

RESEARCH ARTICLE

Does D&O insurance mislead creditors' lending decisions? Evidence from corporate debt maturity structure

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Abstract

This study investigates whether directors' and officers' liability insurance (D&O insurance) misleads creditors' lending decisions by examining its effect on corporate debt maturity structure. We find that purchasing D&O insurance leads to increased corporate debt maturity, and this effect is more pronounced for firms with weaker corporate governance. These results suggest that creditors may view D&O insurance as an external monitoring tool that helps improve corporate governance. However, D&O insurance induces higher firm risk, but cannot help decrease agency costs or improve firm performance, that is, it results in more severe managerial opportunism. Our findings suggest that D&O insurance, to some extent, misguides creditors' lending decisions.

KEYWORDS

agency cost, corporate governance, creditors' lending decisions, D&O insurance, debt maturity structure, managerial opportunism

1 | INTRODUCTION

Directors' and officers' liability insurance (D&O insurance, hereafter), purchased by a firm to cover the potential legal costs when directors and officers are responsible for their decisions, is widely used by listed firms in common-law jurisdictions (Donelson et al., 2018; Lin et al., 2013; Zou et al., 2008). For instance, about 86% of Canadian firms carry D&O insurance (Yuan et al., 2016), and almost all of the listed firms in the U.S. purchase D&O insurance (Lin et al., 2019). However, the Chinese D&O insurance market is far less mature than that in developed countries, with the proportion of listed firms purchasing D&O insurance (insured firms, hereafter) of less than 10% before 2019. After the Luckin Coffee fraud scandal in 2020, Chinese A-share listed firms paid more and more attention to the D&O insurance policy. At the

end of 2021, the number of A-share insured firms significantly increased to 1,385, accounting for about 30% of the listed firms.¹

Although D&O insurance is quite prevalent worldwide and growing quickly in China, existing literature does not reach a consensus on whether D&O insurance helps improve corporate governance. On the one hand, some studies (Boyer & Stern, 2014; Hwang & Kim, 2018; Wang, Zhang, et al., 2020; Yuan et al., 2016) believe that D&O insurance plays a positive role in corporate governance through a 'monitoring mechanism' or 'incentive mechanism'.² On the other hand, opponents (Gillan & Panasian, 2015; Lin et al., 2011; Wang et al., 2022) argue that D&O insurance weakens the disciplinary role of litigation and induces more severe managerial opportunism ('opportunistic mechanism'), which leads to adverse consequences in many aspects (e.g., higher litigation risk,

lower labour investment efficiency, lower performance, etc).³ Moreover, D&O insurance seems to increase firms' financing costs (both debt cost and equity cost) due to the 'opportunistic mechanism' (Chen et al., 2016; Lin et al., 2013).

Despite the hot debate on the effect of D&O insurance, little work has been done to investigate stakeholders' (e.g., creditors and shareholders) reactions to D&O insurance, whose behaviours also have a significant impact on firm operations (e.g., Borochin & Yang, 2017; Lin et al., 2009; Wang, Luo, et al., 2020).⁴ Being aware that debt financing dominates firms' financing sources in China, we investigate how purchasing D&O insurance is perceived by creditors by examining the effect of purchasing D&O insurance on corporate debt maturity structure.

According to related literature (Dang & Phan, 2016; Datta et al., 2005; Rajan & Winton, 1995), short-term debt is generally granted by creditors to decrease agency costs and induce more flexible and frequent monitoring, whereas long-term debt helps firms to reduce refinancing risk and improve financing stability. Therefore, firm managers would like to use more long-term debt to escape from frequent external monitoring (Datta et al., 2005), especially when firms suffer severe financing constraints and high refinancing risk. However, firms (debt demanders) are not the only player in the debt market. Corporate debt financing and maturity structure also depend on supply-side (i.e., creditors) factors to a great extent, especially in a seller's debt market. Therefore, creditors' views towards D&O insurance can significantly affect firms' debt maturity structure. If creditors perceive D&O insurance as an effective monitoring tool that helps decrease agency costs and default risks, they can engage in less monitoring and would like to grant more long-term debt to insured firms, leading to a longer debt maturity. On the contrary, if creditors associate D&O insurance with increased managerial opportunism, they will grant more short-term debt to frequently monitor firm activities, resulting in a shorter debt maturity.

Using data on the Chinese A-share listed firms from 2005 to 2021, we first investigate creditors' views towards D&O insurance by examining the association between D&O insurance and corporate debt maturity structure. Our results show that purchasing D&O insurance is positively associated with long-term debt ratio (i.e., the ratio of long-term debt to total debt), and this association is more pronounced for firms with poorer corporate governance (e.g., firms with smaller ownership of the largest shareholder, lower institutional ownership, higher agency costs, or smaller ratio of independent directors on the board), suggesting that creditors view D&O insurance as a monitoring tool in improving corporate governance and thus grant more long-term debt to insured firms.

These results are robust to using Tobit regression and the Heckman two-stage approach based on instrumental variables.

Being aware that creditors are not always rational when making decisions (Duchin & Sosyura, 2014; Koetter & Popov, 2021; Liu et al., 2018), we then conduct some analyses to identify whether D&O insurance lives up to creditors' expectations by examining the effect of D&O insurance on several aspects of firm operations. Results show that purchasing D&O insurance cannot help decrease agency costs (measured by operating expense ratio or total asset turnover) or improve operating performance. In sharp contrast, it results in higher ROE volatility, greater EBIT volatility, lower Altman (1968) Z-score, and smaller distance to default. These results provide evidence that D&O insurance leads to more severe managerial opportunism rather than improved corporate governance, which is not aligned with creditors' expectations. Therefore, D&O insurance is more likely to 'mislead' creditors' lending decisions.

Our paper contributes to existing literature from the following aspects. First, to the best of our knowledge, this paper is the first to study the association between D&O insurance and corporate debt maturity structure. As an essential aspect of corporate finances, debt maturity structure has a great impact on firms' refinancing ability, cash flow decisions, and investment decisions (Diamond & He, 2014; Harford et al., 2014; He & Milbradt, 2016; Wang, Chiu, & King, 2020). However, there exists little evidence on the potential effect of D&O insurance on debt maturity structure. Therefore, this paper sheds light on related studies by showing that insured firms can have better access to long-term debt after purchasing D&O insurance.

Second, our paper enriches related literature on D&O insurance from the stakeholders' perspective. Previous studies on D&O insurance (e.g., Gillan & Panasian, 2015; Hwang & Kim, 2018; Wang et al., 2022; Yuan et al., 2016) mainly focus on the effect of D&O insurance on corporate governance or its financial consequences, while little work has been done to investigate stakeholders' views towards D&O insurance. We supplement related literature by showing that creditors have positive faith that purchasing D&O insurance should improve corporate governance rather than induce managerial opportunism.

Finally, our paper also has important practical implications for creditors in emerging markets. Findings of related studies based on developed markets (Boyer & Stern, 2014; Chen et al., 2016; Donelson et al., 2018; Lin et al., 2013) may not be applicable to emerging markets, as the determinants of debt maturity or borrower-lender relationships in developing countries can be very different from that in developed countries (Orman &

Köksal, 2017). According to our findings that D&O insurance has an opportunistic effect (rather than a monitoring effect) in China, creditors in emerging markets should be aware of the unintended adverse consequence of D&O insurance and make more rational credit decisions (e.g., granting less long-term debt to insured firms or increasing loan spreads for them).

The rest of this paper is organized as follows: Section 2 introduces the institutional background; Section 3 describes data and methodology; Section 4 reports main empirical results; Section 5 examines the effect of D&O insurance on some aspects of firm operations; and Section 6 concludes the paper.

2 | INSTITUTIONAL BACKGROUND

D&O insurance is widely used in developed countries (such as the United States, Canada, and Germany), but its introduction is relatively late in China. In 2002, the China Security Regulatory Commission first introduced the concept of D&O insurance in the *Code of Corporate Governance for Listed Companies*, which announced that listed companies can purchase liability insurance for directors after approval by the shareholders' meeting.⁵ However, even after this official statement, there exist no relevant regulations on information disclosure or contract structure of D&O insurance in China. As of 2019, less than 10% of Chinese A-share listed companies purchase D&O insurance, which is much smaller than that of other countries.

