Received: 25 August 2022 | Revised: 2 June 2023 | Accepted: 6 June 2023

DOI: 10.1002/ijfe.2849

RESEARCH ARTICLE

WILEY

Does directors' and officers' liability insurance improve corporate ESG performance? Evidence from China

Songlian Tang[1] | **Lingfei He**[2] | **Fei Su**[3] | **Xiaoyun Zhou**[3]

[1]Glorious Sun School of Business and Management, Donghua University, Shanghai, China

[2]Business College, East China University of Science and Technology, Shanghai, China

[3]College of Economics and Management, Nanjing University of Aeronautics and Astronautics, Nanjing, China

Correspondence
Fei Su, Department of Economics, College of Economics and Management, Nanjing University of Aeronautics and Astronautics, No. 29, Jiangjun Ave., Jiangning District, Nanjing 211106, Jiangsu Province, China.
Email: fei.su@nuaa.edu.cn

Funding information
Humanities and Social Sciences Foundation of the Ministry of Education of China, Grant/Award Number: 21YJC630167; National Natural Science Foundation of China, Grant/Award Numbers: 71901087, 72272031; Shanghai Philosophy and Social Science Planning Project, Grant/Award Number: 2022BGL006

Abstract

We examine the causal effect of directors' and officers' liability insurance (D&O insurance) on environmental, social and governance (ESG) performance in China's listed firms. Using a unique data set on D&O insurance purchases in China, we document a positive relationship between D&O insurance and ESG performance, which is robust to a comprehensive battery of robustness checks including Heckman two-step sample selection model, propensity score matching (PSM) model, instrumental variable approach, and fixed effects model. Further analyses suggest that the positive association is more salient for state-owned enterprises (SOEs). Moreover, the path analysis provides evidence for the mediating effect of non-financial information disclosure and corporate governance quality on the relationship between D&O insurance and ESG performance. Collectively, this study contributes to the literature on the economic benefit of D&O insurance by providing initial evidence that D&O insurance appears to enhance corporate governance and improve corporate ESG performance.

KEYWORDS

corporate governance quality, D&O insurance, ESG performance, manager misconduct, non-financial information disclosure

1 | INTRODUCTION

To recruit highly qualified managers and to protect directors and officers from personal liability incurred by business decisions, companies commonly bear the costs of litigation against directors and officers by purchasing directors' and officers' insurance (hereafter as 'D&O insurance'), which provides limited liability and indemnification for their directors and officers (Li & Liao, 2014). Typical D&O insurance policies cover damages, settlements, judgements, and litigation expenses, but not civil or criminal fines or penalties, punitive damages, or multiple damages. The usage of D&O insurance has now been widespread in developed markets, such as North America, West Europe, and some Asia-Pacific countries. The market of D&O insurance has reached the amount of about $10 billion in written premiums (Allianz Global Corporate & Specialty, 2021). Thus, D&O insurance helps in protecting directors and officers against claims alleging breach of their duties (Lin et al., 2011), and allowing directors and officers to take appropriate actions in the best interest of stakeholders (Yuan et al., 2016).

However, the empirical results from prior studies appear to be mixed about the effect of D&O insurance on corporate performance. For example, the extant literature

on D&O insurance has examined the economic impacts of D&O insurance on firm performance, such as loan spreads, audit fees, as well as post-IPO stock performance and stock price crash risk (Boyer & Stern, 2012, 2014; Chung et al., 2015; Lin et al., 2013; Yuan et al., 2016). These empirical investigations suggest that D&O insurance coverage could induce moral hazard and managerial opportunistic behaviour such as empire building (Wang et al., 2022). In addition, executives and managers under the protection of D&O insurance are more likely to engage in excessive risk-taking activities at the expense of the shareholders, or to report financial performance aggressively (Chung & Wynn, 2008; Lin et al., 2011; Wynn, 2008). In addition, investors perceive D&O insurance negatively because firms covered under D&O insurance policies tend to suffer from high capital costs (Chen et al., 2012; Lin et al., 2013). Some studies have also indicated that D&O insurance purchases could cause investment inefficiency (i.e., overinvestment) from the investors' perspective (Li & Liao, 2014), as well as labour investment inefficiency (Wang et al., 2022).

This study extends the stream of research on D&O insurance by documenting a causal relationship between D&O insurance and ESG performance of listed firms. These research questions are particularly important on several grounds. First, it is important to focus on firms' ESG performance since prior studies have argued that moral hazard and agency problems arising from D&O insurance may induce executives and managers to make reckless managerial decisions and take excessive risks, which damages the benefit of the shareholders (Li & Liao, 2014; Lin et al., 2013; Wang et al., 2022). However, we argue that the monitoring mechanisms associated with D&O insurance purchases may improve firms' information disclosure and enhance their ESG performance. In fact, we find robust evidence of a positive causal relationship between D&O insurance and firms' ESG performance. This evidence suggests that directors and officers whose liability are, at least partially, covered by D&O insurance policies are more likely to adopt good ESG practices. Further analyses suggest that this positive association between D&O insurance and ESG performance is more pronounced for state-owned enterprise (SOE) firms. In addition, D&O insurance can improve firms' non-financial information disclosure, enhance corporate governance of listed firms, and prevent managerial misconduct, which all lead to better corporate ESG performance.

Our study contributes to the literature in several ways. First, investigating the impact of D&O insurance on ESG performance can help to better understand whether D&O insurance can improve corporate performance. To the best of our knowledge, this is the first empirical study that relates D&O insurance to ESG performance of listed firms. Our study complements the literature by exploring a new economic effect of D&O insurance. Our study also enriches the extant literature on the consequences of D&O insurance by examining the functional role of D&O insurance in improving firms' ESG performance.

Second, we analyse the relationship between D&O insurance and ESG performance and investigate the governance role of D&O insurance, which sheds new light on the literature on the determinants of firms'' ESG performance in a civil-law socialist country with relatively weak investor protection and highly concentrated ownership. Our findings of a positive association between D&O insurance and ESG performance are helpful for understanding the consequences of D&O insurance, which improves corporate governance and ESG performance of listed firms. Furthermore, we narrow the gap in the literature by focusing on the information disclosure and corporate governance mechanisms underlying the relationship between D&O insurance and ESG performance.

Last but not the least, our article focuses on China, one of the world's largest emerging markets, where management practices are vastly different from those of developed economies. The existing literature on D&O insurance is almost exclusively based on developed markets. The Chinese corporate section is often characterized by highly concentrated ownership structure and weakly internal and external governance. Therefore, the findings of this study have important additional reference values as China provides a different setting to examine the effect of D&O insurance on corporate governance and firm performance. We show that D&O insurance is positively associated with ESG performance of listed firms in China, which complements the existing literature on the economic and social benefits of D&O insurance in emerging markets.

The rest of the article proceeds as follows. Section 2 reviews the literature and develops our hypotheses; Section 3 introduces the sample and proposes the empirical model; Section 4 presents the main empirical findings; Robustness checks and further analyses are provided in Section 5; Section 6 concludes the article.

2 | LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 | Literature on D&O liability insurance

Directors'' and officers'' liability insurance (D&O insurance) is a liability cover purchased by a firm to insulate

its directors and officers from legal liability arising from their business activities on behalf of the company. The main purpose of D&O insurance is to encourage directors and officers to act in the best interest of the stakeholders by reducing agency costs, enhancing investor protection, and improving corporate governance of the firm, as the insurance coverage protects directors and officers against legal liability and claims arising from alleged acts (Lin et al., 2011). The purchase of D&O insurance has become popular for firms in common-law jurisdictions, such as the US, the UK, Canada, and Hong Kong (Zou et al., 2008). The proportion of firms covered by D&O insurance is as high as 97%, 86%, and 70% in the US, Canada, and Hong Kong respectively (Yuan et al., 2016).

The existing literature has examined the determinants of the demand for D&O insurance. Prior studies have indicated that it is more likely to purchase D&O insurance for firms with greater litigation risks and insider control (Core, 1997), for firms with a higher proportion of independent directors or foreign directors (Zou et al., 2008), and for firms with more aggressive earnings management (Boyer & Tennyson, 2015). The previous studies have also examined the economic impacts of D&O insurance on cost of equity (Chen et al., 2016), cost of debt (Lin et al., 2013), merger and acquisition (Lin et al., 2011), capital investment efficiency (Li & Liao, 2014), audit fees (Chung & Wynn, 2014), tax avoidance (Zeng, 2014), diversification (Chi et al., 2013), post-IPO stock performance (Chung et al., 2015), stock price crash risk (Yuan et al., 2016), corporate innovation (Yuan et al., 2018), labour investment efficiency (Wang et al., 2022), and managerial misconduct (He et al., 2022).

In fact, two competing hypotheses about D&O insurance have been proposed and examined in the existing literature (Yuan et al., 2016). The first is the opportunism hypothesis, which posits that directors and officers covered by D&O insurance may not behave in the best interest of shareholders, with excessive risking taking, aggressive financial reporting, and potential corporate fraud. The second one is the monitoring hypothesis, which argues that firms with D&O insurance are closely monitored and supervised by the insurers, and therefore D&O insurance can help improve corporate governance and boost firm performance (Holderness, 1990; O'Sullivan, 1997; Yermack, 1996). Yuan et al. (2016) provide additional support for the notion that D&O insurance improves firms' corporate governance and reduces stock price crash risk in China's listed firms. However, a growing body of research based on developed markets has shown that D&O insurance may induce moral hazard and managerial opportunism (Lin et al., 2011). For example, it is documented that D&O insurance reduces the expected legal liability of managers and therefore deteriorates the quality of financial reporting (Lin et al., 2013; Wang et al., 2022). Prior studies have also provided ample empirical evidence on the negative effect of D&O insurance on firm performance. For example, firms with D&O insurance coverage are more likely to accept low bid premiums and high audit fees (Aguir et al., 2013; O'Sullivan, 2009). Besides, the insured firms are usually associated with less conservative earnings (Chung & Wynn, 2008), higher equity costs (Chen et al., 2016), higher loan spreads (Lin et al., 2013), and lower labour investment efficiency (Wang et al., 2022).

However, there has been little research about how the purchase of D&O insurance affects corporate governance and firm performance in China's listed firms. In addition, little is known about the determinants of ESG performance in the Chinese context. No prior studies have systematically examined the impact of D&O insurance on ESG performance in China. We fill this void by empirically examining the effect of D&O insurance on firms' ESG performance and by focusing on the corporate governance mechanisms underlying the relationship between D&O insurance and firms' ESG performance.

2.2 | Literature on ESG performance

Environmental, social and governance (ESG) practice has acquired great attention in academia and business management in recent years (Barrena et al., 2016; Duque-Grisales & Aguilera-Caracuel, 2019; Flammer, 2015; Tang et al., 2021). It is generally believed that firms can achieve greater success through the implementation of good ESG practices by maintaining good relationship with stakeholders and obtaining legitimacy from the society (Foote et al., 2010; Shin et al., 2023). Environmental, social and governance (ESG) score has emerged as an important pillar of the sustainable development strategy of firms (Duque-Grisales & Aguilera-Caracuel, 2019; Eccles & Serafeim, 2013; KPMG, 2011).

