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Directors' and Officers' Liability Insurance, Directors' and Managerial Overconfidence, and ESG Performance

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Abstract

This study investigates the effects of Directors' and Officers' Liability Insurance (D&O insurance) coverage and managerial and board overconfidence on firm's Environmental, Social, and Governance (ESG) performance. Using a sample of 1,590 non-financial firms listed on the Taiwan Stock Exchange and the Taipei Exchange over the period 2015–2020, this study examines whether D&O insurance and behavioral traits of decision makers influence firms' ESG outcomes. Prior literature suggests that D&O insurance mitigates expected litigation losses, facilitates executive retention, and enhances external monitoring, thereby strengthening corporate governance. However, D&O insurance may also induce moral hazard and speculative behavior. Moreover, while ESG engagement can function as a risk management mechanism, overconfident boards and managers tend to underestimate downside risks and expected losses, potentially reducing ESG investment. Based on correlation analyses and multivariate regression estimations, the empirical results indicate that higher levels of D&O insurance coverage are positively associated with ESG performance, whereas firms characterized by overconfident boards and management exhibit significantly poorer ESG performance.

JEL classification numbers: G22, G40, M14, Q50, Q56.
Keywords: D&O insurance, Overconfidence, ESG Performance.

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1. Introduction

With the globalization of corporate operations and the heightened awareness of investors' rights protection, firms' directors, supervisors, and senior executives are increasingly exposed to elevated litigation risk. When formulating and selecting corporate strategies and investment decisions, top executives may consequently adopt more conservative behaviors to mitigate personal legal exposure and avoid potential litigation-related errors. Such risk-averse decision-making may, however, cause firms to forgo profitable investment opportunities and long-term growth potential. Moreover, litigation-related expenses—including legal fees, fines, and compensation payments—can impose substantial financial burdens on firms and, in extreme cases, threaten their financial viability or even lead to bankruptcy. In high-litigation-risk environments, firms may also become less attractive in the managerial labor market, resulting in talent outflows and greater difficulty in attracting and retaining high-quality executives.

To mitigate these risks, the insurance market has developed directors' and officers' liability insurance (D&O insurance), which provides financial protection for corporate managers against litigation exposure. Specifically, D&O insurance is designed to indemnify directors, supervisors, and other key personnel (and, in some cases, all employees) for personal legal liabilities arising from acts such as errors, negligence, breaches of fiduciary duty, breaches of trust, misrepresentations, or misleading statements committed in the course of performing their professional duties. Under D&O insurance policies, insured individuals are compensated for various litigation-related costs, including investigation expenses, legal defense fees, settlement payments, and court-awarded damages.

The extant literature documents several economic benefits associated with D&O insurance coverage (Cheng, Chang and Chen, 2022). First, the availability of D&O insurance facilitates firms' ability to attract and retain high-quality executives by mitigating personal litigation risk borne by directors and officers (Priest, 1987; Bhagat, Brickley and Coles, 1987; Holderness, 1990; Daniels and Hutton, 1993; Chen and Pang, 2008). Second, prior to underwriting D&O insurance, insurers typically conduct comprehensive assessments of firms' governance structures, managerial quality, and operational risk profiles in order to determine coverage eligibility and premium levels. During the coverage period, insurers continue to monitor whether insured directors and officers fulfill their fiduciary duties, thereby providing an additional layer of external governance and monitoring over insured firms (Holderness, 1990; Baker and Griffith, 2007; Chen and Pang, 2008). Third, D&O insurance alleviates excessive risk aversion among directors, officers, and senior executives by reducing their exposure to personal legal liability, which in turn mitigates value losses arising from foregone profitable investment opportunities or underinvestment problems (Bhagat, Brickley and Coles, 1987). Finally, by transferring litigation-related costs—such as legal defense expenses, settlement payments, and damage awards—to insurers, D&O insurance enables firms to limit the financial burden associated with compensating directors and

officers, thereby reducing expected bankruptcy costs and enhancing corporate financial stability (Mayers and Smith, 1982; Oesterle, 1989).

Building on the framework of Cheng, Chang and Chen (2022), a growing body of empirical evidence documents the economic and governance benefits of D&O insurance. Bhagat, Brickley and Coles (1987) show that firms experience a significantly positive stock price reaction following the public announcement of D&O insurance purchases, suggesting that capital markets view such coverage as value enhancing. Liu, Liu and Jian (2015) report that firms with D&O insurance coverage exhibit higher information disclosure quality and a lower incidence of corporate fraud. Consistent with these findings, Liao, Tang and Lee (2016) document that firms covered by D&O insurance demonstrate superior earnings quality and greater earnings stability. Park (2008) finds a positive association between firms' D&O insurance expenditures and the quality of voluntary disclosure. Furthermore, Liao, Tang and Lee (2017) show that D&O insurance coverage is positively related to corporate credit ratings, although this effect holds only when the insurance coverage amount remains within a normal range. Yuan, Sun and Cao (2016) provide evidence of a significantly negative relationship between the extent of D&O insurance coverage and stock price crash risk, indicating that D&O insurance may mitigate downside tail risk. Finally, Chen, Chen and Yang (2017) find that D&O insurance coverage strengthens the sensitivity of research and development investment to CEO compensation, implying that D&O insurance can facilitate incentive alignment between executives and shareholders.