Although D&O insurance is not widely used in China, related discussion on its impact is heating up, especially after the financial fraud of Luckin Coffee, a China-based firm listed on NASDAQ. On 2 April 2020, Lucky Coffee confessed the fact of fabricating transactions by as much as RMB 2.2 billion in 2019. Interestingly, before going public, Luckin Coffee bought a USD 25 million D&O insurance policy from Ping An Insurance (one of the biggest insurers in China) and seven other insurance companies. After the financial fraud, Ping An Insurance received the insurance claim from Luckin Coffee. Whether such a D&O insurance contract can be claimed triggers a heated discussion.

Moreover, the 2019-revised *Securities Law of the People's Republic of China* (the new Securities Law, hereafter) finally comes into force on 1 March, 2020, which strengthens penalties for violating information disclosure regulations. Specifically, the new Securities Law increases the lower and upper limits of penalties, and it also clarifies the fault presumption and joint liability of D&Os in fraudulent issuance and illegal information disclosure.

Besides, the new Securities Law establishes a solicitation system that provides more protection for small and medium shareholders, which helps them better exercise their rights and participate in corporate governance. Furthermore, a new representative litigation system in the new Securities Law makes it easier for small and medium investors to gather up and safeguard their rights through litigation. Therefore, D&Os may also face higher litigation risks. Generally, the new Securities Law imposes a heavier burden on D&Os, which spurs the demand for D&O insurance. As shown in Figure 1, the number of firms purchasing D&O insurance reached 1385 (accounting for about 30% of the number of listed firms) in 2021, or a remarkable increase of 337% from 317 in 2019.

3 | DATA AND METHODOLOGY

3.1 | Data and sample selection

Our sample consists of listed firms in the Chinese A-share stock market, with the sample period running from 2005 to 2021. Information on D&O insurance purchase and financial reports is retrieved from the China Stock Market & Accounting Research Database (CSMAR), a widely-used financial database in related studies (e.g., Liu et al., 2018; Wei et al., 2022; Yuan et al., 2016). We then exclude financial firms which have particularity in capital structure. As special-treated (S.T.) firms may have abnormal financial conditions, we also eliminate samples of these firms. After excluding firm-year observations with missing data or firms with records of less than 3 years, we get a final sample of 22,217 firm-year observations during our sample period.

3.2 | Measure of corporate debt maturity structure

As the Chinese debt market is primarily a sellers' market and corporate debt maturity structure primarily depends on supply-side factors, the change in corporate debt maturity structure after purchasing D&O insurance can be used to capture creditors' views towards D&O insurance. Following Ben-Nasr et al. (2015) and Chen et al. (2021), we first use the ratio of long-term debt to total debt as a measure of debt maturity structure (*MA1*). Based on El Ghouli et al. (2016) and Wang, Chiu, and King (2020), we also use the ratio of non-current liabilities to total liabilities as another proxy (*MA2*).⁶ Accordingly, firms with greater *MA1* or *MA2* have longer debt maturity, indicating better access to long-term debt.

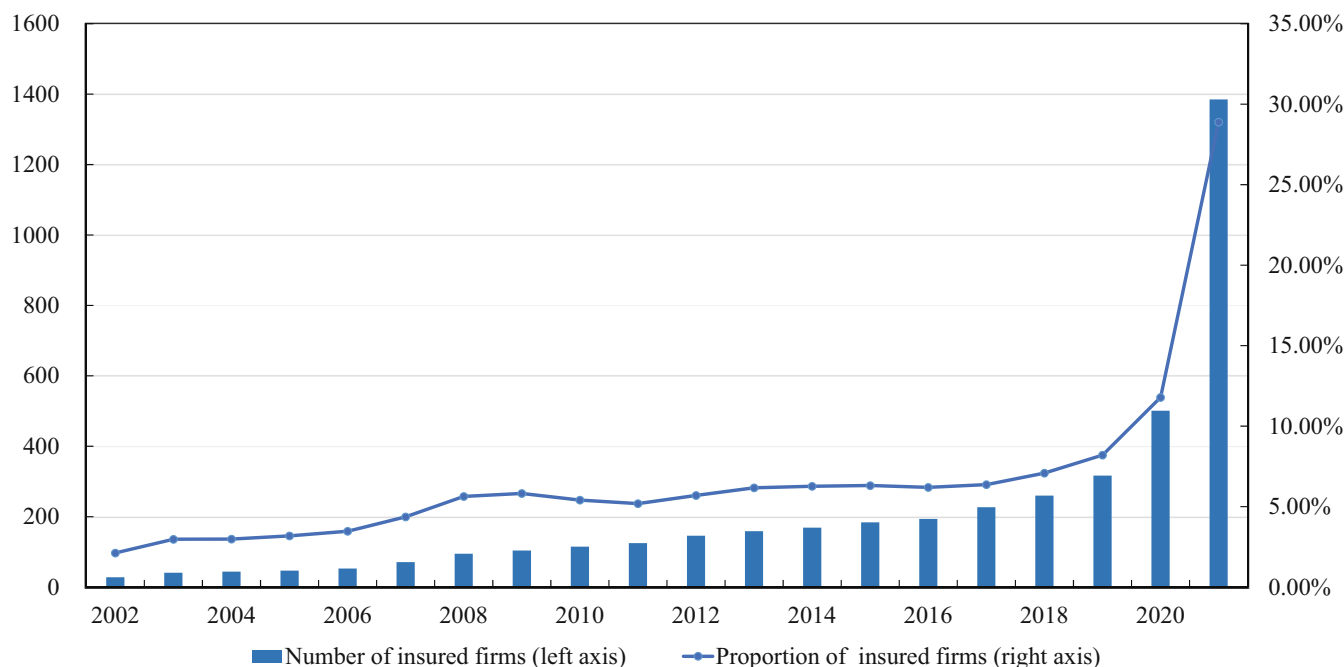


FIGURE 1 Development of D&O insurance in China. This figure shows the development of D&O insurance in China from 2002 to 2021. ‘Number of insured firms’ is the number of Chinese A-share listed firms that purchase D&O insurance. ‘Proportion of insured firms’ is the ratio of the ‘Number of insured firms’ to the number of listed firms in the Chinese A-share stock market at the end of each year. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1002/jie.2885)]

3.3 | Model specification

Creditors play an essential role in the Chinese debt market, and corporate debt maturity structure mainly depends on supply-side factors.⁷ Therefore, how creditors perceive D&O insurance would strongly impact the debt maturity structure of insured firms. If creditors view D&O insurance as an effective corporate governance tool that substitutes for the monitoring role of short-term debt, they can engage in less monitoring and would grant more long-term debt to insured firms, leading to a longer debt maturity. In contrast, if creditors view D&O insurance as an opportunistic factor, they would provide more short-term debt to frequently monitor D&Os’ behaviours, resulting in a shorter debt maturity for insured firms.

We conduct the following model to investigate how creditors react to D&O insurance by examining the association between purchasing D&O insurance and debt maturity structure:

$$MA_{i,t+1} = \beta_0 + \beta_1 Insured_{i,t} + \gamma Control_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where $MA_{i,t+1}$ is the measure of corporate debt maturity structure, which can be $MA1_{i,t+1}$ or $MA2_{i,t+1}$; and $Insured_{i,t}$ is a dummy variable, which equals one if firm i purchases D&O insurance at year t and 0 otherwise (Wang, Zhang, et al., 2020; Yuan et al., 2016; Zou

et al., 2008). In this model, a significant and positive β_1 would suggest that creditors perceive D&O insurance as an effective corporate governance tool and thus grant more long-term debt to insured firms. In contrast, a significant and negative β_1 may imply that creditors associate D&O insurance with increased managerial opportunism and therefore use more short-term debt to monitor D&Os’ behaviours.

