown in Table 5. After adding the Mills ratio, the coefficient of *Purchase* (*Coverage*) remained significant at 10% (5%) level, indicating that

Variable	(1) *Cscore*	(2) *Cscore*	(3) *Cscore*	(4) *Cscore*
Panel A: The effect of security law change				
	2006–2012	2013–2019	2006–2012	2013–2019
Purchase	0.0207** (2.57)	0.0098 (1.63)		
Coverage			0.0012*** (2.80)	0.0006* (1.69)
p-Value	0.001		0.001	
Size	0.0273*** (14.72)	0.0209*** (12.14)	0.0273*** (14.72)	0.0208*** (12.13)
MTB	−0.0013*** (−3.61)	−0.0034*** (−8.42)	−0.0013*** (−3.60)	−0.0034*** (−8.42)
Lev	−0.0213*** (−3.11)	0.0007 (0.12)	−0.0214*** (−3.12)	0.0007 (0.12)
ROA	−0.0400*** (−2.75)	−0.0005 (−0.04)	−0.0400*** (−2.75)	−0.0005 (−0.04)
Growtd	−0.0004 (−0.36)	−0.0018 (−1.62)	−0.0004 (−0.36)	−0.0018 (−1.62)
Age	−0.0124** (−2.36)	−0.0806*** (−19.91)	−0.0124** (−2.36)	−0.0805*** (−19.91)
Top1	−0.0150 (−1.33)	−0.0119 (−1.19)	−0.0150 (−1.32)	−0.0119 (−1.20)
Inst	−0.0180* (−1.68)	0.0312*** (2.97)	−0.0181* (−1.69)	0.0312*** (2.97)
Mshare	0.0047 (0.29)	0.0316*** (4.28)	0.0047 (0.29)	0.0317*** (4.28)
SOE	−0.0260*** (−5.84)	−0.0204*** (−3.07)	−0.0260*** (−5.83)	−0.0204*** (−3.08)
Boardsize	−0.0030 (−0.45)	−0.0030 (−0.57)	−0.0029 (−0.44)	−0.0030 (−0.57)
Indep	0.0102 (0.57)	0.0130 (0.78)	0.0104 (0.58)	0.0131 (0.79)
Dual	−0.0025 (−1.22)	0.0005 (0.33)	−0.0025 (−1.22)	0.0005 (0.33)
Cross	0.0383*** (2.81)	0.0196** (2.07)	0.0384*** (2.81)	0.0196** (2.07)
Constant	−1.0285*** (−25.35)	−0.2698*** (−6.90)	−1.0285*** (−25.35)	−0.2695*** (−6.89)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	8,742	16,243	8,742	16,243
Adjusted R^2	0.993	0.946	0.993	0.946
Panel B: Using Fan and Wang's index as a proxy for investor protection				
	Worse investor protection	Better investor protection	Worse investor protection	Better investor protection
Purchase	0.0309** (2.16)	0.0052 (1.32)		
Coverage			0.0018** (2.17)	0.0003 (1.45)
p-Value	0.052		0.055	
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4,206	20,779	4,206	20,779
Adjusted R^2	0.978	0.978	0.978	0.978

Table 4.
Effect of security law change

Notes: Panel A of this table presents the results of two sub-samples (2006–2012 vs 2013–2019); Panel B presents the results of two sub-samples (worse investor protection vs better investor protection), and the coefficient differences across the sub-samples *(p-values)* are tested on basis of the Chow tests. All regressions include firm- and year-fixed effects; standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

our results were not affected by selection bias. Conversely, the coefficient of *Mills* was not significant in the second stage, also indicating no serious selection bias in our main analysis.

4.3.2 Propensity score matching approach. Following the PSM approach, we formed a control group of firms with similar characteristics that did not purchase D&O insurance. To that end, we used Model 2 to calculate the propensity score. For each D&O-insured firm, we chose the firm with the closest propensity score as a control. We then used this matched sample to run Model 1. The results are presented in Table 6. As shown in Panel A of Table 6,