In fact, empirical results regarding the relationship between ESG performance and financial performance are also mixed (Brammer et al., 2006; Duque-Grisales & Aguilera-Caracuel, 2019; Friede et al., 2015; Lee et al., 2016; Nollet et al., 2016; Ortas et al., 2015). According to the traditional neoclassical approach, investing in ESG activities may bear additional costs and deteriorates financial performance in general (Derwall et al., 2005; Hassel et al., 2005; Semenova & Hassel, 2008). For example, the environmental goals of ESG practices may not be one of the top priorities for the shareholders since the costs of reducing carbon emissions and adopting clean energy could be quite high and financially ineffective. On the other hand, a firm achieving higher level of ESG may enhance its reputation

in society, attract ESG investment, and create financial outcomes (Flammer, 2015; Shin et al., 2023; Su, 2023).

However, the existing studies on ESG practices have mostly focused on developed markets, and little is known about the relationship between D&O insurance and ESG performance in emerging markets, such as China. In fact, compared with developed markets, ESG investment in emerging markets remains largely overlooked, therefore whether D&O insurance can promote ESG performance in emerging markets is worth exploring. Thus, this study contributes to the literature by emphasizing D&O insurance purchases and corporate sustainability in China and providing significant reference values for other emerging markets, where the corporate structure and corporate governance practices are vastly different from those of developed markets.

2.3 | Hypothesis development

Although prior studies have argued that the purchase of D&O insurance could induce managerial opportunistic behaviour (Li & Liao, 2014; Wang et al., 2022), it remains unresolved whether D&O insurance provider fulfils the monitoring function and mitigates such moral hazard, particularly in emerging markets with weak investor protection and poor internal and external monitoring. In this study, we focus on firms listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange where D&O insurers shall have the incentive to play their monitoring role in corporate governance of the insured companies, given the weak internal and external controls in China (Yuan et al., 2016).

As discussed in previous literature (Miazad, 2023; Yuan et al., 2016), D&O insurers could serve as corporate ESG monitors. The insurer assesses a firm's corporate governance practices and then controls its managerial behaviour through the clauses and pricing of D&O insurance contract (Baker & Griffith, 2007). In addition, insurers' independent assessments provide new information to the market about a firm's corporate governance quality, creating an effective monitoring mechanism (Yuan et al., 2016). The continued monitoring by D&O insurers reduces principal-agent conflicts, and mitigates managerial opportunism (Core, 2000). Therefore, we hypothesize that D&O insurance coverage will enhance corporate ESG performance.

To be more specific, we assume three possible paths through which D&O insurance positively influence corporate ESG performance: (1) firms purchasing D&O insurance are more likely to disclose ESG-related information; (2) D&O insurers improve insured firms' corporate governance quality; and (3) D&O insurers prevent managers from misconduct activities. These factors could be viable mechanisms by which D&O insurance positively influences corporate ESG performance. In addition, if D&O insurers have private information regarding the firms and monitor the firm closely, it will reduce agency costs and mitigate the probability of directors and officers manipulating stakeholders and pursuing their own interests, which ultimately lead to better ESG performance. Therefore, we propose the following hypothesis 1:

> **Hypothesis 1.** D&O insurance is positively associated with ESG performance, i.e., D&O insurance coverage increases firms' ESG performance, ceteris paribus.

3 | DATA AND MODEL SPECIFICATION

3.1 | Sample and data

Our sample initially comprises all the firms listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange spanning the period 2010–2020, when data on ESG performance (i.e., ESG scores) has become available. The ESG data is sourced from Sino-Securities Index Information Service Co. Ltd at https://www.chindices.com/. The data on D&O insurance is manually collected from annual reports and disclosures of the board meetings and shareholders' meetings, as the China's Securities and Regulatory Commission (CSRC) requires that any purchase of D&O insurance should be proposed and approved by the board of directors and shareholders' meetings respectively. Following prior studies (Yuan et al., 2016), we exclude financial firms which adopt different accounting principles and reporting rules. We also exclude special treated (ST) firms, particular transfer (PT) firms, and firms with fewer than 130 trading days (i.e., 26 trading weeks) of data in a fiscal year. To obtain a balanced panel data set, we only include firms with data on all explanatory variables available. Finally, 26,439 firm-year observations are retained. The data on firm characteristics used in this study is sourced from the China Stock Market & Accounting Research Database (CSMAR).

3.2 | Variables

Our data set contains a broad array of variables, including indicators of firms' ESG performance, D&O insurance purchase records, and a bunch of firm and board characteristics. The dependent variable we use is corporate ESG performance. To evaluate the ESG performance of listed

firms, we use the ESG scores. The ESG data has become increasingly available from multiple data providers such as Refinitiv, Bloomberg, and Sino-Securities Index Information Service Co. Ltd in China. Sino-Securities Index Information Service collects over 450 ESG-related metrics, which are divided into three main categories and more than 10 subcategories. The three main categories are Environmental (E), Social (S) and Governance (G). The ESG scores have been compiled from over 450 ESG-related metrics and updated on a yearly basis, which are now available for more than 3000 firms listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange in China. Here, ESG scores are expressed as a sequence of digits ranging from 0 (C) to 9 (AAA), where 0 stands for the lowest ESG performance, while 9 stands for the highest ESG performance.

The main variable of interest is D&O insurance. Here, we adopt a dummy variable to measure the purchase of D&O insurance (DOI), which equals 1 if the firm held D&O insurance in the previous year, and 0 otherwise (Yuan et al., 2016). Following prior studies (Chen et al., 2020; Gibson et al., 2021; Tang et al., 2021), we also control for several factors that have been shown to affect the ESG ratings of firms. For example, we add a series of variables of board structure, including the percentage of independent directors on the board (Indep), the percentage of shares held by the top five largest shareholders (Conc), and ownership type (i.e., whether the firm is a state-owned enterprise (SOE)). In addition, considering managers' incentives to pursuit D&O insurance, we control for CEO duality (i.e., whether the CEO also chairs the board of directors) (Dual), female executive ratio (Female), and the dollar value of managerial compensation (Compen) (Wang et al., 2022). Following Tang et al. (2021), we also account for firm characteristics, including firm size (Size), firm age (Age), financial leverage (Lev), return on assets (ROA), sales growth rate (Growth), the ratio of tangible assets to total assets (Tangible), and book-to-market ratio (BM). A full list of the variables used in this study is provided in Table A1 in the Appendix.

3.3 | Descriptive statistics

The summary statistics of the main variables are reported in Table 1. Panel A of Table 1 reports descriptive statistics of the variables used in our analyses. As shown in Panel A of Table 1, the median ESG score is 6, which is equivalent to BBB. The minimum ESG score is 3 (B), while the maximum ESG score is 9 (AAA). In addition, the mean value of DOI is as small as 0.069, suggesting only around 6.9% of listed firms in China have even been covered by D&O insurance, which is much less compared to that of developed markets. Panel B of Table 1 presents the Pearson correlation matrix for the main variables. The results of pairwise correlations among these variables indicate a significantly positive relation between D&O insurance and ESG scores.

Even though the number of insured firms is still relatively small, there is an increasing trend of D&O insurance coverage for China's listed firms, as illustrated in Figure 1. There are now three times more China's listed firms having purchased D&O insurance than before 2010, and the insurance coverage ratio has almost doubled in the last decade, which underlies the recent trend in risk awareness of Chinese firms (Borovkova & Wu, 2020).

3.4 | Univariate analysis

Table 2 reports the results of univariate analysis of key variables used in this study. The means of the key variables are reported for the insured firms versus the uninsured firms, and the differences are statistically significant at the 5% significance level, indicating that firms purchasing D&O insurance have higher ESG performance than those without D&O insurance coverage. In addition, the univariate analysis suggests insured firms are usually larger and older companies, they also tend to have more concentrated ownership, higher leverage ratio, while having poorer financial performance and lower growth rate. Interestingly, there is no statistically significant difference in the female executive ratio between the insured firms and uninsured firms.

3.5 | Model specification

To empirically examine the impact of D&O insurance on ESG performance of China's listed firms, we utilize the following multivariate model:

$$ESG_{i,t} = \alpha + \beta_1 DOI_{i,t-1} + \gamma Controls_{i,t-1} + \varepsilon_{i,t}, \quad (1)$$

where i indexes firms and t indexes years. The dependent variable, $ESG_{i,t}$, is a multiple categorical variable, ranging from 0 to 9. Following the prior literature (Chalmers & Harford, 2002; Core, 1997; Lin et al., 2013; Liou et al., 2017; Wang et al., 2022), we use two proxies for the main explanatory variable, D&O liability insurance, including (1) a dummy variable indicating whether firm i had purchased D&O insurance in year $t-1$; and (2) a continuous variable defined as the natural logarithm of one plus the dollar value of the insurance coverage

TABLE 1 Descriptive statistics.

Panel A: Summary statistics

Variable	*N*	Mean	Std. dev.	Min	Median	Max
ESG	26,439	6.488	1.117	3.000	6.000	9.000
DOI	26,439	0.069	0.254	0.000	0.000	1.000
Indep	26,439	0.375	0.054	0.333	0.357	0.571
Dual	26,439	0.275	0.447	0.000	0.000	1.000
Conc	26,439	34.710	14.714	9.190	32.640	74.300
Size	26,439	22.194	1.283	19.810	22.021	26.161
Lev	26,439	0.433	0.207	0.055	0.426	0.902
ROA	26,439	0.038	0.064	−0.263	0.037	0.208
Growth	26,439	0.175	0.438	−0.592	0.105	2.856
Age	26,439	2.853	0.354	1.609	2.890	3.497
BM	26,439	2.478	1.799	0.845	1.897	11.198
Tangible	26,439	0.923	0.092	0.512	0.954	1.000
Female	26,439	0.039	0.104	0.000	0.000	0.500
Compen	26,439	0.067	0.134	0.000	0.000	0.595

Panel B: Correlation matrix of the main variables

	ESG	DOI	Indep	Dual	Conc	Size	Lev	ROA	Growth	Age	BM	Tangible	Female	Compen
ESG	1.000													
DOI	0.115***	1.000												
Indep	−0.007	0.017***	1.000											
Dual	−0.105***	−0.085***	0.123***	1.000										
Conc	0.135***	0.031***	0.040***	−0.052***	1.000									
Size	0.350***	0.226***	0.007	−0.170***	0.215***	1.000								
Lev	0.088***	0.119***	−0.007	−0.130***	0.055***	0.494***	1.000							
ROA	0.138***	−0.032***	−0.025***	0.027***	0.139***	0.013**	−0.353***	1.000						
Growth	−0.014**	−0.019***	0.002	0.019***	0.005	0.036***	0.028***	0.237***	1.000					
Age	0.052***	0.106***	−0.014**	−0.093***	−0.100***	0.174***	0.169***	−0.104***	−0.067***	1.000				
BM	−0.121***	−0.079***	0.062***	0.120***	−0.073***	−0.456***	−0.336***	0.211***	0.085***	−0.093***	1.000			
Tangible	0.081***	−0.038***	−0.002	−0.039***	0.132***	0.000	0.101***	0.026***	−0.116***	−0.005	−0.042***	1.000		