Following previous studies (Boubaker et al., 2019; Dang & Phan, 2016; Díaz-Díaz et al., 2016; Shahzad et al., 2021), we also account for the following firm characteristics that may be related to corporate debt maturity structure, including: (1) Tobin’s Q ratio (*Tobin*), computed as the ratio of book value of assets plus market value of common equity minus the book value of common equity to the value of total assets; (2) market-to-book ratio (*MB*); (3) firm nature (*SOE*), which equals one for a state-owned enterprise and 0 otherwise; (4) a dummy variable *Big4*, indicating whether auditor comes from big four accounting firms; (5) managerial stock ownership (*ManaOwn*), computed as the sum of common and restricted stock shares owned by executives scaled by shares outstanding; (6) debt to asset ratio (*Leverage*); (7) return on asset (*ROA*); (8) return on equity (*ROE*); (9) the annual firm asset growth rate (*SizeGrowth*), calculated as the year-on-year percentage change in total assets; (10) asset structure (*PPE*), computed as the ratio

of property, plant, and equipment to total assets; and (11) ownership of the largest shareholder (*Largest*), computed as the ratio of shares held by the largest shareholder to total shares. We also include firm- and year-fixed effects and use robust standard errors in Model (1). Definitions of all variables used in this paper are presented in Appendix A.

4 | MAIN EMPIRICAL RESULTS

4.1 | Descriptive statistics

Panel A in Table 1 presents summary statistics for the main variables used in Model (1).⁸ The mean value of *Insured* (0.058) is much smaller than that in the United States or Canada (Donelson et al., 2018; Lin et al., 2011), suggesting that D&O insurance is not so popular in China. The ratio of long-term debt to total debt (*MA1*) has a mean value of 0.162, and the mean value of the ratio of non-current liabilities to total liabilities (*MA2*) is 0.199. These results are quite similar to that of Zhang and Xu (2021). To address the interference of outliers, we winsorize all the continuous variables at the 1st and 99th percentiles when conducting regression analysis.

4.2 | Effect of D&O insurance on debt maturity structure

We first conduct a univariate analysis to compare the difference in debt maturity structure between insured and uninsured firms. Panel B in Table 1 shows the results of univariate analysis. The mean value of *MA1* for insured firms is 0.189, which is significantly greater than that for uninsured firms (0.159) at the 1% significance level. In addition, the mean value of *MA2* for insured firms is 0.231, also statistically significantly greater than that for uninsured firms (0.196). These results suggest that insured firms have better access to long-term debt, which provides intuitive evidence that creditors may perceive D&O insurance as an effective corporate governance tool and thus provide more long-term debt for insured firms. Of course, these results are only suggestive. We then perform several rigorous tests to identify creditors' views towards D&O insurance by examining the association between D&O insurance and debt maturity structure.

Table 2 reports the estimation results of Model (1). Columns 1 and 3 (Columns 2 and 4) use *MA1* (*MA2*) to measure debt maturity structure. We do not include control variables in Columns 1 and 2 but control other factors in Columns 3 and 4. As shown in Table 2, the

coefficient on *Insured_{it}* is significantly positive at the 5% significance level in Columns 1–4, indicating that insured firms are able to acquire more long-term debt after purchasing D&O insurance.⁹ In addition, our sample may include firms that bought D&O insurance before 2005 and have no variation in the value of *Insured* over the sample period, which may bias the estimated coefficient on *Insured*. We then exclude insured firms with no variation in *Insured*, re-estimate Model (1), and report regression results in Columns 5 and 6 of Table 2. Consistent with that in Columns 1–4, the coefficient on *Insured_{it}* is also positive and significant. Collectively, regression results in Table 2 provide strong evidence that purchasing D&O insurance leads to longer debt maturity.¹⁰

The effect of purchasing D&O insurance on debt maturity structure is also economically significant. For example, the coefficient on *Insured_{it}* is 0.021 in Column 4 of Table 2, implying that insured firms experience an increase of more than 10.5% (relative to the mean) in long-term debt ratio proxied by *MA2* after purchasing D&O insurance. According to our discussion in previous sections, these results suggest that creditors view D&O insurance as an effective external monitoring tool and thus grant more long-term debt to insured firms.

Notably, the coefficients on control variables in Table 2 are also consistent with previous studies (Datta et al., 2005; Díaz-Díaz et al., 2016; Ozkan, 2000), showing that firms with higher leverage, greater ROE, and higher market-to-book ratio have longer debt maturity.

4.3 | Effect of corporate governance on the association between D&O insurance and debt maturity structure

If creditors grant more long-term debt to insured firms because they perceive D&O insurance as an external monitoring role that alleviates agency problems, the positive association between D&O insurance and long-term debt ratio should be more pronounced for firms with poorer corporate governance.

Following related literature (Ang et al., 2000; Chen et al., 2007; Jiang & Kim, 2020; Obeng et al., 2020; Singh & Davidson Iii, 2003), we conduct four measures to reflect corporate governance from different aspects, including (1) ownership of the largest shareholder (*Largest*); (2) institutional ownership (*InstiOwn*), calculated as the ratio of shares owned by institutional investors to total shares; (3) operating expense ratio (*GAExp*), computed as the ratio of general and administrative expenses to annual sales, which reflects the efficiency that managers control 'excessive perquisite consumption and other direct agency costs' (Du et al., 2017); and (4) the

TABLE 1 Descriptive statistics for main variables.

Panel A: Summary statistics						
Variable	N	Mean	SD	Min	P50	Max
<i>Insured</i>	22,217	0.058***	0.234	0.000	0.000	1.000
<i>MA1</i>	22,217	0.162***	0.175	0.000	0.103	0.714
<i>MA2</i>	22,217	0.199***	0.180	0.000	0.148	0.744
<i>Tobin</i>	22,217	1.845***	1.113	0.855	1.476	7.883
<i>MB</i>	22,217	0.666***	0.247	0.127	0.677	1.169
<i>SOE</i>	22,217	0.500***	0.500	0.000	0.000	1.000
<i>Big4</i>	22,217	0.038***	0.192	0.000	0.000	1.000
<i>ManaOwn</i>	22,217	0.027***	0.078	0.000	0.000	0.438
<i>Leverage</i>	22,217	0.512***	0.186	0.113	0.514	0.999
<i>ROA</i>	22,217	0.022***	0.073	−0.495	0.026	0.181
<i>ROE</i>	22,217	0.023***	0.248	−1.781	0.058	0.349
<i>SizeGrowth</i>	22,217	0.164***	0.377	−0.443	0.084	2.518
<i>PPE</i>	22,217	0.247***	0.179	0.002	0.215	0.744
<i>Largest</i>	22,217	0.301***	0.169	0.050	0.289	0.743
Panel B: Univariate analysis						
Variable	Uninsured firms		Insured firms		Difference	
	(1) N	(2) Mean	(3) N	(4) Mean	(2)−(4) Mean	t-Value
<i>MA1</i>	20,325	0.159	1892	0.189	−0.030	−7.134***
<i>MA2</i>	20,325	0.196	1892	0.231	−0.034	−7.961***
<i>Tobin</i>	20,325	1.858	1892	1.711	0.147	5.483***
<i>MB</i>	20,325	0.662	1892	0.711	−0.049	−8.241***
<i>SOE</i>	20,325	0.491	1892	0.591	−0.100	−8.360***
<i>Big4</i>	20,325	0.033	1892	0.098	−0.066	−14.301***
<i>ManaOwn</i>	20,325	0.028	1892	0.016	0.012	6.170***
<i>Leverage</i>	20,325	0.510	1892	0.540	−0.030	−6.691***
<i>ROA</i>	20,325	0.022	1892	0.018	0.004	2.371***
<i>ROE</i>	20,325	0.023	1892	0.013	0.011	1.801**
<i>SizeGrowth</i>	20,325	0.166	1892	0.146	0.020	2.165**
<i>PPE</i>	20,325	0.249	1892	0.228	0.021	4.914***
<i>Largest</i>	20,325	0.300	1892	0.317	−0.017	−4.156***

Note: Panel A reports the summary statistics for variables used in Model (1). Panel B presents the results of univariate analysis, which shows differences in mean values of main variables for the uninsured firms (i.e., firms with *Insured* = 0) and insured firms (i.e., firms with *Insured* = 1). The sample covers 22,217 firm-year observations in the Chinese A-share stock market from 2005 to 2021. Variable definitions are presented in Appendix A. *t*-Value is the *t* statistic for the one-sided test. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

ratio of independent directors on the board (*IndDir*). Accordingly, firms with smaller *Largest*, lower *InstiOwn*, greater *GAExp*, or smaller *IndDir* are more likely to have poorer corporate governance.

We then generate four dummy variables to denote firms with poor corporate governance (*PoCG*) based on

the industry median value. Specifically, *LowLar* (*LowInsti*) equals one if *Largest* (*InstiOwn*) is below its yearly industrial median and 0 otherwise; *HigGAE* equals one if *GAExp* is above its yearly industrial median each year and 0 otherwise; *LowInd* equals one if *IndDir* is below its yearly industrial median each year and 0 otherwise.