	First stage		Second stage	
	(1)		(2)	(3)
Variable	*Purchase*	Variable	*Cscore*	*Cscore*
AVG	9.4921*** (8.87)	*Purchase*	0.0073* (1.91)	
Size	0.3222*** (17.33)	*Coverage*		0.0004** (2.04)
MTB	0.0207*** (2.63)	*Size*	0.0224*** (20.89)	0.0224*** (20.89)
Lev	−0.2577** (−2.21)	*MTB*	−0.0016*** (−6.91)	−0.0016*** (−6.91)
ROA	−1.2114*** (−3.19)	*Lev*	−0.0048 (−1.47)	−0.0048 (−1.47)
Growth	−0.0330 (−0.86)	*ROA*	−0.0109 (−1.05)	−0.0109 (−1.05)
Mshare	−0.8518*** (−5.65)	*Growth*	−0.0006 (−0.85)	−0.0006 (−0.85)
Indep	0.5300* (1.88)	*Age*	−0.0220*** (−12.51)	−0.0219*** (−12.51)
DA	−0.0299 (−0.32)	*Top1*	−0.0074 (−1.50)	−0.0074 (−1.51)
		Inst	0.0141** (2.39)	0.0141** (2.39)
		Mshare	0.0130*** (2.99)	0.0131*** (2.99)
		SOE	−0.0086*** (−3.32)	−0.0086*** (−3.32)
		Boardsize	−0.0005 (−0.15)	−0.0004 (−0.15)
		Indep	0.0128 (1.35)	0.0128 (1.36)
		Dual	0.0005 (0.52)	0.0005 (0.52)
		Cross	0.0167** (2.22)	0.0165** (2.18)
		Mills	0.0007 (0.29)	0.0007 (0.30)
Constant	−9.4558*** (−22.12)	Constant	−0.9369*** (−33.80)	−0.9369*** (−33.80)
Industry FE	Yes	Firm FE	Yes	Yes
Year FE	Yes	Year FE	Yes	Yes
Observations	24,985	Observations	24,985	24,985
R^2	0.145	Adjusted R^2	0.978	0.978

Notes: This table presents the results of Heckman two-stage model. All second stage regressions include firm- and year-fixed effects; standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Table 5. Regression results of Heckman two-stage model

there were no significant differences between the treated and control groups after PSM, except for *Mshare*, which was significantly different at the 10% level. All absolute values of percent bias were less than 10, indicating good PSM fit.

The coefficients of *Purchase* and *Coverage* shown in Panel B of Table 6 were 0.0311 and 0.0018, respectively, and were significant at the 5% level. These results provide further support for *H1a* and *H1b*.

To further address endogeneity concerns, we also constructed a matched sample to examine whether accounting conservatism differed significantly between D&O insurance purchasers and non-purchasers before the former made the purchases. The results shown in Panel C of Table 6 revealed no significant differences, lending further support to the hypotheses presented in Section 2.2.

4.3.3 Controlling for additional variables. Prior studies have found that stock return volatility, bankruptcy risk and auditor reputation correlate highly with a firm's conservatism (Gong and Luo, 2018). Accordingly, we included stock return volatility (*Retvol*), Altman's bankruptcy score (*Altman*) and the Big Four auditor indicator (*Big4*) as control variables. The obtained values and significance of the coefficients (data not shown) were the same as those shown in Table 3.

4.4 Using expanded samples

In our main analysis, we omitted samples with D&O insurance but did not disclose indemnity limits to make our sample size consistent when the independent variable was

Panel A: Diagnostics of matching quality

Matching variable	Before PSM/ After PSM	Mean for treated observations	Mean for control observations	(%) bias	*t*-score for the *t*-test	*p*-value for the *t*-test
Size	Before PSM	23.418	22.022	98.3	30.480	0.000
	After PSM	23.415	23.440	−1.7	−0.300	0.764
MTB	Before PSM	2.606	3.629	−38.1	−9.340	0.000
	After PSM	2.607	2.789	−6.8	−1.420	0.156
Lev	Before PSM	0.530	0.434	47.9	12.690	0.000
	After PSM	0.530	0.524	2.6	0.510	0.613
ROA	Before PSM	0.033	0.040	−12.8	−3.370	0.001
	After PSM	0.033	0.035	−2.9	−0.550	0.582
Growth	Before PSM	0.182	0.203	−4.5	−1.190	0.236
	After PSM	0.182	0.179	0.7	0.150	0.882
Mshare	Before PSM	0.038	0.123	−53.6	−11.830	0.000
	After PSM	0.038	0.049	−6.8	−1.810	0.071
Indep	Before PSM	0.378	0.371	12.2	3.300	0.001
	After PSM	0.378	0.379	−3.4	−0.600	0.550
DA	Before PSM	0.101	0.113	−7.6	−1.800	0.072
	After PSM	0.101	0.095	3.7	0.900	0.371