TABLE 1 (Continued)

Panel B: Correlation matrix of the main variables														
	ESG	DOI	Indep	Dual	Conc	Size	Lev	ROA	Growth	Age	BM	Tangible	Female	Compen
Female	−0.025***	−0.007	0.022***	0.049***	−0.043***	−0.016**	−0.033***	−0.003	0.018***	0.047***	0.049***	−0.059***	1.000	
Compen	−0.104***	−0.110***	0.091***	0.469***	−0.045***	−0.264***	−0.250***	0.124***	0.050***	−0.194***	0.178***	−0.041***	0.061***	1.000

Note: This table reports descriptive statistics for the main variables used in this study. Summary statistics is reported in Panel A, and the correlation matrix in reported in Panel B. The sample period is from 2010 to 2020 for all the variables except for *ESG*, which is 1 year ahead of other variables. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

purchased by the firm. *Controls* denote control variables and ε represents the error term. A set of firm-specific control variables is included in our regression model following the existing literature (Huang et al., 2021; Tang et al., 2021; Wang et al., 2022; etc.). For example, Huang et al. (2021) argue that intangible information could be associated with firm size and book-to-market ratio at the corporate level. Therefore, we include the variables of firm size and B/M ratio in our regression, in addition to other control variables. The variable of interest in this analysis is β_1, which indicates the relationship between D&O insurance and ESG performance of China's listed firms. To minimize the effect of outliers, we winsorize all continuous variables at the 1% and 99% levels.

Here, we implement an OLS regression for the model specification above. All the control variables are lagged by 1 year (i.e., the dependent variable is set to be 1 year ahead), to better address the reverse causality issue when estimating the effect of D&O insurance on ESG performance (Hou & Moore, 2010). In addition to control variables as stated above, we include industry and year fixed effects to capture unobserved heterogeneity across industries and the influence of unobservable time-invariant factors associated with the purchase of D&O insurance.

4 | EMPIRICAL FINDINGS

4.1 | Main regression results

Table 3 reports the results of baseline regression analysis utilizing Equation (1). The t-statistics are calculated based on standard errors adjusted for firm-level clustering to account for any possible correlations between firms. As is shown in the table below, the coefficient of DOI is positive and significant at the 1% significance level, suggesting that firms purchasing D&O insurance can achieve higher ESG performance. It should be noted that this effect is not only statistically significant, but also economically important. The coefficients of DOI are 0.466 in the simple univariate regression model in Column (1) and 0.182 in the multiple regression model in Column (2), after controlling for various firm characteristics. It indicates that compared to uninsured firms, firms with D&O insurance coverage achieve a higher ESG score by 0.182 on average after controlling for other factors, which is a remarkable increase (i.e., around 3%) considering that the average ESG score is about 6.5 for listed firms in China. Therefore, the results of baseline regression confirm Hypothesis 1.

In addition, coefficients on the majority of control variables are statistically significant and consistent

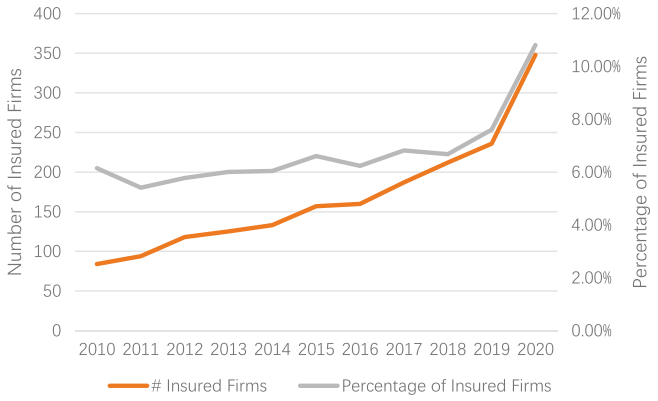

FIGURE 1 D&O insurance coverage in China's listed firms. This figure illustrates the number of D&O insured firms (left axis) and the percentage of D&O insured firms (right axis) among China's listed firms over the period of 2010–2020. [Colour figure can be viewed at wileyonlinelibrary.com]

with prior studies (Tang et al., 2021). For example, the empirical results in Table 3 shows that firm size and profitability have significantly positive impacts on firms' ESG performance, consistent with Tang et al. (2021)'s findings that firms do good when they are doing well. The coefficient on leverage is negative and significant, in line with the financial constraint hypothesis (Hong et al., 2012; Tang et al., 2021). The negative coefficient on CEO duality echoes agency motives behind ESG spending (Cheng et al., 2016; Tang et al., 2021). Independent director has no significant impact on corporate ESG performance, which is also in line with the findings of previous studies (Jia & Tang, 2018). We also control for the impact of manager characteristics on the relationship between D&O insurance and ESG performance. The significantly negative coefficient on female executive ratio, suggesting that firms with a more gender-diverse executive team tend to achieve lower ESG ratings, seems a little bit contradicting. In fact, Han et al. (2018) document that female executives who are generally more conservative invest less in capital expenditure, while exhibit greater cost efficiency.

In both Column (1) and Column (2) of Table 3, DOI is positively associated with ESG performance, which are statistically significant at the 1% significance level. To further alleviate endogeneity concerns, we perform several robustness checks to examine the sensitivity of our results, such as Heckman two-stage sample selection model, propensity score matching (PSM) model, instrumental variable (IV) model, and fixed effects model, thereby reinforcing our conjecture about the nontrivial relationship between D&O insurance and ESG performance.

4.2 | Heckman two-stage sample selection model

A firm's decision to purchase D&O insurance may not be random, i.e., the decision to purchase D&O insurance and its ESG performance could be jointly determined by some unobservable factors, which may cause self-selection issues. To mitigate such self-selection issues, we adopt the Heckman two-step sample selection model as an additional robustness check. Namely, Heckman's estimator requires exogenous variables that are correlated with a firm's propensity to purchase D&O insurance, but not with its ESG performance.

We consider the endogenous indicator variable *DOI*, which equals 1 if the firm has purchased D&O insurance, and 0 otherwise. Namely, in stage one, we estimate the probability of firms purchasing D&O insurance using the probit model. Here, following prior studies (Yuan et al., 2016, 2018), we add the determinants of D&O insurance purchases in the first step regression, including Indep (the proportion of independent directors on board scaled by the board of directors), Dual (a dummy variable that equals 1 if the firm's CEO also chairs the board, and 0 otherwise), Conc (the percentage of ownership held by the top five shareholder), Size (firm size), Lev (financial leverage ratio), ROA (return on assets), Growth (sales growth rate), Age (firm age), Tangible (the ratio of tangible assets to the total assets), BM (book-to-market ratio), Female (female executive ratio), Compensation (the dollar value of the manager compensation), Foreign (the proportion of foreign directors on board scaled by the board of directors), Big4 (big 4 auditors), and Cross-listing (a dummy variable that equals 1 if the firm is a cross-listed company, and 0 otherwise), which all will affect the firm's decision to purchase D&O insurance (Wang et al., 2022; Yuan et al., 2016). For example, if a firm have more independent (foreign) directors on board, it is more likely for the firm to purchase D&O insurance as required by those independent (foreign) directors. Similarly, cross-listed firms are more likely to purchase D&O insurance, in order to meet the regulatory requirements. In stage two, the inverse Mills ratio (IMR) obtained from the first-step regression is then added to the original model to control for the sample selection bias (Heckman, 1979).

Table 4 reports the results of the OLS regression utilizing the Heckman two-stage sample selection model. Most of the coefficients are consistent with our conjectures. The coefficient on DOI is statistically significant and positive. The results of the first stage of the Heckman two-stage sample selection model are presented in Column (1) of Table 4, which shows that firms with more independent director and more foreign directors are more

TABLE 2 Univariate analysis.

Variables	Uninsured firms	Mean_1	Insured firms	Mean_2	Diff
ESG	24,602	6.453	1837	6.958	−0.505***
Indep	24,602	0.375	1837	0.379	−0.004***
Dual	24,602	0.285	1837	0.136	0.149***
Conc	24,602	34.59	1837	36.36	−1.777***
Size	24,602	22.11	1837	23.25	−1.138***
Lev	24,602	0.426	1837	0.523	−0.097***
ROA	24,602	0.039	1837	0.030	0.008***
Growth	24,602	0.177	1837	0.144	0.033***
Age	24,602	2.842	1837	2.990	−0.147***
BM	24,602	2.516	1837	1.960	0.556***
Tangible	24,602	0.924	1837	0.910	0.014***
Female	24,602	0.039	1837	0.037	0.003
Compen	24,602	0.071	1837	0.013	0.058***

Note: This table reports the results of univariate tests of the key variables used in this study. The mean values of key independent variables are reported for the uninsured firms (Mean_1) and the insured firms (Mean_2) respectively. *Diff* stands for the difference of the means of these two groups of firms (i.e., uninsured vs. insurance firms). ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

likely to purchase D&O insurance. In addition, larger and older firms, and firms with higher leverage ratio and lower ROA are more likely to purchase D&O insurance, which are generally consistent with prior studies (Zou et al., 2008). Besides, cross-listed companies are more inclined to purchase D&O insurance, probably to better meet the regulatory requirements (Yuan et al., 2016). Interestingly, companies audited by Big 4 audit firms are also more likely to purchase D&O insurance, which echoes the monitoring hypothesis.

The results of the second stage regression are reported in Column (2) of Table 4. The coefficient associated with the endogenous variable DOI is still positive and significant at the 5% significance level, suggesting that the decision to purchase D&O insurance can help firms to achieve better ESG performance. Overall, the results of Table 4 confirm the positive effect of D&O insurance on ESG performance, even after taking into account potential self-selection issues. In addition, the coefficient on the inverse Mills ratio (IMR) is significant and negative, which implies that the unobserved factors that motivate firms to purchase D&O insurance are negatively related to ESG performance.

4.3 | Propensity score matching (PSM) approach

In this subsection, we control for the potential endogeneity between the decision on D&O insurance purchases and ESG performance by adopting a PSM methodology. Namely, we compare insured firms to a sample of control firms without D&O insurance coverage, which are matched based on the propensity to purchase D&O insurance (Armstrong et al., 2010; Yuan et al., 2016). To identify the propensity-score matched control sample, we first estimate a probit model. The model specification is the same as that in Section 4.2. We then calculate a propensity score for each firm, which is the conditional probability that a firm decides to purchase D&O insurance, given all the observable information on control variables. For each insured firm, one control firm with the closest propensity score is matched, which constitutes the propensity-score matched control sample. Finally, 26,412 firm-year observations are obtained.