TABLE 2 Baseline regressions of D&O insurance and debt maturity structure.

	(1) <i>MA1</i> _{<i>i,t</i>+1}	(2) <i>MA2</i> _{<i>i,t</i>+1}	(3) <i>MA1</i> _{<i>i,t</i>+1}	(4) <i>MA2</i> _{<i>i,t</i>+1}	(5) <i>MA1</i> _{<i>i,t</i>+1}	(6) <i>MA2</i> _{<i>i,t</i>+1}
<i>Insured</i> _{<i>i,t</i>}	0.013** (0.007)	0.022*** (0.007)	0.013** (0.006)	0.021*** (0.007)	0.012* (0.007)	0.021*** (0.007)
<i>Tobin</i> _{<i>i,t</i>}			−0.003 (0.002)	−0.002 (0.002)	−0.003* (0.002)	−0.003 (0.002)
<i>MB</i> _{<i>i,t</i>}			0.039*** (0.009)	0.029*** (0.009)	0.039*** (0.009)	0.027*** (0.010)
<i>SOE</i> _{<i>i,t</i>}			0.016*** (0.005)	0.010* (0.005)	0.015*** (0.005)	0.009 (0.005)
<i>Big4</i> _{<i>i,t</i>}			−0.006 (0.008)	0.000 (0.009)	−0.005 (0.008)	0.002 (0.009)
<i>ManaOwn</i> _{<i>i,t</i>}			−0.011 (0.022)	−0.033 (0.023)	−0.013 (0.023)	−0.035 (0.023)
<i>Leverage</i> _{<i>i,t</i>}			0.083*** (0.009)	0.051*** (0.010)	0.084*** (0.009)	0.052*** (0.010)
<i>ROA</i> _{<i>i,t</i>}			−0.033 (0.025)	−0.043 (0.028)	−0.038 (0.025)	−0.044 (0.029)
<i>ROE</i> _{<i>i,t</i>}			0.043*** (0.007)	0.026*** (0.008)	0.046*** (0.007)	0.028*** (0.008)
<i>SizeGrowth</i> _{<i>i,t</i>}			0.029*** (0.003)	0.031*** (0.003)	0.029*** (0.003)	0.030*** (0.003)
<i>PPE</i> _{<i>i,t</i>}			−0.006 (0.013)	−0.011 (0.013)	−0.007 (0.013)	−0.012 (0.013)
<i>Largest</i> _{<i>i,t</i>}			0.045*** (0.009)	0.045*** (0.009)	0.045*** (0.009)	0.045*** (0.009)
Firm effect	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,217	22,217	22,217	22,217	21,746	21,746
Adj. R ²	0.559	0.556	0.571	0.564	0.567	0.560

Note: This table reports results of the association between D&O insurance and debt maturity structure. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Therefore, firms with *LowLar*, *LowInsti*, *HigGAE*, or *LowInd* equal to one may have weaker corporate governance. Finally, we conduct the following regression to examine whether the effect of D&O insurance on long-term debt ratio is more pronounced for firms with poorer governance:

$$MA_{i,t+1} = \beta_0 + \beta_1 Insured_{i,t} + \beta_2 PoCG_{i,t} + \beta_3 Insured_{i,t} \times PoCG_{i,t} + \gamma Control_{i,t} + \varepsilon_{i,t} \quad (2)$$

where *PoCG* is the dummy variable indicating firms with poorer corporate governance, which can be *LowLar*, *LowInsti*, *HigGAE*, or *LowInd*; other variables are the same as

those in Model (1). Notably, we also control firm- and year-fixed effects in Model (2). In this specification, a significantly positive β_3 would suggest that the positive association between D&O insurance and long-term debt ratio is more salient for firms with weaker corporate governance, which can provide supportive evidence that creditors perceive D&O insurance as an external monitoring role and thus grant more long-term debt to insured firms.

Panels A and B in Table 3 report regression results of Model (2) using *MA1* and *MA2* as measures of debt maturity structure, respectively. Columns 1–4 use *LowLar*, *LowInsti*, *HigGAE*, or *LowInd* as poor governance dummies (*PoCG*), respectively. As shown, the coefficient on the

TABLE 3 Effect of corporate governance on the association between D&O insurance and debt maturity structure.

	(1) <i>PoCG = LowLar</i>	(2) <i>PoCG = LowInsti</i>	(3) <i>PoCG = HigGAE</i>	(4) <i>PoCG = LowInd</i>
Panel A: $MA1_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.018* (0.009)	0.024*** (0.009)	0.017** (0.009)	0.030*** (0.011)
$Insured_{i,t}$	0.004 (0.007)	0.003 (0.007)	0.005 (0.007)	0.003 (0.007)
$PoCG_{i,t}$	-0.002 (0.003)	-0.001 (0.003)	0.012*** (0.002)	-0.003 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,217	22,217	22,217	22,217
Adj. R^2	0.571	0.571	0.572	0.571
Panel B: $MA2_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.020** (0.010)	0.016* (0.009)	0.017* (0.009)	0.024** (0.010)
$Insured_{i,t}$	0.012 (0.007)	0.015** (0.007)	0.013* (0.007)	0.014* (0.007)
$PoCG_{i,t}$	-0.002 (0.003)	-0.001 (0.003)	0.018*** (0.003)	-0.004 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,217	22,217	22,217	22,217
Adj. R^2	0.564	0.564	0.565	0.564

Note: Panels A and B show regression results for Model (2) using $MA1$ and $MA2$ as proxies for debt maturity structure, respectively. $PoCG$ is a dummy variable, which equals 1 for firms with poorer corporate governance and 0 otherwise. Definitions of other variables are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant, control variables, and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

interaction term between $Insured$ and $PoCG$ is statistically significantly positive in each column of Table 3, suggesting that the positive association between D&O insurance and debt maturity structure is more pronounced for firms with poorer governance. This finding supports our hypothesis that creditors view D&O insurance as an effective external monitoring role in corporate governance and thus provide more long-term debt to insured firms.

4.4 | Robustness tests

4.4.1 | Tobit model

As our measures of debt maturity structure (i.e., $MA1$ and $MA2$) are censored at 0 or 1, we then adopt the Tobit

regression method to re-estimate our baseline regression and present estimation results for Model (1) in Column 1 of Table 4. Similar to that in Table 2, the coefficient on $Insured_{i,t}$ remains significantly positive in Panels A and B using either $MA1$ or $MA2$ as measure of debt maturity structure, strongly suggesting that purchasing D&O insurance results in increased long-term debt ratio (i.e., debt maturity).

In addition, we run Tobit regression for Model (2) as in Table 3 and report estimation results in Columns 2–5 of Table 4 using $LowLar$, $LowInsti$, $HigGAE$, or $LowInd$ as poor governance dummy ($PoCG$). Consistent with results in Table 3, the coefficient on $Insured_{i,t} \times PoCG_{i,t}$ is positive in each column and is statistically significant in almost all columns of Table 4 (except Column 4 in Panel A), also showing that the positive association between

TABLE 4 Tobit regression results.

	(1)	(2) <i>PoCG = LowLar</i>	(3) <i>PoCG = LowInsti</i>	(4) <i>PoCG = HigGAE</i>	(5) <i>PoCG = LowInd</i>
Panel A: $MA1_{i,t+1}$ as dependent variable					
<i>Insured_{i,t}</i>	0.011* (0.007)	0.002 (0.008)	0.001 (0.008)	0.005 (0.008)	0.002 (0.008)
<i>Insured_{i,t} × PoCG_{i,t}</i>		0.019* (0.010)	0.026*** (0.009)	0.015 (0.009)	0.031*** (0.010)
<i>PoCG_{i,t}</i>		−0.001 (0.003)	−0.003 (0.003)	0.013*** (0.003)	−0.003 (0.003)
Controls	Yes	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes
Observations	22,217	22,217	22,217	22,217	22,217
Panel B: $MA2_{i,t+1}$ as dependent variable					
<i>Insured_{i,t}</i>	0.020*** (0.006)	0.011 (0.008)	0.014* (0.007)	0.012* (0.007)	0.013* (0.007)
<i>Insured_{i,t} × PoCG_{i,t}</i>		0.020** (0.010)	0.017* (0.009)	0.017** (0.009)	0.024*** (0.009)
<i>PoCG_{i,t}</i>		−0.002 (0.003)	−0.002 (0.002)	0.019*** (0.002)	−0.004 (0.002)
Controls	Yes	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes
Observations	22,217	22,217	22,217	22,217	22,217

Note: This table reports Tobit regression results for Model (1) and Model (2). Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant, control variables, and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

purchasing D&O insurance and debt maturity structure is more salient for firms with weaker corporate governance. These results reinforce our core hypothesis that creditors perceive D&O insurance as an effective tool in improving corporate governance and thus grant more long-term loans to insured firms.