Panel B: Results using matched sample

	(1)	(2)
Variable	*Cscore*	*Cscore*
Purchase	0.0311** (2.17)	
Coverage		0.0018** (2.33)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	1,486	1,486
Adjusted R^2	0.965	0.965

*Panel C: D&O insurance and **prior** accounting conservatism*

Variable	$Cscore_{t-1}$	$Cscore_{t-1}$
Purchase	0.0029	
	(0.12)	
Coverage		0.0002
		(0.12)
Controls	Yes	Yes
Observations	224	224
Adjusted R^2	0.085	0.085

Notes: Panel A reports the diagnostics of matching quality of our one-to-one propensity score matching. For each of the matching variables, we report the mean of the treated group (*Purchase* = 1) and that of the control group (*Purchase* = 0) for both the unmatched sample before PSM and the matched sample after PSM. The percentage bias is the standardized percentage bias calculated as the difference in the means between the treated and control groups as a percentage of the positive square root of the average of the variances for the two groups (Rosenbaum and Rubin, 1985). The *t*-test tests the null hypothesis that the means for the two groups are equal. Panel B shows the condensed regression results for the PSM matched sample using annual data over the sample period of 2006–2019. The regression specifications are the same as those in Table 4. All regressions include firm- and year-fixed effects. Panel C presents the regression results of prior accounting conservatism and D&O insurance using a one-to-one PSM matched sample. The regression specifications are the same as those in Table 4, excluding firm- and year-fixed effects. Standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; **indicates statistical significance at the 5% level respectively

Table 6.
Regression results based on PSM sample

either *Purchase* or *Coverage*. To further check the robustness of our results, we used an expanded sample, including all firm-years with D&O insurance regardless of whether indemnity limits were disclosed and reran Model 1, where *Purchase* was the independent variable. The coefficients of *Purchase* were 0.0159 and significant at the 1% level when control variables were not added and 0.0126 when control variables were included, providing more support for *H1a* (Table 7).

Although the first D&O insurance contract was signed in 2002, we did not include data from the period 2002–2005. To address any concerns about data mining, we used a sample covering the period 2002–2019 to rerun Model 1. The results confirm the validity of our main results.

4.5 Other measures of conservatism

To ensure that our findings were not sensitive to our choice of accounting conservatism measures, we performed robustness tests following Basu (1997) and Louis *et al.* (2012). The results of the Basu model are shown in Panel A of Table 8. We also used an unconditional conservatism measure (*UAC*), calculated as negative one times the ratio of non-operating accruals to the total assets accumulated over the previous three years (Louis *et al.*, 2012). The results are shown in Panel B of Table 8. The significant positive coefficients of *D*R*Purchase* and *D*R*Coverage* shown in Panel A and of *Purchase* and *Coverage* shown in Panel B indicate that our results were not affected by the selected conservatism measures.

Variable	(1) *Cscore*	(2) *Cscore*	(3) *Cscore*	(4) *Cscore*
Purchase	0.0159*** (4.24)	0.0126*** (3.67)	0.0143*** (3.20)	
Coverage				0.0009*** (3.49)
Size		0.0204*** (18.55)	0.0189*** (20.35)	0.0189*** (20.34)
MTB		−0.0012*** (−4.45)	−0.0027*** (−10.45)	−0.0027*** (−10.44)
Lev		−0.0062 (−1.48)	0.0005 (0.13)	0.0004 (0.12)
ROA		−0.0112 (−0.99)	−0.0221** (−2.37)	−0.0220** (−2.36)
Growth		−0.0006 (−0.61)	−0.0007 (−1.01)	−0.0007 (−1.01)
Age		−0.0284*** (−13.74)	−0.0222*** (−10.74)	−0.0222*** (−10.74)
Top1		−0.0042 (−0.72)	−0.0053 (−1.07)	−0.0054 (−1.09)
Inst		0.0115* (1.79)	0.0054 (0.84)	0.0054 (0.83)
Mshare		0.0160*** (3.44)	0.0117*** (2.67)	0.0118*** (2.69)
SOE		−0.0135*** (−5.34)	−0.0105*** (−3.90)	−0.0105*** (−3.90)
Boardsize		−0.0039 (−1.25)	0.0011 (0.36)	0.0011 (0.36)
Indep		0.0046 (0.45)	0.0127 (1.43)	0.0129 (1.45)
Dual		0.0001 (0.11)	−0.0001 (−0.05)	−0.0000 (−0.05)
Cross		0.0294*** (3.93)	0.0261** (2.56)	0.0255** (2.45)
Constant	−0.5018*** (−288.40)	−0.8677*** (−38.84)	−0.2602*** (−13.17)	−0.2599*** (−13.16)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	27,615	27,615	28,481	28,481
Adjusted R^2	0.971	0.972	0.973	0.973