Following Chen et al. (2018), we use a Difference-in-Differences (DID) research design that compares changes in corporate ESG performance of insured firms with changes in ESG performance among the benchmark control firms during our sample period. Namely, *Treat* stands for the treatment group (i.e., insured firms). We further adopt a dummy variable *Post* which equals one after the year of D&O insurance purchase for each treatment firm and zero otherwise. Equation (1) is then re-estimated after including the interaction term of *Post* and *Treat* to capture the effect of D&O insurance purchases over those periods. The results in Panel A of Table 5 show that, as expected, the treatment group (i.e., insured firms) achieves better ESG performance. Moreover, the interaction term *Treat*Post* is significantly positive,

TABLE 3 D&O insurance and ESG performance—-Main regression.

Dep. Var. =	ESG (1)	ESG (2)
DOI	0.466***	0.182***
	(7.15)	(3.04)
Indep		0.079
		(0.35)
Dual		−0.111***
		(−4.00)
Conc		0.002**
		(2.18)
Size		0.371***
		(24.45)
Lev		−0.642***
		(−7.84)
ROA		1.848***
		(9.70)
Growth		−0.143***
		(−8.67)
Age		0.092**
		(1.99)
BM		0.016**
		(2.26)
Tangible		0.831***
		(5.65)
Female		−0.237***
		(−2.74)
Compen		0.149
		(1.60)
Industry fixed	No	Yes
Year fixed	No	Yes
N	26,439	26,439
Pseudo R^2	0.004	0.091

Note: This table reports the main results regarding impact of D&O insurance on ESG performance in China's listed firms. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. In Column (2), we control for industry fixed effect and year fixed effect to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

indicating that the positive effect of D&O insurance on ESG performance has even amplified in the post-event period, which reinforces the perception that there is a positive causal relationship between D&O insurance purchase and ESG performance. Overall, we conclude that insurance companies become more diligent monitors of insured firms, and the heightened external monitoring reduces agency costs and improves corporate ESG performance (Yuan et al., 2016).

To ensure that the matching process is satisfactory, we also assess covariate balance by testing whether the means of the covariates used in the PSM model differ between the insured firms and matched control firms and report the results in panel B of Table 5 (Yuan et al., 2016). Namely, Panel B presents the results of univariate analysis of the propensity score-matched control sample and treatment sample. By comparing the means of all independent variables in the matched sample, we find that there is no significant difference between the control group and treatment group after the matching procedure, indicating that the propensity-score matched control sample resembles the D&O insured firms along virtually all dimensions. In addition, the practical estimation of DID method is based on the premise that the treatment and control samples could pass the parallel trend test, that is, without the D&O insurance coverage, the development trend of variables for the treatment and control groups remain consistent (Jacobson et al., 1993). We estimate the regression coefficients at the 95% confidence intervals before and after the purchase of D&O insurance respectively. In untabulated results, we confirm that the treatment and control groups are not significantly different before the purchase of D&O insurance and satisfy the parallel trend.

4.4 | Instrumental variable (IV) approach

There is also concern that the association between D&O insurance purchases and ESG performance could be spurious because of the reverse causality problem. To address potential endogeneity due to reverse causality, the extant literature on D&O insurance has generally utilized the instrumental variables and two stage least squares method (Jia & Tang, 2018; Wang et al., 2022; Yuan et al., 2016). Here, we adopt two instrumental variables (IVs)—the industry average D&O insurance ratio (i.e., the average purchase ratio of D&O insurance in the same industry as firm *i*), and the number of financial institutions in the region where firm *i* resides, in a particular year. IV estimators require exogenous variables that are correlated with a firm's propensity to purchase D&O insurance, but not with its ESG performance. Note that industry average ratio of D&O coverage is likely to be an important factor for a listed firm when deciding whether to purchase D&O insurance, but less likely to be closely correlated with ESG performance (Lin et al., 2011; Yuan et al., 2016). We also include the number of financial institutions in the province where the headquarter of

firm *i* resides, as an instrumental variable. The rationale behind this variable is that firms located in regions with more financial institutions may have a greater awareness of, as well as more exposure to D&O insurance (Jia & Tang, 2018). That implies the number of financial institutions may have a positive impact on a firm's D&O insurance purchase decision, but unlikely to influence a firm's ESG performance."

The results of the OLS regression utilizing the 2SLS-IV method are reported in Table 6. From the results of the first-stage regression in Column (1), we can see that both the coefficients on industry average D&O insurance ratio and the number of financial institutions are positive and significant, suggesting the positive association between the instrumental variables and the endogenous variable DOI. The results of the second-stage regression reported in Column (2) indicate that the coefficient on D&O insurance is still significantly positive at the 1% significance level, and quantitatively similar to the results reported in Table 3, which proves the robustness of our findings that D&O insurance is significantly positively related to ESG performance, even after controlling for potential endogeneity concerns.

Furthermore, the p-value for the statistic of the Hausman specification test for endogeneity is 0.0005, which confirms the endogeneity of the variable DOI. The results from the first-stage analysis in Column (1) of Table 6 indicate that, as expected, the two IVs are significantly positively correlated with D&O insurance dummy and the F-test indicates that the two variables are not weak instruments (p-value = 0.0000). The results of the weak instrumental variable test show that the F-statistic is 123.1, which is much larger than the rule-of-thumb value of 10, indicating that the instrumental variables are valid. Therefore, the proposed instrumental variables are neither under-identified, nor weakly identified.

TABLE 4 D&O insurance and ESG performance—-Heckman two-step sample selection model.

Dep. Var. =	DOI (1)	ESG (2)
DOI		0.149**
		(2.47)
Indep	0.535**	−0.014
	(2.18)	(−0.06)
Dual	−0.164***	−0.085***
	(−4.46)	(−2.86)
Conc	−0.003***	0.002**
	(−3.01)	(2.45)
Size	0.133***	0.339***
	(9.29)	(16.29)
Lev	0.340***	−0.671***
	(3.91)	(−8.02)
ROA	−0.591**	1.961***
	(−2.46)	(10.00)
Growth	−0.031	−0.136***
	(−0.99)	(−8.08)
Age	0.464***	0.018
	(9.25)	(0.31)
BM	0.032***	0.009
	(3.30)	(1.26)
Tangible	−0.814***	0.968***
	(−5.83)	(6.18)
Female	−0.076	−0.227***
	(−0.57)	(−2.63)
Compen	−1.697***	0.434***
	(−8.12)	(2.87)
Foreign	0.180***	
	(7.28)	
Cross-listing	0.656***	
	(14.64)	
Big4	0.565***	
	(12.21)	
IMR		−0.182**
		(−2.35)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
		(Continues)

TABLE 4 (Continued)

Dep. Var. =	DOI (1)	ESG (2)
N	26,338	26,338
Pseudo R^2	0.187	0.091

Note: This table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms by using Heckman two-step sample selection method. The t-statistics reported in parentheses are based on standard errors clustered by firm. In the regression, we control for industry and year fixed effects to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

4.5 | Subgroup analysis based on firm type

We propose that the positive effect of D&O insurance on ESG performance should be stronger for state-owned

TABLE 5 D&O insurance and ESG performance—PSM approach.

Panel A: The regression results using PSM-DID procedure						
					ESG	
Dep. Var. =					**(1)**	
Treat					0.147**	
					(2.09)	
Treat*Post					0.192***	
					(2.72)	
Post					−0.013	
					(−0.23)	
Indep					0.080	
					(0.35)	
Dual					−0.111***	
					(−4.00)	
Conc					0.002**	
					(2.15)	
Size					0.372***	
					(24.35)	
Lev					−0.641***	
					(−7.83)	
ROA					1.851***	
					(9.71)	
Growth					−0.143***	
					(−8.69)	
Age					0.092**	
					(1.99)	
BM					0.016**	
					(2.28)	
Tangible					0.821***	
					(5.57)	
Female					−0.236***	
					(−2.73)	
Compen					0.140	
					(1.49)	
Industry fixed					Yes	
Year fixed					Yes	
N					26,412	
Pseudo R^2					0.091	
Panel B: The results of covariate balance checks						
		Mean			***t*-test**	
Variable	**Unmatched/matched**	**Treated**	**Control**	**% bias**	***t***	***p*** > |***t***|
Indep	U	0.376	0.375	2.000	1.080	0.281
	M	0.376	0.378	−3.300	−1.300	0.195

TABLE 5 (Continued)

Panel B: The results of covariate balance checks						
		Mean			*t*-test	
Variable	Unmatched/matched	Treated	Control	% bias	*t*	$p > \|t\|$
Dual	U	0.176	0.290	−27.10	−13.840	0.000
	M	0.176	0.191	−3.600	−1.600	0.110
Conc	U	35.870	34.540	9.000	4.900	0.000
	M	35.870	36.190	−2.200	−0.860	0.389
Size	U	22.880	22.090	56.000	34.000	0.000
	M	22.88	22.91	−2.200	−0.810	0.419
Lev	U	0.487	0.425	30.500	16.380	0.000
	M	0.487	0.488	−0.600	−0.240	0.811
ROA	U	0.035	0.038	−5.500	−2.930	0.003
	M	0.035	0.035	0.700	0.310	0.759
Growth	U	0.188	0.173	3.300	1.820	0.068
	M	0.188	0.194	−1.300	−0.510	0.611
Age	U	2.897	2.846	14.400	7.820	0.000
	M	2.897	2.885	3.400	1.410	0.159
BM	U	2.131	2.528	−23.200	−12.020	0.000
	M	2.131	2.142	−0.700	−0.290	0.774
Tangible	U	0.911	0.925	−13.400	−7.870	0.000
	M	0.911	0.911	0.200	0.0600	0.953
Female	U	0.039	0.039	0.100	0.0700	0.945
	M	0.039	0.039	0.600	0.230	0.818
Compen	U	0.030	0.072	−35.100	−16.840	0.000
	M	0.030	0.038	−6.100	−3.110	0.012

Note: Panel A of this table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms, by utilizing a propensity score matching (PSM) approach. Following Chen et al. (2018), we utilize a difference-in-differences (DID) design. Namely, *Treat* stands for the treatment group (i.e., insured firms). We further adopt a dummy variable *Post* which equals one after the year of D&O insurance purchase for each treatment firm and zero otherwise. Equation (1) is then re-estimated after including the interaction term of *Post* and *Treat* to capture the effect of D&O insurance purchases over those periods. We control for industry and year fixed effects to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. Panel B reports the results of covariate balance checks on the mean difference in the covariates used in the probit model between the D&O insured firms and the matched control firms, when propensity score matching is adopted. *% bias* stands for the percent difference before and after the propensity score matching. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

enterprise (SOE) firms than that of non-SOEs, given the fact that managers and directors in SOEs have much stronger incentives to follow government's policies and comply with regulatory rules due to their political concerns (Su et al., 2021). Therefore, D&O insurance providers could better fulfil their monitoring function in SOE firms and improve their ESG performance. However, the SOE firms may easily manipulate the ESG ratings with their political powers and social status. Therefore, it is ultimately an empirical question whether the impact of D&O insurance on ESG performance is more salient for SOEs than that of non-SOEs.