4.4.2 | Heckman two-stage approach

To address the potential self-selection bias problem, we also adopt the Heckman two-stage approach. Specifically, we estimate the following Probit regression in the first stage:

$$\Pr(\text{Insured}_{i,t+1}) = \beta_0 + \beta_1 IV_{i,t} + \gamma \text{Controls} + \varepsilon_{i,t}, \quad (3)$$

where $\text{Insured}_{i,t+1}$ is the dummy variable used in our baseline regression, indicating whether firm i purchases

D&O insurance at year $t + 1$. Following Li et al. (2022), we use two instrumental variables (IV), including (1) $\text{Distance}_{i,t}$, defined as the natural logarithm of one plus the distance between firm i 's headquarter and its nearest airport at year t ; and (2) $\text{InsRatio}_{i,t}$, computed as the natural logarithm of the ratio of total sales volume (divided by 1000) of insurance products in the province where firm i is headquartered to the population of the province.¹¹ Accordingly, Distance (InsRatio) is negatively (positively) related to Insured but unrelated to corporate debt maturity structure and thus can serve as a good instrumental variable.

In addition, we follow Jia and Tang (2018) and Yuan et al. (2016) and use the following factors as control variables (*Controls*) in Model (3), including *MB*, *SOE*, *Mana-Own*, *Leverage*, *SizeGrowth*, *PPE*, *Age*, and *Largest* defined in Section 3.3. We also account for some additional factors that may be related to D&O insurance purchase decisions, including (1) the ratio of independent directors

on the board (*IndDir*); (2) a dummy variable (*Violation*), which equals one when a firm has violation record and 0 otherwise; and (3) the amount of related party transactions divided by total assets (*Related*). Following Li et al. (2022) and Yuan et al. (2016), we also include industry- and year-fixed effects in Model (3).¹²

We then calculate the Inverse Mills Ratio (*IMR*) from Model (3) and conduct the Heckman second-stage regression by adding *IMR* to the baseline Model (1) with firm- and year-fixed effects. Table 5 reports the estimation results of Heckman two-stage regression using *Distance* as instrumental variable. Column 1 presents the results of the first-stage regression. As expected, the coefficient on *Distance* is statistically significantly negative, indicating that firms close to airports have better access to financial products like D&O insurance (Li et al., 2022). Columns 2 and 3 in Table 5 reflect the results of the second-stage regression using *MA1* and *MA2* as measures of debt maturity structure, respectively. As shown, the coefficient on *Insured* remains positive and significant in Columns 2 and 3, suggesting that purchasing D&O insurance increases the long-term debt ratio. Results using *InsRatio* as an instrumental variable are reported in Appendix C, which also shows a similar pattern. Therefore, our baseline results still hold after considering the potential self-selection bias.¹³

In addition, we run Heckman two-stage regressions for Model (2) as in Table 3 and report estimation results of the second stage using *Distance* as instrumental variable in Table 6. Panels A and B in Table 6 use *MA1* and *MA2* as measures of debt maturity structure, respectively. As shown, the coefficient on the interaction term between *Insured* and *PoCG* (i.e., poor governance dummy) remains positive and significant, which is consistent with the results in Table 3. Thus, these results also suggest that the effect of D&O insurance on debt maturity structure is more salient for firms with poorer corporate governance.¹⁴ In sum, regression results based on Heckman two-stage approach further enhance the robustness of our main findings that creditors perceive D&O insurance as an effective corporate-governance tool and thus grant more long-term loans to insured firms.

5 | EFFECT OF D&O INSURANCE ON FIRM OPERATIONS

In Section 4, we show that D&O insurance is positively associated with corporate debt maturity structure, as creditors may view D&O insurance as an external monitoring role in corporate governance. However, creditors are not always rational when making decisions. Factors

such as government intervention, political connection, and information asymmetry may affect the quality of credit lending decisions (Akins et al., 2017; Duchin & Sosyura, 2014; Koetter & Popov, 2021; Liu et al., 2018; Mirzaei et al., 2021). For example, creditors sometimes have no advantage in assessing information related to firms' repayment ability and operating conditions (Agarwal & Hauswald, 2010; Berger et al., 2017; Steijvers & Voordeckers, 2009), and thus may misjudge firms' profitability or default risks when making lending decisions.

As D&O insurance is not so widely used by the Chinese listed firms, creditors in China may misestimate the effect of D&O insurance and make biased lending decisions of providing more long-term debts to insured firms. In this section, we examine whether D&O insurance meets creditors' expectations by investigating its effect on firm operations from many aspects (including agency costs, firm risk, and firm performance).

5.1 | Effect of D&O insurance on agency costs

If D&O insurance plays an effective monitoring role in corporate governance as expected by creditors, D&O insurance should help mitigate the agency problem and reduce firm agency costs. In addition to the operating expense ratio (*GAExpRatio*) used in Section 4.3, we also follow Ang et al. (2000) and Obeng et al. (2020) and use total asset turnover (*AssetTurnover*, computed as the ratio of annual sales to total assets) as another measure of agency costs. Accordingly, more self-interest managers may exert less effort in generating sales, leading to decreased total asset turnover (Ang et al., 2000). Therefore, a smaller *AssetTurnover* would suggest more severe agency conflicts and higher agency costs.

We then use the following model to examine the effect of D&O insurance on firm agency costs:

$$AC_{i,t+1} = \beta_0 + \beta_1 Insured_{i,t} + \gamma Control_{i,t} + \varepsilon_{i,t}, \quad (4)$$

where the dependent variable ($AC_{i,t+1}$) is the measure of agency cost, which can be $GAExpRatio_{i,t+1}$ or $AssetTurnover_{i,t+1}$. Following related literature (Belghitar & Clark, 2015; Du et al., 2017; Rashid, 2015), we control for *Largest*, *InstiOwn*, *Leverage*, *SizeGrowth*, *Age*, *SOE*, *Big4*, *ROA*, and *ROE* defined in previous sections. In addition, we account for some other variables that may be related to firm agency costs, including (1) the total number of directors on the board (*Board*); and (2) a dummy variable indicating whether the CEO is also board chairman (*Duality*). Finally, we include firm- and year-fixed effects to control for unobservable factors that may affect agency costs.

TABLE 5 Regressions results of Heckman two-stage approach.

Step one		Step two		
	(1) <i>Insured_{i,t+1}</i>		(2) <i>MA1_{i,t+1}</i>	(3) <i>MA2_{i,t+1}</i>
<i>Distance_{i,t}</i>	−0.001** (0.000)	<i>Insured_{i,t}</i>	0.015** (0.008)	0.024*** (0.008)
<i>MB_{i,t}</i>	−0.013 (0.067)	<i>Tobin_{i,t}</i>	−0.003 (0.002)	−0.002 (0.002)
<i>SOE_{i,t}</i>	0.255*** (0.031)	<i>MB_{i,t}</i>	0.040*** (0.009)	0.029*** (0.009)
<i>ManaOwn_{i,t}</i>	−1.169*** (0.238)	<i>SOE_{i,t}</i>	0.016*** (0.005)	0.010* (0.005)
<i>Leverage_{i,t}</i>	0.377*** (0.079)	<i>Big4_{i,t}</i>	−0.008 (0.008)	−0.003 (0.009)
<i>SizeGrowth_{i,t}</i>	0.055 (0.036)	<i>ManaOwn_{i,t}</i>	−0.011 (0.022)	−0.033 (0.023)
<i>PPE_{i,t}</i>	−0.274*** (0.096)	<i>Leverage_{i,t}</i>	0.082*** (0.009)	0.050*** (0.010)
<i>Age_{i,t}</i>	0.012*** (0.003)	<i>ROA_{i,t}</i>	−0.032 (0.025)	−0.043 (0.029)
<i>Largest_{i,t}</i>	0.001 (0.001)	<i>ROE_{i,t}</i>	0.043*** (0.007)	0.026*** (0.008)
<i>IndDir_{i,t}</i>	0.455** (0.231)	<i>SizeGrowth_{i,t}</i>	0.030*** (0.003)	0.031*** (0.003)
<i>Violation_{i,t}</i>	0.026 (0.040)	<i>PPE_{i,t}</i>	−0.004 (0.013)	−0.009 (0.013)
<i>Related_{i,t}</i>	0.001 (0.003)	<i>Largest_{i,t}</i>	0.045*** (0.009)	0.045*** (0.009)
		<i>IMR_{i,t}</i>	−0.002 (0.003)	−0.002 (0.003)
Industry effect	Yes	Firm effect	Yes	Yes
Year effect	Yes	Year effect	Yes	Yes
Observations	22,107	Observations	22,107	22,107
Pseudo R ²	0.135	Adj. R ²	0.571	0.254