Notes: Columns (1) and (2) present results using a sample of all firm-years with D&O insurance included, whether indemnity limit data is disclosed or not. Columns (3) and (4) present the results using a sample over the period of 2002–2019. All variables are as defined in the Appendix. All regressions include firm- and year-fixed effects. Standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Table 7.
Expanded samples

	(1)	(2)	(3)	(4)
Panel A: Using Basu model to measure conservatism				
Variable	Earnings	Earnings	Earnings	Earnings
D	−0.0058*** (−6.27)	0.0274 (1.62)	−0.0058*** (−6.26)	0.0275 (1.62)
R	0.0150*** (18.14)	−0.0210 (−1.41)	0.0150*** (18.14)	−0.0210 (−1.41)
*D*R*	0.0220*** (8.17)	−0.0341 (−1.21)	0.0220*** (8.19)	−0.0341 (−1.21)
Purchase	0.0021 (0.33)	0.0017 (0.28)		
*D*Purchase*	0.0033 (0.69)	0.0068 (1.36)		
*R*Purchase*	0.0027 (0.56)	0.0004 (0.07)		
*D*R*Purchase*	0.0231* (1.73)	0.0235* (1.81)		
Coverage			0.0001 (0.35)	0.0001 (0.30)
*D*Coverage*			0.0002 (0.66)	0.0004 (1.35)
*R*Coverage*			0.0002 (0.58)	0.0000 (0.06)
*D*R*Coverage*			0.0013* (1.65)	0.0013* (1.76)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	24,985	24,985	24,985	24,985
Adjusted R^2	0.115	0.185	0.115	0.185

Panel B: Measuring Conservatism following Louis (2012)	(1)	(2)
Variable	UAC	UAC
Purchase	0.0132*** (2.80)	
Coverage		0.0008*** (2.96)
Controls	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	21,255	21,255
Adjusted R^2	0.143	0.143

Notes: Panel A presents the impact of D&O insurance on conservatism when Basu model is used (Basu, 1997). All regressions include firm- and year-fixed effects. Panel B presents the results when conservatism is measured by UAC (Louis, 2012). UAC and other variables are as defined in the Appendix. All regressions include industry- and year-fixed effects. Standard errors are adjusted for firm-level clustering; *t*-statistics are presented in the parentheses; *** and * indicate statistical significance at the 1 and 10% levels, respectively

Table 8.
Other measures of conservatism

5. Further analyses

5.1 Moderating effect of the internal supervision mechanism

Before a company purchases D&O insurance, the insurer conducts a risk assessment. If the company has an internal governance problem, the insurer will increase the premium to minimize the risks involved (Core, 2000). Thus, we expected that the positive relationship between D&O insurance and accounting conservatism would be stronger for companies with weak internal supervision.

Using supervisors' ownership and internal control quality as proxy variables for internal supervision (Ji *et al.*, 2016; Gramling and Schneider, 2018), we divided the sample into a subsample of companies with strong internal supervision and a subsample of companies with weak internal supervision. Firm-years with above-average supervisor ownership or complete internal control were included in the strong internal supervision subsample, and vice versa. The empirical results are shown in Panel A of Table 9. In the strong internal supervision subsamples, the coefficients of the D&O insurance variables were not

Table 9.
Moderating effects

Variable	(1) *Cscore*	(2) *Cscore*	(3) *Cscore*	(4) *Cscore*	(5) *Cscore*	(6) *Cscore*	(7) *Cscore*	(8) *Cscore*
Panel A: Moderating effect of internal supervision								
	Internal control				Supervisors' ownership			
	Complete	Defective	Complete	Defective	High	Low	High	Low
Purchase	0.0049 (1.28)	0.0201* (1.80)			0.0126 (1.02)	0.0062 (1.54)		
Coverage			0.0003 (1.42)	0.0012* (1.81)			0.0007 (1.04)	0.0004* (1.66)
p-Values	0.016		0.019		0.951		0.981	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,736	5,249	19,736	5,249	3,654	21,331	3,654	21,331
Adjusted R^2	0.982	0.946	0.982	0.946	0.983	0.978	0.983	0.978
Panel B: Moderating effect of creditors' supervision								
	Total loan ratio				Short-term loan ratio			
	High	Low	High	Low	High	Low	High	Low
Purchase	−0.0041 (−0.72)	0.0166*** (3.24)			0.0003 (0.05)	0.0121** (2.29)		
Coverage			−0.0002 (−0.66)	0.0010*** (3.33)			0.0000 (0.08)	0.0007** (2.34)
p-Values	0.004		0.004		0.098		0.087	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,398	11,587	13,398	11,587	12,826	12,159	12,826	12,159
Adjusted R^2	0.979	0.978	0.979	0.978	0.981	0.975	0.981	0.975