We divide the whole sample into state-owned enterprises (SOE) and non-SOEs (Non-SOE) according to the nature of property rights. Namely, SOEs are defined as listed firms owned by central or local government or government agencies, where the state owns a minimum 10% of the shares (Su et al., 2021). As is shown in Table 7, the magnitude of the coefficient on D&O insurance is larger in SOEs than in non-SOEs and the difference is statistically significant at the 5% level. Therefore, it is shown that D&O insurance plays a more dominant role in improving ESG performance for SOEs than for non-SOEs, which provides additional support for our hypothesis regarding the

relationship between D&O insurance and ESG performance. However, we have to bear in mind that most of the non-SOEs in China have not yet been covered by D&O insurance, which may impose selection biases and influence the validity of our results; therefore, these results should be interpreted with caution.

5 | ROBUSTNESS CHECKS AND FURTHER ANALYSES

In this section, we perform several additional robustness checks to confirm the validity of our results and conduct further analyses to better understand the mechanism of impact of D&O insurance on corporate ESG performance.

5.1 | Fixed effects model

To mitigate concerns about the omission of time-invariant firm-specific characteristics, we re-estimate Equation (1) using the fixed effects model. Namely, we include firm fixed effects in our regression. We also control for province fixed effect to account for the impact of informal institutional factors such as regional culture and economic development (Callen & Fang, 2015; Li et al., 2017; Yang et al., 2020). Here, sample firms are categorized based on provinces where their headquarters reside. As shown in Table 8, the coefficients on variable DOI remain significantly positive at the 1% significance level. Therefore, our results are robust to controlling for unobservable time-invariant firm-specific factors. We also conduct the Hausman test where the *p*-value for the statistic of the Hausman test is 0.006, which justifies our use of the fixed effects model.

5.2 | An alternative measure of D&O insurance

The impact of D&O insurance on corporate decisions may be affected by the period that a firm has held D&O insurance (Wang et al., 2022). For firms which have recently purchased D&O insurance, the monitoring effect of insurance companies might not be strong and effective. Meanwhile, it takes time for D&O insurance providers to deal with the moral hazard problem and improve corporate governance of listed firms. Therefore, we expect the length of D&O insurance coverage is positively related to ESG performance. Here, we use the natural logarithm of one plus the years since a firm has held D&O insurance. The results presented in Table 9 show that the length of D&O insurance coverage is significantly positively related

TABLE 6 D&O insurance and ESG performance—Instrumental variable (IV) approach.

	DOI	ESG
Dep. Var. =	**(1)**	**(2)**
DOI		0.131***
		(2.76)
AvgDOI	0.001***	
	(12.28)	
Financial	4.572***	
	(6.51)	
Indep	0.860***	0.184
	(3.61)	(1.51)
Dual	−0.177***	−0.115***
	(−4.90)	(−6.90)
Conc	−0.002**	0.002***
	(−2.52)	(3.96)
Size	0.287***	0.385***
	(22.39)	(27.66)
Lev	0.130	−0.592***
	(1.52)	(−14.46)
ROA	−0.866***	1.579***
	(−3.64)	(13.02)
Growth	−0.072**	−0.139***
	(−2.27)	(−9.05)
Age	0.517***	0.131***
	(10.67)	(5.40)
BM	0.058***	0.022***
	(6.20)	(4.37)
Tangible	−0.834***	0.685***
	(−6.10)	(8.94)
Female	−0.029	−0.200***
	(−0.22)	(−3.25)
Compen	−1.990***	0.084
	(−9.21)	(1.48)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
N	26,338	26,439
Adjusted R^2	0.151	
Pseudo R^2		0.188

Note: This table reports the results regarding impact of D&O insurance on ESG performance by utilizing an instrumental variable (IV) approach. The instrumental variables are the industry average D&O insurance ratio (AvgDOI) and the number of financial institutions in the same region as firm *i* (Financial). The t-statistics reported in parentheses are based on standard errors clustered by firm. In all the regression, we control for industry and year fixed effects to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

to corporate ESG performance, which is consistent with our conjecture.

5.3 | Economic mechanisms: Information disclosure and corporate governance quality

In this subsection, we seek to understand the economic mechanisms through which D&O insurance coverage improve firms' ESG performance. Following prior literature (He et al., 2022; Wang et al., 2022; Yuan et al., 2016), we explore three possible paths: (1) whether firms purchasing D&O insurance are likely to issue more ESG information disclosure; (2) whether D&O insurance leads to better corporate governance; and (3) whether D&O insurance could prevent managerial misconduct.

5.3.1 | D&O insurance and non-financial information disclosure

The above evidence suggests that firms purchasing D&O insurance tend to achieve better ESG performance. However, Lin et al. (2013) and Wang et al. (2022) document the deteriorating financial reporting quality for D&O insured firms, while Yuan et al. (2016) find that firms purchasing D&O insurance are more likely to improve internal control quality and enhance financial reporting quality. Even though prior studies have documented mixed evidence about the impact of D&O insurance on financial reporting quality, we instead explore whether firms purchasing D&O insurance are more likely to disclose non-financial information such as ESG-related information. As discussed earlier, D&O insurance could protect directors and officers from personal liability incurred by their activities on behalf of the company. Such liability protection could possibly encourage managers to set ESG issues as work priorities and disclose more such information to the market.

We follow the causal steps approach to analyse the mediating effect of information disclosure quality (Baran & Forst, 2015). We use a two-step multivariate OLS regression to examine the effect of D&O insurance on non-financial information disclosure and ESG performance. In the first step, D&O insurance purchase is regressed on non-financial disclosure as proxied by ESG information disclosure.[1] In the second step, the associations among D&O insurance, the mediator (i.e., ESG information disclosure), and ESG performance can be fully investigated. In addition, Figure 2 plots the time trend of ESG disclosure index constructed using textual analysis, for D&O insured firms versus uninsured firms in China over the period of 2010–2020. It is evidenced that D&O insured firms are in nature more ESG-oriented and disclose more ESG-related information to the market.

The empirical results are presented in Table 10. As shown in Column (1) and Column (2) of Table 10, the coefficient of DOI is significantly and positively related to ESG information disclosure (ESG_Disclosure) at the 5% significance level, while ESG information disclosure is significantly positively associated with ESG performance at the 1% significance level. The results of the second-step regression are shown in Column (2) of Table 10. With ESG information disclosure included in the regression as a contingency factor, the magnitude of the coefficient on DOI decreases slightly from 0.182 as documented in Column (2) of Table 3 to 0.103 in Column (2) of Table 10, which however remains significantly positive at the 5% significance level. These findings prove that D&O insurance can help enhance ESG performance by improving non-financial information disclosure, which echoes our conjecture that D&O insurance encourage managers to prioritize ESG issues and voluntarily disclose more non-financial information such as ESG information to the market.

5.3.2 | D&O insurance and corporate governance quality

In this subsection, we test whether D&O insurance could help firms to enhance their ESG performance by improving corporate governance quality. To fully measure corporate governance quality of listed firms, we develop the corporate governance indicator (CGI) by utilizing principal component analysis (PCA). Namely, the CGI is a comprehensive measure obtained from combining a wide set of corporate governance quality measures, including ownership structure, board structure, managerial behaviour, information disclosure, and business ethics, which are all based on the key principles of corporate governance (Jiang & Yuan, 2018; Wang et al., 2022). By means of the principal component analysis to reduce data dimension, the CG indicator is a linear combination of the corporate governance-related metrics, which serve well as an index for corporate governance performance. The full components of the CG indicator are provided in Table A2 in the Appendix.

The empirical results considering the moderating effect of CG indicator are reported in Table 11. In Column (1) of Table 11, the coefficient on DOI is significantly and positively related to corporate governance quality (CGI) at the 1% significance level, suggesting that D&O insurance coverage can improve corporate

TABLE 7 D&O insurance and ESG performance—Subgroup analysis.

Dep. Var. = ESG	SOE (1)	Non-SOE (2)
DOI	0.145*	0.070
	(1.87)	(0.82)
Indep	−0.010	0.099
	(−0.03)	(0.35)
Dual	−0.108**	−0.050
	(−2.12)	(−1.51)
Conc	0.001	−0.001
	(0.62)	(−1.08)
Size	0.377***	0.325***
	(15.58)	(15.67)
Lev	−0.808***	−0.604***
	(−5.59)	(−6.22)
ROA	1.035***	2.387***
	(2.68)	(10.83)
Growth	−0.102***	−0.142***
	(−3.79)	(−6.88)
Age	−0.127	0.066
	(−1.27)	(1.24)
BM	0.028*	0.018**
	(1.86)	(2.21)
Tangible	0.001	0.816***
	(0.00)	(5.43)
Female	0.164	−0.237**
	(0.91)	(−2.43)
Compen	−3.906***	0.378***
	(−5.19)	(3.74)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
N	9866	16,573
Pseudo R^2	0.098	0.070

Note: This table reports the results of subgroup analysis, conditional on firm type (i.e., SOE firms vs. non-SOE firms). The *t*-statistics reported in parentheses are based on standard errors clustered by firm. In the regression, we control for industry fixed effect and year fixed effect to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

TABLE 8 D&O insurance and ESG performance—Province and firm fixed effects.

Dep. Var. =	ESG (1)	ESG (2)
DOI	0.412***	0.140***
	(6.87)	(2.75)
Indep		−0.016
		(−0.08)
Dual		−0.092***
		(−3.67)
Conc		0.002**
		(2.14)
Size		0.338***
		(25.46)
Lev		−0.585***
		(−7.87)
ROA		1.695***
		(9.59)
Growth		−0.126***
		(−8.36)
Age		0.099**
		(2.36)
BM		0.012**
		(1.98)
Tangible		0.740***
		(5.57)
Female		−0.173**
		(−2.26)
Compen		0.083
		(0.99)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
Province fixed	Yes	Yes
Firm fixed	Yes	Yes
N	26,438	26,438
Pseudo R^2	0.124	0.251

Note: This table reports the results regarding impact of D&O insurance on ESG performance, by adding province and firm fixed effects. The *t*-statistics reported in parentheses are based on standard errors clustered by firm. In the regression, we control for industry fixed effect and year fixed effect to capture for unobserved heterogeneity across industries and over time. In addition, we add province fixed effect and firm fixed effect to account for unobservable regional factor such as economic development, institutional and social trust in different provinces, as well as the influence of unobservable firm-specific factors. ***, ** and * indicate statistical significance at the 1%,
5% and 10% significance level respectively.

governance. The coefficient on DOI in Column (2) of Table 11 is still positive and statistically significant at the 10% significance level, which suggests that D&O insurance can help enhance ESG performance by improving corporate governance quality in China's listed firms.

The empirical results in Table 11 show that D&O insurance evidently enhances corporate ESG performance, as well as demonstrating a significantly positive

TABLE 9 D&O insurance and ESG performance—Alternative measure of D&O insurance.