Note: This table shows regression results based on the Heckman two-stage approach using the distance (*Distance*) between firm headquarter and airport as instrumental variable. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 7 reports regression results of Model (4). We use *GAExpRatio* (*AssetTurnover*) as a proxy for agency costs in Columns 1 and 3 (Columns 2 and 4). As shown, the coefficient on *Insured* is insignificant in each column of Table 7, indicating that purchasing D&O insurance is not associated with decreased agency costs. These results provide evidence that D&O insurance cannot significantly improve corporate governance, which does not align with creditors' expectations that D&O insurance plays an external

monitoring role. Therefore, D&O insurance, to some extent, misleads creditors' lending decisions.

5.2 | Effect of D&O insurance on firm risk

According to related literature (Chung & Wynn, 2008; Jia & Tang, 2018; Lin et al., 2019; Wang et al., 2022),

TABLE 6 Heckman two-stage regression results.

	(1) <i>PoCG = LowLar</i>	(2) <i>PoCG = LowInsti</i>	(3) <i>PoCG = HigGAE</i>	(4) <i>PoCG = LowInd</i>
Panel A: $MA1_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.020** (0.010)	0.024*** (0.009)	0.017** (0.009)	0.030*** (0.011)
$Insured_{i,t}$	0.014* (0.008)	0.005 (0.008)	0.007 (0.008)	0.005 (0.008)
$PoCG_{i,t}$	−0.002 (0.003)	−0.002 (0.003)	0.012*** (0.002)	−0.002 (0.003)
$IMR_{i,t}$	−0.002 (0.003)	−0.002 (0.003)	−0.001 (0.003)	−0.002 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,107	22,107	22,107	22,107
Adj. R^2	0.564	0.571	0.572	0.571
Panel B: $MA2_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.018* (0.009)	0.017* (0.009)	0.017* (0.009)	0.024** (0.010)
$Insured_{i,t}$	0.006 (0.008)	0.017** (0.008)	0.015* (0.008)	0.016* (0.008)
$PoCG_{i,t}$	−0.002 (0.003)	−0.002 (0.003)	0.018*** (0.003)	−0.004 (0.003)
$IMR_{i,t}$	−0.002 (0.003)	−0.002 (0.003)	−0.002 (0.003)	−0.002 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,107	22,107	22,107	22,107
Adj. R^2	0.571	0.564	0.565	0.564

Note: This table shows regression results of Model (2) based on the Heckman two-stage approach using the distance (*Distance*) between firm headquarter and airport as instrumental variable. Definitions of variables are presented in Appendix A. Robust standard errors are in parentheses. We do not report the regression results of step one to save space. Coefficients on constant, control variables, and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

D&O insurance can have a harmful impact on firm operations through the ‘opportunistic mechanism’. Specifically, D&O insurance may weaken the disciplinary role of litigation, aggravate moral hazard of the management, and thus enable insured firms to take more risk when making investment decisions. Such an opportunistic mechanism would also disappoint creditors’ expectations of D&O insurance.

To examine this conjecture, we follow Chen et al. (2016) and Lin et al. (2013) and investigate the effect of D&O insurance on firm risk. Following related literature (Bartram et al., 2011; Faccio et al., 2016; John et al., 2008;

Luo et al., 2022), we use four measures of firm risk, including (1) the standard deviation of industry-adjusted ROE from year t to year $t + 2$ (*adjROEVOL*); (2) the standard deviation of industry-adjusted EBIT scaled by total assets from year t to $t + 2$ (*adjEBITVol*); (3) financial distress, inversely measured by Altman (1968) Z-score (*ZScore*); and (4) distance to default calculated using Moody’s KMV model (*DD*). Accordingly, higher *adjROEVOL*, greater *adjEBITVol*, smaller *ZScore*, or lower *DD* means a higher level of corporate risk-taking. Then, we conduct the following model to examine the association between D&O insurance and firm risk:

TABLE 7 Effect of D&O insurance on agency costs

	(1) <i>GAExpRatio</i> _{<i>i,t</i>+1}	(2) <i>AssetTurnover</i> _{<i>i,t</i>+1}	(3) <i>GAExpRatio</i> _{<i>i,t</i>+1}	(4) <i>AssetTurnover</i> _{<i>i,t</i>+1}
<i>Insured</i> _{<i>i,t</i>}	0.001 (0.003)	0.004 (0.018)	0.003 (0.003)	0.004 (0.018)
<i>Largest</i> _{<i>i,t</i>}			−0.001*** (0.000)	−0.001 (0.000)
<i>InstiOwn</i> _{<i>i,t</i>}			−0.022** (0.008)	0.003 (0.023)
<i>Leverage</i> _{<i>i,t</i>}			−0.031*** (0.008)	0.120*** (0.021)
<i>SizeGrowth</i> _{<i>i,t</i>}			−0.011*** (0.002)	−0.012* (0.006)
<i>Age</i> _{<i>i,t</i>}			−0.004*** (0.000)	−0.003*** (0.001)
<i>SOE</i> _{<i>i,t</i>}			−0.015** (0.006)	0.005 (0.011)
<i>Big4</i> _{<i>i,t</i>}			−0.005 (0.003)	−0.005 (0.015)
<i>ROA</i> _{<i>i,t</i>}			−0.044 (0.032)	0.146** (0.059)
<i>ROE</i> _{<i>i,t</i>}			−0.049*** (0.010)	0.040** (0.017)
<i>Board</i> _{<i>i,t</i>}			−0.001 (0.001)	−0.004* (0.002)
<i>Duality</i> _{<i>i,t</i>}			−0.004* (0.002)	−0.002 (0.007)
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,212	22,215	22,212	22,215
Adj. <i>R</i> ²	0.452	0.735	0.475	0.736

Note: This table shows the association between D&O insurance and agency costs. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

$$Risk_{i,t+1} = \beta_0 + \beta_1 Insured_{i,t} + \gamma Control_{i,t} + \varepsilon_{i,t}, \quad (5)$$

where the dependent variable (*Risk*_{*i,t*+1}) is the firm-risk measure, which can be *adjROEVol*_{*i,t*+1}, *adjEBITVol*_{*i,t*+1}, *ZScore*_{*i,t*+1}, or *DD*. Following previous studies (Faccio et al., 2016; Luo et al., 2022; Song et al., 2021), we also include *MB*, *Leverage*, *Age*, *ManaOwn*, *SizeGrowth*, *SOE*, and *Big4* as well as firm- and year-fixed effects in Model (5).

The estimated results for Model (5) are reported in Table 8. Columns 1–4 use *adjROEVol*, *adjEBITVol*, *ZScore*, and *DD* as proxies for firm risk, respectively. As

Table 8 shows, the coefficient on *Insured* is positive in Columns 1 and 2 and statistically significant in Column 2. In addition, the coefficient on *Insured* is statistically significantly negative in Columns 3 and 4. These results suggest that purchasing D&O insurance is associated with higher firm risk (i.e., greater EBIT volatility, lower Altman (1968) Z-score, and smaller distance to default). Therefore, D&O insurance tends to induce more severe managerial opportunism, which does not advocate creditors' views towards D&O insurance. In sum, D&O insurance is more likely to misguide creditors' lending decisions.