(*continued*)

Table 9.

Variable	(1) *Cscore*	(2) *Cscore*	(3) *Cscore*	(4) *Cscore*	(5) *Cscore*	(6) *Cscore*	(7) *Cscore*	(8) *Cscore*
Panel C: Moderating effect of agency problem								
	Management ownership				SG&A ratio			
	High	Low	High	Low	Low	High	Low	High
Purchase	−0.0015 (−0.27)	0.0080* (1.90)			0.0042 (0.82)	0.0118* (1.83)		
Coverage			−0.0001 (−0.26)	0.0005** (2.04)			0.0003 (0.93)	0.0007* (1.86)
p-Values	0.028		0.022		0.156		0.162	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,338	17,647	7,338	17,647	16,860	8,125	16,860	8,125
Adjusted R^2	0.981	0.979	0.981	0.979	0.981	0.976	0.981	0.976

Notes: Panel A of this table presents the regression results of sub-samples with strong and weak internal supervision. Firm-years with higher than average supervisors' ownership or complete internal control are classified as sub-sample with strong internal supervision, and vice versa. Panel B presents the regression results of sub-samples with strong and weak creditors' supervision. Firm-years with higher than average total (short-term) loan ratios are classified as sub-sample with strong creditors' supervision, and vice versa. Panel C presents the regression results of sub-samples with and without serious agency problem. Firm-years with higher than average management ownership or lower than average SG&A ratio are classified as sub-sample without serious agency problem, and vice versa. The regression specifications are the same as those in Table 4. The coefficient differences across the sub-samples *(p-values)* are tested on basis of the Chow tests. Standard errors are adjusted for firm-level clustering. All regressions include firm- and year-fixed effects; *t*-statistics are presented in the parentheses; ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

significant, whereas in the weak internal supervision subsamples, three of the four coefficients were significantly positive at the 10% level. The coefficient differences between the two subsamples were statistically significant at the 5% level. These results indicate that D&O insurance had a stronger supervision effect on firms with weak internal supervision mechanisms.

5.2 Moderating effect of the external supervision mechanism

External supervision can restrain executives' behaviour. Companies with weak external supervision mechanisms may have higher risks, lower information transparency and higher levels of earnings management (Chang and Chen, 2018; Yuan *et al.*, 2016). Accordingly, we expected that D&O insurers would play a more active supervisory role in companies with weak external supervision. As creditors have a similar risk-return structure to that of insurers, we considered creditors' supervision.

When the loan ratio is high, creditors will monitor the firm more strictly. Firms with higher short-term loan ratios have higher default risks (Custodio *et al.*, 2013), and creditors have a stronger incentive to monitor them rigorously. Accordingly, we used the total and short-term loan ratios as proxies and divided the sample into higher and lower loan ratio subsamples. The empirical results are shown in Panel B of Table 9. The positive coefficients between *Purchase* and *Cscore* and between *Coverage* and *Cscore* were significant at the 1% level in the subsample with a lower total loan ratio and at the 5% level in the subsample with a lower short-term ratio but not significant in the subsamples with higher total or short-term loan ratios. The coefficient differences between the subsamples were statistically significant at conventional *p*-values. These results support our hypothesis that D&O insurers would play a more active supervisory role in companies with poor external supervision mechanisms.

5.3 Moderating effects of the agency problem

A serious agency problem in a company causes intense conflict between shareholders and management. In such cases, management has greater motivation and capacity to sacrifice shareholders' interests for its own benefit. Therefore, insurers may strengthen the follow-up supervision of such companies and require more conservative accounting. Thus, we expected that the positive relationship between D&O insurance and accounting conservatism would be stronger for firms with serious agency problems.