Dep. Var. =	ESG (1)	ESG (2)
Length	0.058***	0.028***
	(6.40)	(3.32)
Indep		0.060
		(0.27)
Dual		−0.110***
		(−3.95)
Conc		0.002**
		(2.19)
Size		0.371***
		(24.48)
Lev		−0.650***
		(−7.93)
ROA		1.843***
		(9.67)
Growth		−0.142***
		(−8.64)
Age		0.086*
		(1.86)
BM		0.015**
		(2.22)
Tangible		0.835***
		(5.70)
Female		−0.231***
		(−2.68)
Compen		0.149
		(1.60)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
N	26,439	26,439
Pseudo R^2	0.005	0.091

Note: This table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms, by using an alternative measure of D&O insurance. Namely, D&O coverage length (Length) is defined as the natural logarithm of one plus the years since firm *i* has held D&O insurance. The t-statistics reported in parentheses are based on standard errors clustered by firm. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

effect of D&O insurance on corporate governance performance. Further analysis suggests that the positive association between D&O insurance and ESG performance is achieved through the mediating role of information disclosure and corporate governance quality, which supports our conjecture about the causal relationship between D&O insurance and ESG performance.

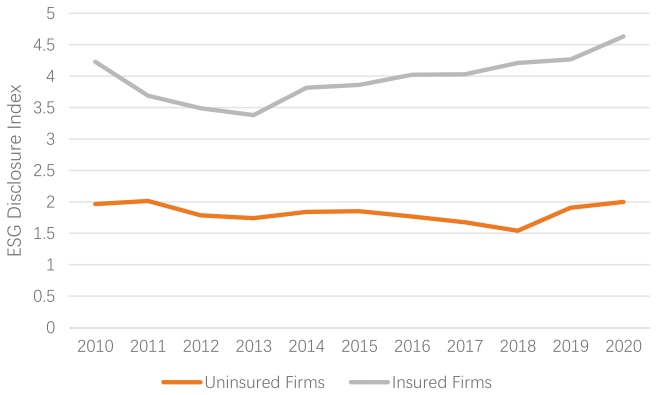

FIGURE 2 Trend of ESG disclosure index. This figure illustrates the time trend of Environmental, Social, and Governance (ESG) disclosure index for D&O insured firms versus uninsured firms in China over the period of 2010–2020. [Colour figure can be viewed at wileyonlinelibrary.com]

5.4 | D&O insurance and managerial misconduct

We further refine this study to focus on managers' misconduct behaviour, including illegal share buybacks, unauthorized change in use of funds, controlling shareholder's embezzlement, insider trading, stock price manipulation, and illegal loan guarantee, as previous literature has argued that managers covered by D&O insurance will tend to engage in manipulative activities to satisfy their personal interests, which are detrimental to the company (Wang et al., 2022). However, according to the cost–benefit analysis of corporate violation theory (Correia, 2009; Khanna et al., 2015), manager's misconduct behaviour is subject to the cost of violation, depending on the probability of being detected of such violation and the corresponding losses suffered (He et al., 2022; Su et al., 2021). In a weak internal and external governance setting such as China, D&O insurers have an even greater incentive to monitor their client firms to minimize future litigation costs (Yuan et al., 2016). To understand this motivation, we test whether D&O insurance coverage prevents managers from engaging in manipulating activities such as fraud. If D&O insurance purchases could help firms achieve high-quality ESG performance, it will benefit corporate sustainable development. Previous research has not yet provided consistent evidence to answer this question.

Different from previous literature that has documented the detrimental effect of D&O insurance on internal

TABLE 10 Mechanism analysis—The mediating role of ESG information disclosure

	ESG_Disclosure	ESG
Dep. Var. =	**(1)**	**(2)**
DOI	0.618**	0.103**
	(2.56)	(2.13)
ESG_Disclosure		0.218***
		(47.73)
Indep	1.064	−0.109
	(1.29)	(−0.58)
Dual	−0.131	−0.106***
	(−1.44)	(−4.23)
Conc	−0.000	0.003***
	(−0.01)	(3.21)
Size	1.295***	0.182***
	(22.61)	(13.21)
Lev	−1.167***	−0.528***
	(−4.20)	(−7.66)
ROA	1.224**	1.896***
	(2.12)	(10.82)
Growth	−0.430***	−0.086***
	(−8.82)	(−4.99)
Age	0.501***	0.002
	(3.26)	(0.05)
BM	0.133***	−0.007
	(5.52)	(−1.07)
Tangible	2.429***	0.494***
	(4.99)	(3.73)
Female	−0.491*	−0.178**
	(−1.90)	(−2.16)
Compen	−1.376***	0.468***
	(−4.71)	(5.43)
Ind fixed	Yes	Yes
Year fixed	Yes	Yes
N	26,439	26,439
Adjusted R^2	0.191	
Pseudo R^2		0.211

Note: This table reports the results regarding impact of D&O insurance on ESG performance, by examining the mediating effect of ESG information disclosure of listed firms (ESG_Disclosure). For a detailed introduction of the construction of ESG disclosure index, please refer to footnote (21). The t-statistics reported in parentheses are based on standard errors clustered by firm. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level, respectively.

governance and firm performance (Chung & Wynn, 2008; Lin et al., 2013; Wang et al., 2022), we investigate the impact of D&O insurance on external

TABLE 11 Mechanism analysis—The mediating role of corporate governance quality.

	CGI	ESG
Dep. Var. =	**(1)**	**(2)**
DOI	0.149***	0.101*
	(8.08)	(1.74)
CGI		0.548***
		(10.84)
Indep	−2.431***	1.410***
	(−38.94)	(5.50)
Dual	−0.005	−0.108***
	(−0.77)	(−3.94)
Conc	0.015***	−0.006***
	(56.11)	(−4.75)
Size	0.126***	0.305***
	(26.50)	(18.40)
Lev	−0.106***	−0.589***
	(−5.01)	(−7.25)
ROA	0.366***	1.668***
	(8.18)	(8.83)
Growth	−0.048***	−0.117***
	(−11.14)	(−7.19)
Age	0.078***	0.049
	(6.82)	(1.07)
BM	0.004*	0.014**
	(1.80)	(1.99)
Tangible	0.216***	0.722***
	(5.44)	(5.01)
Female	−0.019	−0.229***
	(−0.91)	(−2.69)
Compen	−0.505***	0.428***
	(−24.63)	(4.49)
Industry fixed	Yes	Yes
Year fixed	Yes	Yes
N	26,439	26,439
Adjusted R^2	0.659	
Pseudo R^2		0.097

Note: This table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms, by examining the mediating effect of corporate governance quality. Corporate governance index (CGI) is a comprehensive measure of corporate governance quality of firms based on principle component analysis (PCA) approach. For the specific corporate governance variables of the CGI, please refer to Appendix A2. The t-statistics reported in parentheses are based on standard errors clustered by firm. In the regression, we control for industry fixed effect and year fixed effect to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level respectively.

TABLE 12 Mechanism analysis—The mediating role of manager misconduct.

	Misconduct	ESG
Dep. Var. =	**(1)**	**(2)**
DOI	−0.218*	0.179***
	(−1.89)	(3.00)
Misconduct		−0.518***
		(−6.30)
Indep	−0.098	0.078
	(−0.21)	(0.34)
Dual	0.111*	−0.109***
	(1.86)	(−3.95)
Conc	−0.006***	0.002**
	(−2.90)	(2.12)
Size	−0.041	0.371***
	(−1.47)	(24.47)
Lev	0.425***	−0.637***
	(2.64)	(−7.81)
ROA	−1.780***	1.814***
	(−4.96)	(9.56)
Growth	−0.049	−0.143***
	(−0.59)	(−8.72)
Age	0.066	0.092**
	(0.79)	(2.01)
BM	−0.018	0.016**
	(−0.89)	(2.27)
Tangible	−0.106	0.831***
	(−0.38)	(5.65)
Female	−0.374	−0.242***
	(−1.34)	(−2.80)
Compen	−0.099	0.149
	(−0.44)	(1.59)
Ind fixed	Yes	Yes
Year fixed	Yes	Yes
N	26,175	26,439
Pseudo R^2	0.054	0.092

Note: This table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms, by examining the mediating effect of manager's misconduct behaviour. Manager misconduct (Misconduct) includes illegal share buybacks, unauthorized change in use of funds, controlling shareholder's embezzlement, insider trading, stock price manipulation, and illegal loan guarantee. The t-statistics reported in parentheses are based on standard errors clustered by firm. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level respectively.

TABLE 13 D&O insurance and different dimensions of ESG.

	E-score	S-score	G-score
Dep. Var. =	**(1)**	**(2)**	**(3)**
DOI	0.201***	0.102*	0.156***
	(3.05)	(1.68)	(2.62)
Indep	0.331	0.126	0.196
	(1.25)	(0.57)	(0.89)
Dual	−0.046	−0.022	−0.117***
	(−1.46)	(−0.85)	(−4.45)
Conc	−0.001	−0.000	0.004***
	(−0.75)	(−0.34)	(4.54)
Size	0.357***	0.322***	0.326***
	(21.06)	(21.23)	(21.09)
Lev	−0.511***	−0.367***	−0.640***
	(−5.53)	(−4.58)	(−8.08)
ROA	0.109	0.623***	2.231***
	(0.56)	(3.46)	(12.31)
Growth	−0.136***	−0.092***	−0.160***
	(−8.36)	(−5.28)	(−9.37)
Age	0.113**	0.048	0.106**
	(1.99)	(1.07)	(2.50)
BM	0.047***	0.009	0.017**
	(5.84)	(1.38)	(2.41)
Tangible	0.233	0.102	0.945***
	(1.50)	(0.72)	(6.92)
Female	−0.027	−0.058	−0.340***
	(−0.29)	(−0.72)	(−4.04)
Compen	−0.281**	0.114	0.127
	(−2.49)	(1.30)	(1.44)
Industry fixed	Yes	Yes	Yes
Year fixed	Yes	Yes	Yes
N	26,439	26,439	26,439
Pseudo R^2	0.071	0.146	0.082

Note: This table reports the results regarding impact of D&O insurance on ESG performance in China's listed firms, by separately examining the effect of D&O insurance on different dimensions of ESG scores. Here, E-score, S-score, and G-score represents the environmental, social and corporate governance score of the ESG ratings. The t-statistics reported in parentheses are based on standard errors clustered by firm. In the regression, we control for industry fixed effect and year fixed effect to capture for unobserved heterogeneity across industries and the influence of unobservable time-invariant factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% significance level respectively.

monitoring of firms, which would be helpful to catering the stakeholder's demand. The results as presented in Table 12 suggest that D&O insurance prevent managers from engaging in misconduct behaviours, with a significantly negative coefficient on DOI in Column (1) of Table 12, and constrained managerial behaviour can

improve corporate ESG performance (i.e., a significantly negative coefficient on Misconduct in Column (2) of Table 12). D&O insurance coverage releases vital information to the market, which exposes managers to a stronger external monitoring by insurance companies, and in turn, makes them aware of the cost of violation and reduces their misconduct activities. Therefore, our results provide important empirical evidence on how to mitigate moral hazard problems between shareholders and management.