TABLE 8 Effect of D&O insurance on firm risk

	(1) <i>adjROEVOL_{i,t+1}</i>	(2) <i>adjEBITVOL_{i,t+1}</i>	(3) <i>ZScore_{i,t+1}</i>	(3) <i>DD_{i,t+1}</i>
<i>Insured_{i,t}</i>	0.003 (0.011)	0.083** (0.034)	−0.236* (0.135)	−0.440** (0.210)
<i>MB_{i,t}</i>	0.025*** (0.009)	0.088*** (0.021)	−4.487*** (0.226)	−3.317*** (0.119)
<i>Leverage_{i,t}</i>	0.095*** (0.014)	0.153*** (0.026)	−5.761*** (0.276)	−4.330*** (0.199)
<i>ManaOwn_{i,t}</i>	−0.130*** (0.048)	−0.370*** (0.096)	−0.681 (0.693)	−0.962*** (0.243)
<i>SizeGrowth_{i,t}</i>	−0.010*** (0.003)	−0.012 (0.008)	−0.082* (0.048)	−0.353*** (0.079)
<i>SOE_{i,t}</i>	0.005 (0.010)	−0.001 (0.013)	−0.032 (0.135)	−0.295** (0.118)
<i>Big4_{i,t}</i>	−0.007 (0.009)	0.047 (0.036)	−0.097 (0.150)	−1.422*** (0.280)
<i>ROA_{i,t}</i>	−0.075 (0.086)	0.408*** (0.106)	3.304** (1.385)	−0.544 (0.525)
<i>ROE_{i,t}</i>	−0.036 (0.032)	−0.072** (0.033)	0.036 (0.416)	0.276 (0.215)
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	15,999	16,110	18,986	21,987
Adj. R ²	0.298	0.337	0.411	0.515

Note: This table shows the association between D&O insurance and firm risk. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

5.3 | Effect of D&O insurance on firm performance

If creditors believe that D&O insurance has a beneficial effect on firm performance through other unobservable channels, they would also grant more long-term debt to insured firms ('performance mechanism'). To rule out this mechanism, we examine the potential effect of D&O insurance on firm performance. Specifically, we follow Lin et al. (2011) and Li et al. (2022), use return on asset (ROA) and return on equity (ROE) as two measures of firm performance, and estimate the following model:

$$Performance_{i,t+1} = \beta_0 + \beta_1 Insured_{i,t} + \gamma Control_{i,t} + \varepsilon_{i,t}, \quad (6)$$

where the dependent variable ($Performance_{i,t+1}$) is the measure of firm performance ($ROA_{i,t+1}$ or $ROE_{i,t+1}$). In this model, we control for a battery of factors that may be

related to firm performance, including *Leverage*, *SizeGrowth*, *Age*, *Board*, *ManaOwn*, *Duality*, *SOE*, and *Big4* (Bennouri et al., 2018; Li et al., 2022; Liu et al., 2015). We also account for firm- and year-fixed effects in Model (6).

Columns 1 and 3 (Columns 2 and 4) in Table 9 report the estimation results of Model (6) using *ROA* (*ROE*) as measure of firm performance. As shown, the coefficient on *Insured* is positive but insignificant in each column of Table 9, suggesting that D&O insurance cannot significantly improve firm performance. Therefore, the 'performance mechanism' cannot help explain the positive association between D&O insurance and debt maturity structure. Thus, D&O insurance is more likely to misguide creditors' lending decisions.

6 | CONCLUSION

Although much literature investigates the effect of D&O insurance, little attention has been paid to studying how

TABLE 9 Effect of D&O insurance on firm performance

	(1) $ROA_{i,t}$ $t+1$	(2) $ROE_{i,t}$ $t+1$	(3) $ROA_{i,t+1}$	(4) $ROE_{i,t+1}$
<i>Insured_{i,t}</i>	0.000 (0.004)	0.008 (0.015)	0.001 (0.004)	0.010 (0.015)
<i>Leverage_{i,t}</i>			−0.062*** (0.007)	−0.161*** (0.023)
<i>SizeGrowth_{i,t}</i>			0.024*** (0.002)	0.075*** (0.005)
<i>Age_{i,t}</i>			0.001*** (0.000)	0.001 (0.001)
<i>Board_{i,t}</i>			−0.001** (0.001)	−0.004** (0.002)
<i>ManaOwn_{i,t}</i>			0.050** (0.021)	0.108 (0.069)
<i>Duality_{i,t}</i>			−0.002 (0.002)	−0.009 (0.008)
<i>SOE_{i,t}</i>			−0.003 (0.004)	−0.001 (0.015)
<i>Big4_{i,t}</i>			0.007** (0.004)	0.020 (0.013)
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,217	22,046	22,217	22,046
Adj. R ²	0.259	0.172	0.278	0.188

Note: This table presents results of the effect of D&O insurance on firm performance. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

D&O insurance is perceived by creditors. In this paper, we investigate creditors' views towards D&O insurance by examining the effect of D&O insurance on debt maturity structure. We find that insured firms experience an increase in long-term debt ratio after purchasing D&O insurance, suggesting that D&O insurance leads to increased debt maturity. In addition, the effect of D&O insurance on corporate debt maturity structure is more pronounced for firms with poorer corporate governance (e.g., firms with smaller ownership of the largest shareholder, lower institutional ownership, higher agency costs, or smaller ratio of independent directors on the board). These results indicate that creditors perceive D&O insurance as an effective external monitoring tool and thus grant more long-term debt to insured firms.

As the Chinese D&O insurance market is far less mature, creditors may misestimate or overweight the

advantage of D&O insurance. We then investigate whether D&O insurance meets creditors' expectations by examining its effect on several aspects of firm operation. Results show that purchasing D&O insurance does not result in decreased agency costs or better operating performance but induces higher firm risk, suggesting that D&O insurance is associated with more severe managerial opportunism rather than better corporate governance. Therefore, D&O insurance is more likely to live up to creditors' expectations and mislead their lending decisions.

This paper sheds light on related studies by showing that D&O insurance is positively associated with corporate debt maturity structure. We also enrich related literature on D&O insurance from stakeholders' perspectives by showing that creditors have positive faith that purchasing D&O insurance should improve corporate governance. Finally, according to our findings that D&O insurance can mislead creditors' lending decisions, creditors should be aware of the unintended adverse effect of D&O insurance to avoid potential loss.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in the China Stock Market & Accounting Research Database. These data were derived from the following resources available in the public domain: <https://www.gtarsc.com/>.

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ENDNOTES

¹ On 2 April 2020, Luckin Coffee, a China-based firm listed on NASDAQ, confessed that its chief operating officer and other employees fabricated transactions by as much as RMB 2.2 billion in 2019.

² The 'monitoring mechanism' suggests that D&O insurers may have professional risk assessment capability and play an external monitoring role in corporate governance (Boyer & Stern, 2014; Core, 2000; Yuan et al., 2016). The 'incentive mechanism' shows that a higher level of D&O insurance coverage reduces D&O's risk aversion and makes them more receptive to riskier but

positive-NPV projects (Core, 1997; Hwang & Kim, 2018; Wang et al., 2020b).

- ³ For instance, some studies show that because of such an 'opportunistic mechanism', higher D&O insurance coverage induces worse earnings conservatism (Chung & Wynn, 2008), less disclosure of bad news (Wynn, 2008), higher litigation risk (Gillan & Panasian, 2015), lower labour investment efficiency (Wang et al., 2022) and lower performance (Boyer & Stern, 2014; Lin et al., 2011).
- ⁴ Lin et al. (2013) reveal that creditors view D&O insurance as higher credit risk and protect themselves by charging higher loan spreads in Canada.
- ⁵ But such insurance shall not cover the liabilities arising in connection with D&Os' violation of laws, regulations, or the company's articles of association.
- ⁶ Due to the constraint of data availability, we are not able to use the ratio of debt maturing in 3 or 5 years to total debt (Barclay & Smith, 1995; Datta et al., 2005) or measures computed using the incremental approach (Brockman et al., 2010; Guedes & Opler, 1996) as an alternative.
- ⁷ Agency cost and the monitoring role of short-term debt are essential aspects that creditors take into account when making decisions on debt maturity (Datta et al., 2005; Hart & Moore, 1995; Rajan & Winton, 1995).
- ⁸ To save space, we report summary statistics for other variables in Appendix B.
- ⁹ We also use bond term and duration on bond's first trading day to measure debt maturity structure. Results (not tabulated) also show that purchasing D&O insurance leads to increased maturity, consistent with results in Table 2.
- ¹⁰ Following Abadie et al. (2022), we re-estimate Model (1) with standard errors clustered at the firm level. Regression results (not tabulated) are in line with our baseline results.
- ¹¹ Data on airport location is retrieved from the Civil Aviation Administration of China (www.caac.gov.cn). Information on the location of firm headquarter, sales volume of insurance products, and province-level population is obtained from the CSMAR database. We then compute the distance between firm headquarter and airport using Baidu Maps API.
- ¹² Being aware that firm-fixed effects will incorporate too many dummies into Model (3) and lead to biased estimation results, we do not include firm-fixed effect in Model (3).
- ¹³ Following Yuan et al. (2016), we also use the average incidence of purchasing D&O insurance of firms in the same industry (multiplied by 100) as an exogenous variable (*AVGINS*). Our findings still hold.
- ¹⁴ Estimation results of the second stage using *InsRatio* as instrumental variable (reported in Appendix D) are also consistent with results in Table 3.