We divided the sample into two subsamples according to the proportion of management ownership or the SG&A ratio (Mustapha and Che Ahmad, 2011), calculated as the sum of selling, general and administrative expenses divided by revenue. When the proportion of management ownership is low or the SG&A ratio is high, the conflicts of interest between shareholders and management tend to be serious. Panel C of Table 9 reports the empirical results. Only the subsample with serious agency problems showed significantly positive correlations. Moreover, the coefficient differences between the two subsamples were statistically significant at the 5% level. These results confirm the hypothesis that D&O insurers would play a more active supervisory role in companies with serious agency problems.

6. Conclusion

In this study, we examined whether the insurer supervision effects of D&O insurance dominate in jurisdictions with weak shareholder protection, such as China. To that end, we empirically investigated the relationship between D&O insurance and accounting conservatism. We found that D&O insurance increased insured companies' accounting

conservatism, indicating that insurance companies played an effective supervisory role. Further analyses showed that the monitoring role of D&O insurers was more active when investor protection was weak, when the internal or external supervision mechanisms of insured companies were weak and when agency problems between shareholders and management were serious.

Overall, our findings support the notion that D&O insurers play a monitoring role in insured companies. This is not in line with studies conducted in contexts characterized by strong investor protection. In countries such as Canada, the USA, and the UK, firms face high litigation risks, and the relationship between D&O insurance and insured companies' financial reporting supports the managerial opportunism hypothesis (see Section 1). Conversely, in regions where the legal environment is considerably weaker, such as China, the supervision effect of D&O insurance dominates.

This study enriches the literature on D&O insurance. We provide evidence supporting the external supervision hypothesis of D&O insurance and demonstrate that as an emerging governance mechanism, D&O insurance has a supervision effect on China's capital market. Our findings also have implications for investors. For listed companies with weak internal or external supervision or serious agency problems, purchasing D&O insurance is a good signal.

Notes

1. Losses resulting from wilful, dishonest or fraudulent conduct are not covered by D&O insurance.
2. Some D&O insurance contracts also provide coverage for claims against a company on the basis of its own wrongful acts.
3. Detailed D&O insurance contracts can be found on the website of the Insurance Association of China (www.iachina.cn).
4. We also used an expanded sample that included firm-years without indemnity limit data to test *H1a*. The results are shown in Table 9.

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Appendix

Variable	Definition
Cscore	Accounting conservatism, calculated following Khan and Watts (2009) and Isaboke and Chen (2019)
Purchase	An indicator variable that takes the value of one if a company purchases the D&O insurance and zero otherwise
Coverage	The natural logarithm of one plus the indemnity limit (in yuan)
Size	The natural logarithm of total assets
MTB	The market-to-book ratio of equity
Lev	The ratio of total liabilities to total assets
ROA	The ratio of net income to total assets
Growth	The growth rate of revenue
Age	The natural logarithm of one plus years the company has listed
Top1	The proportion of shares held by the largest shareholder
Inst	The proportion of shares held by funds
Mshare	The proportion of shares held by management
SOE	The proportion of state-owned stocks
Boardsize	The natural logarithm of the number of board directors
Indep	The ratio of the number of independent directors to the number of total board directors
Dual	An indicator variable that equals one if the chairman of the board and CEO are the same person, and zero otherwise
Cross	An indicator variable that equals one if a firm is cross-listed during year t in HongKong stock exchange, and zero otherwise
AVG	The mean of D&O insurance purchased at the industry level
DA	Performance-matched discretionary accrual computed based on Kothari *et al.* (2005)
Altman	Altman's bankruptcy score, calculated as the sum of 1.2 times working capital/total assets, 1.4 times retained earnings/total assets, 3.3 times earnings before interest and taxes/total assets, 0.6 times market value equity/book value of total liabilities and one times sales/total assets for each firm-year
Big4	An indicator variable that equals one if the audit firm in year t for firm i is one of the Big four audit firms, and zero otherwise
Retvol	The standard deviation of daily stock returns for firm i in year t
Earnings	The income before extraordinary items divided by the lagged market value of equity
D	The 12-month compound return starting eight months before the year-end
R	An indicator variable that equals one when R is negative, and zero otherwise
UAC	Negative one times the ratio of non-operating accruals to total assets cumulated over the previous three years. Non-operating accruals are defined as net income plus depreciation minus cash flow from operations minus change in accounts receivable minus change in inventories minus change in prepaid expenses plus the change in accounts payable plus the change in tax payable

Table A1.
Variable definitions

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