5.5 | The effects of D&O insurance on different dimensions of ESG

In this subsection, we test the effects of D&O insurance on all three dimensions of the overall ESG score. Namely, we separately examine the effect of D&O insurance on three dimensions of ESG scores (i.e., E-score, S-score, and G-score) which are also sourced from the Sino-Securities Index Information Service.

Table 13 reports the results of heterogeneous impacts of D&O insurance on all three dimensions of ESG ratings, which are quantitatively similar to those reported in Table 3. It shows that D&O insurance has significantly positive effects on environmental, social, and corporate governance performance in the context of Chinese listed firms. Interestingly, D&O insurance exerts the strongest impact upon the environmental performance (E-score) of listed firms, followed by corporate governance (G-score) and social responsibility (S-score). The results are generally consistent with our conjectures that D&O insurance affects ESG performance mainly through the channel of improving information disclosure and corporate governance quality. That is to say, D&O insurance can promote firms' information disclosure, enhance corporate governance, and improve corporate ESG performance.

6 | CONCLUSIONS AND IMPLICATIONS

Using a unique data set on corporate purchases of D&O insurance by China's listed firms, we test the hypothesis that firms with D&O insurance coverage will promote their corporate ESG performance. Based on a sample of Chinese listed firms from 2010 through 2020, we find a significantly positive association between D&O insurance and ESG performance, suggesting that D&O insurance helps enhance the directors' and officers' incentives to act in the best interests of stakeholders. We also find this positive association to be more prominent in SOE firms, consistent with the notion that larger controlling shareholder ownership helps align shareholders' and managers' interests, and reduce managerial "myopia." Further empirical analysis provides direct evidence for a mediating effect of disclosure quality and corporate governance on the relationship between D&O insurance and ESG performance.

The empirical evidence suggests that D&O insurance exerts a positive and significant effect on ESG performance, which is in support of the monitoring hypothesis. Therefore, this study adds to the literature on the economic and social effect of D&O insurance by demonstrating that D&O insurance can improve firms' ESG performance and generates positive economic, environmental and social benefits. Our study adds to the growing literature on D&O insurance and its implications on firms and investors. We focus on the role of D&O insurance in improving corporate ESG performance and provide new evidence on the economic consequences of D&O insurance. We also extend prior studies on ESG by identifying a new factor that has an incremental positive effect on firms' ESG practices. Different from previous literature that focuses on the impact of D&O insurance on financial performance (Lin et al., 2011, 2013; Li & Liao, 2014; Wang et al., 2022; etc.), we investigate the impact of D&O insurance on corporate ESG engagement via the internal governance of firms to catering the stakeholders' demand.

Our results have several potential implications for regulators and investors. For example, we provide policy implications on how to effectively leverage the corporate governance effects of D&O insurance. Only a few countries have mandated the disclosure of information on D&O insurance purchases. As information about D&O insurance has a significantly positive impact on ESG performance, securities regulators in China and other countries should consider mandating the disclosure of D&O insurance purchases of listed firms, which may generate favourable economic consequences in the context of ESG engagement and investment. Our results are also beneficial to investors and portfolio managers who want to identify and manage ESG risks, by providing evidence that the purchase of D&O insurance would be helpful to manage corporate ESG risk.

This study can be extended in several ways. First, future studies can expand on the findings of this study by discovering improved measures of D&O insurance clauses using texture analysis to better investigate the relationship between D&O insurance and corporate ESG performance. Second, this research can be extended to other developing and developed countries. An international study can help understand mechanisms underlying

the relationship between D&O insurance and ESG performance around the world. For example, future studies could investigate the moderating role of a country's cultural and institutional environments as external contingency factors in the relationship between D&O insurance and corporate ESG performance. Last but not the least, with the prevalence of the COVID-19 pandemic and uncertainties surrounding the global recession, future research could examine how various market conditions, including economic and policy uncertainties, influence both purchases and claims of D&O insurance and the resulting impact on future corporate ESG performance.

ACKNOWLEDGEMENTS

We would like to thank the IJFE editorial team and two anonymous referees for their valuable comments. We acknowledge financial support from the National Natural Science Foundation of China (Grant No. 71901087; 72272031), Shanghai Philosophy and Social Science Planning Project (2022BGL006), and the Humanities and Social Sciences Foundation of the Ministry of Education of China (21YJC630167). All errors are our own.

DATA AVAILABILITY STATEMENT

The data that support the findings will be available in CSMAR at https://cn.gtadata.com/ following an embargo from the date of publication to allow for commercialization of research findings.

ORCID

Fei Su https://orcid.org/0000-0002-9477-858X

ENDNOTE

[1] Unlike Yuan et al. (2016) which utilizes the issuance of CSR reports as proxies for non-financial information disclosure, we resort to textual analysis to construct the variable of ESG disclosure index. More specifically, we follow these steps to construct the ESG disclosure indicator: (1) Use the web crawler to obtain the PDF versions of CSR reports for all listed companies in China, spanning the period 2008 to 2021, which is sourced from the CNINFO Data Service (http://www.cninfo.com.cn/), and convert them into text files; (2) Clean the data from the text files of CSR reports collected from the CNINFO Data Service, such as deleting and replacing original line breaks, removing all numbers and whitespace, etc.; (3) Utilize the LDA topic model to determine the optimal number of topics; The optimal number of topics in this study is 16 based on the perplexity of test data; (4) Construct word dictionaries based on the optimal number of topics determined by LDA topic model for the three dimensions of ESG reports, namely, environmental, social, and corporate governance topics; (5) Select the top 100 words for each topic, among the 16 topics generated by LDA model, and identify groups of similar data portions. We merge data portions with similar topics, while eliminating duplicate words within each dimension as well as those that are irrelevant to the topic. Then the final version retains most of the original words and serves as the final dictionary; (6) Use Python to count the occurrences of each ESG-related word from CSR reports, and construct the ESG information disclosure indicator by taking the logarithm of one plus the total number of words related to ESG issues respectively.

REFERENCES

Aguir, I., Burns, N., Mansi, S. A., & Wald, J. K. (2013). Liability protection, director compensation, and incentives. *Journal of Financial Intermediation*, *23*, 570–589.

Allianz Global Corporate & Specialty. (2021). *Identifying the major business risks for 2021*. Allianz Risk Barometer.

Armstrong, C., Jagolinzer, A. D., & Larcker, D. F. (2010). Chief executive officer equity incentives and accounting irregularities. *Journal of Accounting Research*, *48*, 225–271.

Baker, T., & Griffith, S. J. (2007). Predicting corporate governance risk: Evidence from the directors' & officers' liability insurance market. *The University of Chicago law Review*, *74*(2), 487–544.

Baran, L., & Forst, A. (2015). Disproportionate insider control and board of director characteristics. *Journal of Corporate Finance*, *35*, 62–80.

Barrena, J., López, M., & Romero, P. M. (2016). Corporate social responsibility: Evolution through institutional and stakeholder perspectives. *European Journal of Management and Business Economics*, *25*, 8–14.

Borovkova, S., & Wu, Y. (2020). ESG versus financial performance of large-cap firms: The case of EU, US, Australia, and South-East Asia. Refinitiv White Paper.

Boyer, M. M., & Stern, L. H. (2012). Is corporate governance risk valued? Evidence from directors' and officers' insurance. *Journal of Corporate Finance*, *18*(2), 349–372.

Boyer, M. M., & Stern, L. H. (2014). D&O insurance and IPO performance: What can we learn from insurers? *Journal of Financial Intermediation*, *23*(4), 504–540.

Boyer, M. M., & Tennyson, S. (2015). Directors' and officers' liability insurance, corporate risk and risk taking: New panel data evidence on the role of directors' and officers' liability insurance. *Journal of Risk and Insurance*, *82*(4), 753–791.

Brammer, S., Brooks, C., & Pavelin, S. (2006). Corporate social performance and stock returns: UK evidence from disaggregate measures. *Financial Management*, *35*(3), 97–116.

Callen, J. L., & Fang, X. (2015). Religion and stock price crash risk. *Journal of Financial and Quantitative Analysis*, *50*(1–2), 169–195.

Chalmers, J. L. D., & Harford, J. (2002). Managerial opportunism? Evidence from directors' and officers' insurance purchase. *The Journal of Finance*, *57*, 609–636.

Chen, T., Dong, H., & Lin, C. (2020). Institutional shareholders and corporate social responsibility. *Journal of Financial Economics*, *135*, 483–504.

Chen, Y. C., Hung, M., & Wang, Y. (2018). The effect of mandatory CSR disclosure on firm profitability and social externalities: Evidence from China. *Journal of Accounting and Economics*, *65*(1), 169–190.

Chen, Z., Li, O. Z., & Zou, H. (2012). Directors' and officers' liability insurance and the cost of equity capital. http://ssrn.com/abstract=1837912

Chen, Z., Li, O. Z., & Zou, H. (2016). Directors' and officers' liability insurance and the cost of equity. *Journal of Accounting and Economics*, *61*(1), 100–120.

Cheng, I.-H., Hong, H., & Shue, K. (2016). Do managers do good with other people's money? Working Paper, Dartmouth College.

Chi, H., Gong, J. J., Weng, T., & Chen, G. (2013). Effects of directors' and officers' liability insurance on corporate diversification. SSRN Working Paper.

Chung, H., Hillegeist, S., & Wynn, J. (2015). Directors' and officers' legal liability insurance and audit pricing. *Journal of Accounting and Public Policy*, *34*, 551–577.

Chung, H. H., & Wynn, J. P. (2008). Managerial legal liability coverage and earnings conservatism. *Journal of Accounting and Economics*, *46*, 135–153.

Chung, H. H., & Wynn, J. P. (2014). Corporate governance, directors' and officers' insurance premiums and audit fees. *Managerial Auditing Journal*, *29*, 173–195.

Core, J. (2000). On the corporate demand for directors' and officers' insurance premium: An outside assessment of the quality of corporate governance. *Journal of Law, Economics, and Organization*, *16*, 447–449.

Core, J. E. (1997). On the corporate demand for directors' and officers' insurance. *The Journal of Risk and Insurance*, *64*(1), 63–87. https://doi.org/10.2307/253912

Correia, M. M. (2009). Political connections, SEC enforcement and accounting quality. AAA 2010 Financial Accounting and Reporting Section (FARS) Paper. https://ssrn.com/abstract=1465783

Derwall, J., Guenster, N., Bauer, R., & Koedijk, K. (2005). The eco-efficiency premium puzzle. *Financial Analysts Journal*, *61*(2), 51–63.

Duque-Grisales, E., & Aguilera-Caracuel, J. (2019). Environmental, social and governance (ESG) scores and financial performance of multilatinas: Moderating effects of geographic international diversification and financial slack. *Journal of Business Ethics*, *168*, 1–20.

Eccles, R. G., & Serafeim, G. (2013). The performance frontier: Innovating for a sustainable strategy: Interaction. *Harvard Business Review*, *91*(7), 17–18.

Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science*, *61*, 2549–2568.

Foote, J., Gafney, N., & Evans, J. R. (2010). Corporate social responsibility: Implications for performance excellence. *Total Quality Management*, *21*(8), 799–812.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, *5*(4), 210–233.