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APPENDIX A: Variable definitions

Variable	Definition
<i>Insured</i>	A dummy variable, which equals one if firm <i>i</i> purchases D&O insurance at year <i>t</i> , and 0 otherwise
<i>MA1</i>	The ratio of long-term debt to total debt
<i>MA2</i>	Non-current liabilities divided by total liabilities
<i>Tobin</i>	The ratio of book value of assets plus market value of common equity minus the book value of common equity to the value of total assets
<i>MB</i>	Market-to-book ratio
<i>SOE</i>	Firm nature, which equals one for a state-owned enterprise and 0 otherwise
<i>Big4</i>	A dummy variable indicating whether auditor comes from big four accounting firms
<i>ManaOwn</i>	Managerial stock ownership, computed as the sum of common and restricted stock shares owned by executives scaled by shares outstanding
<i>Leverage</i>	Debt to asset ratio, computed as the total liabilities divided by total assets
<i>ROA</i>	Return on asset
<i>ROE</i>	Return on equity
<i>SizeGrowth</i>	The annual firm asset growth rate, calculated as the year-on-year percentage change in total assets
<i>PPE</i>	Asset structure, computed as the ratio of property, plant, and equipment to total assets
<i>Largest</i>	Ownership of the largest shareholder, computed as the ratio of shares held by the largest shareholder to total shares
<i>InstiOwn</i>	Institutional ownership, calculated as the ratio of shares owned by institutional investors to total shares
<i>GAExp</i>	The ratio of general and administrative expenses to annual sales
<i>IndDir</i>	The ratio of independent directors on the board
<i>Distance</i>	The natural logarithm of one plus the distance (in kilometres) between firm's headquarter and its nearest airport
<i>InsRatio</i>	The natural logarithm of the ratio of the total sales volume of insurance products in the province in which the firm is headquartered (divided by 1000) to the population of the province
<i>Age</i>	Firm age, measured as the years since the time going listing
<i>Violation</i>	A dummy variable, which equals 1 when a firm has violation record and 0 otherwise
<i>Related</i>	The amount of related party transactions divided by total assets
<i>AssetTurnover</i>	Asset turnover ratio, computed as the ratio of annual sales to total assets
<i>Board</i>	Total number of directors on the board
<i>Duality</i>	A dummy variable indicating whether the CEO is also board chairman
<i>adjROEVol</i>	The standard deviation of industry-adjusted ROE from year <i>t</i> to year <i>t</i> + 2
<i>adjEBITVol</i>	The standard deviation of industry-adjusted EBIT scaled by total assets from year <i>t</i> to <i>t</i> + 2
<i>ZScore</i>	Financial distress, inversely measured by Altman (1968) Z-score
<i>DD</i>	Distance to default calculated using Moody's KMV model

APPENDIX B: Summary statistics for other variables

Variable	N	Mean	SD	Min	P50	Max
<i>InstiOwn</i>	22,215	0.467	0.209	0.009	0.482	0.880
<i>GAExp</i>	22,212	0.089	0.085	0.007	0.068	0.573
<i>IndDir</i>	22,214	0.371	0.054	0.286	0.333	0.571
<i>Distance</i>	22,217	3.218	0.924	0.942	3.200	5.190
<i>InsRatio</i>	22,171	7.437	0.915	5.209	7.536	9.172
<i>Age</i>	22,217	13.376	5.710	5.083	12.333	27.083
<i>Violation</i>	22,214	0.134	0.340	0.000	0.000	1.000
<i>Related</i>	22,214	0.389	0.439	0.000	0.257	2.491
<i>AssetTurnover</i>	22,215	0.632	0.456	0.057	0.526	2.577
<i>Board</i>	22,215	8.816	1.801	0.000	9.000	19.000
<i>Duality</i>	20,329	0.188	0.390	0.000	0.000	1.000
<i>adjROEVOL</i>	15,999	0.072	0.117	0.001	0.036	0.732
<i>adjEBITVol</i>	16,110	0.219	0.301	0.002	0.113	1.737
<i>ZScore</i>	18,986	3.126	2.908	−0.537	2.280	17.219
<i>DD</i>	21,987	0.465	3.261	−153.141	1.171	9.761

This table reports the summary statistics for other variables used in the paper. Variable definitions are presented in Appendix A.

APPENDIX C: Results of Heckman two-stage approach using *InsRatio* as instrumental variable

Step one		Step two		
	(1) <i>Insured_{i,t+1}</i>		(2) <i>MA1_{i,t+1}</i>	(3) <i>MA2_{i,t+1}</i>
<i>InsRatio_{i,t}</i>	0.021*** (0.007)	<i>Insured_{i,t}</i>	0.015** (0.008)	0.023*** (0.008)
		<i>IMR_{i,t}</i>	−0.002 (0.003)	−0.002 (0.003)
<i>Controls</i>	Yes	<i>Controls</i>	Yes	Yes
Industry effect	Yes	Firm effect	Yes	Yes
Year effect	Yes	Year effect	Yes	Yes
Observations	22,061	Observations	22,061	22,061
Pseudo R^2	0.135	Adj. R^2	0.571	0.564

This table shows regression results based on the Heckman two-stage approach using *InsRatio* as instrumental variable. Variable definitions are presented in Appendix A. Robust standard errors are in parentheses. Coefficients on constant, control variables and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

APPENDIX D: Heckman two-stage approach using *InsRatio* as instrumental variable

	(1) <i>PoCG = LowLar</i>	(2) <i>PoCG = LowInsti</i>	(3) <i>PoCG = HigGAE</i>	(4) <i>PoCG = LowInd</i>
Panel A: $MA1_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.018* (0.009)	0.025*** (0.009)	0.018** (0.009)	0.030*** (0.011)
$Insured_{i,t}$	0.006 (0.008)	0.005 (0.008)	0.006 (0.008)	0.005 (0.008)
$PoCG_{i,t}$	-0.002 (0.003)	-0.002 (0.003)	0.012*** (0.002)	-0.002 (0.003)
$IMR_{i,t}$	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,061	22,061	22,061	22,061
Adj. R^2	0.571	0.571	0.572	0.571
Panel B: $MA2_{i,t+1}$ as dependent variable				
$Insured_{i,t} \times PoCG_{i,t}$	0.020** (0.010)	0.017* (0.009)	0.017* (0.009)	0.024** (0.010)
$Insured_{i,t}$	0.014 (0.008)	0.017** (0.008)	0.015* (0.008)	0.016* (0.008)
$PoCG_{i,t}$	-0.001 (0.003)	-0.002 (0.003)	0.018*** (0.003)	-0.004 (0.003)
$IMR_{i,t}$	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
Controls	Yes	Yes	Yes	Yes
Firm effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Observations	22,061	22,061	22,061	22,061
Adj. R^2	0.564	0.564	0.565	0.564

This table shows regression results based on the Heckman two-stage approach using *InsRatio* as instrumental variable. Definitions of variables are presented in Appendix A. p -Value is the empirical p -value for the difference in coefficients between two groups. Robust standard errors are in parentheses. We do not report the regression results of step one to save space. Coefficients on constant, control variables, and fixed effects are omitted for brevity. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.