Gibson, R., Krüeger, P., & Schmidt, P. S. (2021). ESG rating disagreement and stock returns. *Financial Analysts Journal*, *77*(4), 104–127.

Han, D., Hao, Y., Liu, Q., & Xie, G. (2018). Are female executives trailblazers or maintainers? Evidence of financial policy by Chinese companies (July 29, 2018). https://ssrn.com/abstract=3222242

Hassel, L., Nilsson, H., & Nyquist, S. (2005). The value relevance of environmental performance. *European Accounting Review*, *14*(1), 41–61.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, *47*(1), 153–161. https://doi.org/10.2307/1912352

He, F., Du, H., & Yu, B. (2022). Corporate ESG performance and manager misconduct: Evidence from China. *International Review of Financial Analysis*, *82*(C), 102201.

Holderness, C. (1990). Liability insurers as corporate monitors. *International Review of Law and Economics*, *10*, 115–129.

Hong, H., Kubik, J. D., & Scheinkman, J. A. (2012). Financial constraints on corporate goodness, Working Paper, Columbia University.

Hou, W., & Moore, G. (2010). Player and referee roles held jointly: The effect of state ownership on China's regulatory enforcement against fraud. *Journal of Business Ethics*, *95*, 317–335.

Huang, R. J., Jeng, V., Wang, C.-W., & Yue, J. C. (2021). Does size and book-to-market contain intangible information about managerial incentives? Learning from corporate D&O insurance purchase. *Pacific-Basin Finance Journal*, *68*, 101560.

Jacobson, L. S., LaLonde, R. J., & Sullivan, D. G. (1993). Earning losses of displaced workers. *The American Economic Review*, *83*, 685–709. https://doi.org/10.17848/wp92-11

Jia, N., & Tang, X. (2018). Directors' and Officers' liability insurance, independent director behavior and governance effects. *Journal of Risk and Insurance*, *85*(4), 1013–1054.

Jiang, X., & Yuan, Q. (2018). Institutional investors' corporate site visits and corporate innovation. *Journal of Corporate Finance*, *48*, 148–168.

Khanna, V. S., Kim, E. H., & Lu, Y. (2015). CEO connectedness and corporate frauds. *Journal of Finance*, *70*(3), 1203–1252. https://doi.org/10.1111/jofi.12243

KPMG. (2011). *KPMG international survey of corporate responsibility reporting 2011*. KPMG.

Lee, K.-H., Cin, B. C., & Lee, E. Y. (2016). Environmental responsibility and firm performance: The application of an environmental, social and governance model. *Business Strategy and the Environment*, *25*(1), 40–53.

Li, K., & Liao, Y. (2014). Directors' and officers' liability insurance and investment efficiency: Evidence from Taiwan. *Pacific-Basin Finance Journal*, *29*, 18–34.

Li, X., Wang, S. S., & Wang, X. (2017). Trust and stock price crash risk: Evidence from China. *Journal of Banking and Finance*, *76*, 74–91.

Lin, C., Officer, M. S., Wang, R., & Zou, H. (2013). Directors' and officers' liability insurance and loan spreads. *Journal of Financial Economics*, *110*, 37–60.

Lin, C., Officer, M. S., & Zou, H. (2011). Directors' and officers' liability insurance and acquisition outcomes. *Journal of Financial Economics*, *102*, 507–525.

Liou, C. H., Liu, J. L., Jian, P. M., & Tsai, C. C. (2017). Effects of director and officer liability insurance coverage on information disclosure quality and corporate fraud. *Emerging Markets Finance and Trade*, *53*(4), 806–818.

Miazad, A. (2023). D&O Insurers as climate governance monitors (February 11, 2023). https://ssrn.com/abstract=4222100

Nollet, J., Filis, G., & Mitrokostas, E. (2016). Corporate social responsibility and financial performance: A non-linear and disaggregated approach. *Economic Modelling*, *52*, 400–407.

Ortas, E., Álvarez, I., Jaussaud, J., & Garayar, A. (2015). The impact of institutional and social context on corporate environmental, social and governance performance of companies committed to voluntary corporate social responsibility initiatives. *Journal of Cleaner Production*, *108*, 673–684.

O'Sullivan, N. (1997). Insuring the agents: The role of directors' and officers' insurance in corporate governance. *Journal of Risk and Insurance*, *64*, 545–556.

O'Sullivan, N. (2009). The impact of directors' and officers' insurance on audit pricing: Evidence from UK companies. *Accounting Forum*, *33*, 146–161.

Semenova, N., & Hassel, L. G. (2008). Financial outcomes of environmental risk and opportunity for US companies. *Sustainable Development*, *16*(3), 195–212.

Shin, J., Moon, J. J., & Kang, J. (2023). Where does ESG pay? The role of national culture in moderating the relationship between ESG performance and financial performance, *International Business Review*, *32*(3), 102071.

Su, F. (2023). Environmental, social and governance (ESG) and corporate default risk: The moderating role of national culture. Working paper.

Su, F., Feng, X., & Tang, S. (2021). Do site visits mitigate corporate fraudulence? Evidence from China. *International Review of Financial Analysis*, *78*, 101940.

Tang, D. Y., Yan, J., & Yao, Y. (2021). The determinants of ESG ratings: Rater ownership matters. Proceedings of Paris December 2021 finance meeting EUROFIDAI—ESSEC.

Wang, S. Q., Lai, S., Pi, S., & Anderson, H. (2022). Does directors' and officers' liability insurance induce empire building? Evidence from corporate labor investment. *Pacific-Basin Finance Journal*, *73*, 101753.

Wynn, J. P. (2008). Legal liability coverage and voluntary disclosure. *The Accounting Review*, *83*, 1639–1669.

Yang, J., Lu, J., & Xiang, C. (2020). Company visits and stock price crash risk: Evidence from China. *Emerging Markets Review*, *44*, 100723.

Yermack, D. (1996). Higher valuation of companies with a small board of directors. *Journal of Financial Economics*, *40*, 185–212.

Yuan, R., Sun, J., & Cao, F. (2016). Directors' and officers' liability insurance and stock price crash risk. *Journal of Corporate Finance*, *37*, 173–192.

Yuan, R., Sun, J., & Cao, F. (2018). Directors' and Officers' liability insurance and corporate innovation. SSRN 3305503.

Zeng, T. (2014). Directors' and officers' liability insurance and tax aggressiveness. SSRN Working Paper.

Zou, H., Wong, S., Shum, C., Xiong, J., & Yan, J. (2008). Controlling-minority shareholder incentive conflicts and directors' and officers' liability insurance: Evidence from China. *Journal of Banking & Finance*, *32*, 2636–2645.

How to cite this article: Tang, S., He, L., Su, F., & Zhou, X. (2024). Does directors' and officers' liability insurance improve corporate ESG performance? Evidence from China. *International Journal of Finance & Economics*, *29*(3), 3713–3737. https://doi.org/10.1002/ijfe.2849

APPENDIX A

TABLE A1 Variable definition.

Variable		Definition
Dependent Variable		
ESG score	ESG	ESG scores ranging from 0 (C) to 9 (AAA), sourced from the Sino-Securities Index Information Service Co. Ltd: https://www.chindices.com/;
Independent Variable		
D&O Liability Issuance	DOI	A dummy variable that takes the value of 1 if the firm purchased D&O insurance in year *t*-1, and 0 otherwise;
Length of D&O coverage	Length	The natural logarithm of one plus the years since firm *i* has held D&O insurance;
Control Variable		
Independent director	Indep	The natural logarithm of one plus the number of independent directors, divided by the total number of directors on the board;
Duality	Dual	A dummy variable that takes the value of 1 if the firm's CEO also chairs the board, and 0 otherwise;
Concentration	Conc	The percentage of ownership held by the top five shareholders;
Firm size	Size	The natural logarithm of total assets at the beginning of the year;
Firm leverage	Lev	Total debt to total assets at the beginning of the year;
Return on Assets	ROA	The sum of profit after tax plus interest expense to total assets at the beginning of the year;
Growth rate	Growth	Annualized sales growth rate;
Firm age	Age	The natural logarithm of one plus the firm' age since the firm was established;
B/M ratio	BM	The market value of common equity plus the book value of total liabilities divided by the book value of total assets;
Tangible assets	Tangible	The percentage of firm i's tangible assets (net property, plant and equipment) divided by its total assets;
Female executives	Female	The ratio of female executives for firm *i* in year *t*-1;
Managerial Compensation	Compen	The natural logarithm of one plus the total compensation in dollars in year *t*-1;
Foreign director	Foreign	The natural logarithm of one plus the number of foreign directors, divided by the total number of directors on the board;
Big 4 auditor	Big4	A dummy variable equal to 1 if the auditor for firm *i* is one of the Big 4 audit firms or their predecessors, and 0 otherwise;
Cross-listing firm	Cross-listing	A dummy variable equal to 1 if firm *i* is cross-listed in stock exchanges, and 0 otherwise;
State-owned enterprise	SOE	A dummy variable equal to 1 if firm *i* is a state-owned enterprise (SOE), and 0 otherwise;
Corporate governance index	CGI	Corporate governance index constructed based on 12 corporate governance variables following Jiang and Yuan (2018);
Managerial misconduct	Misconduct	The natural logarithm of one plus the number of management fraud cases, including illegal share buybacks, unauthorized change in use of funds, controlling shareholder's embezzlement, insider trading, stock price manipulation, and illegal loan guarantee;
ESG information disclosure	ESG_Disclosure	The natural logarithm of one plus the number of words related to ESG issues in annual reports of listed firms in year *t*-1;
Industry fixed effect	Industry	Industry dummy variable;
Year fixed effect	Year	Year dummy variable;.

TABLE A2 Description of the CG indicator.

Category	Indicator	Definition
Ownership Structure	Top	The percentage of ownership held by the largest shareholder;
	S-Index	The percentage of ownership held by the top 10 shareholders, excluding the largest shareholder;
	SOE	A dummy variable that equals 1 if the firm is a state-owned enterprise (SOE), and 0 otherwise;
Board Structure	Managerial ownership	A dummy variable that takes the value of 1 if the chairman of the board or CEO owns the shares, and 0 otherwise;
	Independent directors	The percentage of independent directors on the board;
	Number of board members	The number of directors on the board;
Managerial Behaviour	Dividends	A dummy variable that takes the value of 1 if the firm pays dividends in year *t*, and 0 otherwise;
	Managerial compensation	The natural logarithm of one plus the total compensations for managers;
Information Disclosure	Unqualified opinion	A dummy variable that equals 1 if the firm received an unqualified opinion for its financial report in fiscal year *t*, and 0 otherwise;
	Cross-listing	A dummy variable that equals 1 if the firm is a cross-listed company, and 0 otherwise;
	Big 4 auditor	A dummy variable that equals 1 if the firm is audited by Big 4 audit firms, and 0 otherwise;
Business Ethics	Donations	The natural logarithm of one plus the amount of donations in CNY in year *t*;.