Nevertheless, some scholars contend that D&O insurance may impose potential costs on firms (Cheng, Chang and Chen, 2022). This concern is primarily grounded in insurance theory, particularly the problems of moral hazard and adverse selection, which may arise not only within the firm but also in the assessments and perceptions of financial market participants. By transferring part of the legal and financial liability borne by directors, officers, and senior executives to insurance providers, the purchase of D&O insurance effectively attenuates personal legal exposure. Such a risk-shifting mechanism may induce moral hazard and opportunistic or speculative behavior (Gutierrez, 2003; Baker and Griffith, 2007), and may further give rise to overinvestment problems (Li and Liao, 2014; Chan and Chen, 2014).

A strand of the literature provides empirical support for the cost perspective of D&O insurance. For instance, Lin, Officer, Wang and Zou (2013) document a positive association between D&O insurance coverage and corporate credit spreads, suggesting that firms purchasing D&O insurance are perceived by capital providers as exhibiting heightened moral hazard. Consequently, lenders adopt a more pessimistic assessment of firm risk, which is reflected in higher loan interest rates. From an adverse selection perspective, this evidence indicates that firms with D&O insurance coverage face higher borrowing costs. Consistent with this view, Chen, Li and Zou (2016) find a positive relation between the extent of D&O insurance coverage and firms' cost of capital. Focusing on the auditing dimension, Chan, Sue and Liu (2014) report a positive association between the degree of D&O insurance coverage among Taiwanese listed firms and audit fees, implying that auditors

perceive higher engagement risk for firms with D&O insurance. Moreover, firms with excessive levels of D&O insurance coverage tend to receive lower credit ratings and exhibit a higher likelihood of financial statement restatements (Liao, Tang and Lee, 2017; Tang, Liao and Lee, 2015). The moral hazard effects induced by D&O insurance further manifest in inefficient investment behavior, a weakened sensitivity of managerial compensation to firm performance, and a deterioration in earnings quality and disclosure quality (Li and Liao, 2014; Chi, 2015; Chen, Zhu and Li, 2015; Chan, Chang, Chen and Wang, 2019; Wang and Chen, 2016).

The extant literature has extensively investigated the implications of D&O insurance for a wide range of corporate financial outcomes, including firm performance and value (Chen, Wang, Wu and Wu, 2015; Yi, Chen and Lin, 2018), cost of capital (Chen, Li and Zou, 2016; Yi, Chen and Zhao, 2013), credit ratings (Liao, Tang and Lee, 2017), earnings reporting quality and financial restatements (Tang, Liao and Lee, 2014, 2015), audit fees (Chan, Sue and Liu, 2014), tax avoidance (Li and Tang, 2019; Liao, Sang and Kao, 2021), and stock price crash risk (Yuan, Sun and Cao, 2016). In contrast, relatively limited attention has been devoted to examining whether and how D&O insurance coverage influences firms' attention to, and commitment toward, stakeholder interests. In particular, the effect of D&O insurance on firm's ESG performance remains underexplored, representing a notable gap in the literature and a central motivation for the present study. From an insurance-theoretic perspective, D&O insurance may give rise to moral hazard concerns. By partially transferring the legal and financial liabilities of directors, officers, and senior executives to insurers, D&O insurance coverage reduces personal legal exposure, which may induce moral hazard and speculative behavior (Gutierrez, 2003; Baker and Griffith, 2007) as well as overinvestment problems (Li and Liao, 2014). Under this view, D&O insurance coverage may weaken directors' and executives' incentives to carefully assess risks and diligently fulfill their fiduciary duties, potentially fostering complacency or opportunistic behavior aimed at personal benefit at the expense of the firm. Moreover, reliance on D&O insurance may reduce firms' incentives to allocate resources toward stakeholder protection and engagement, thereby impairing ESG performance. Accordingly, this perspective predicts a negative relationship between the extent of D&O insurance coverage and corporate ESG performance.

The corporate social responsibility (CSR) literature suggests that superior CSR performance enhances a firm's public image, reputation, and stakeholder trust, thereby functioning as a form of risk management or reputational insurance (Sen and Bhattacharya, 2001; Godfrey, 2005; Peloza, 2006; Godfrey, Merrill and Hansen, 2009; Minor and Morgan, 2011; Koh, Qian and Wang, 2014; Hung, Chang and Lin, 2022). Consistent with this view, firms with stronger CSR performance tend to experience smaller declines in firm value and operating performance when confronted with adverse events such as product recalls, financial distress, financial crises, the lifting of short-selling constraints, or financial restatements (Lins, Servaes and Tamayo, 2017; Gupta and Krishnamurti, 2018; Jia, Gao and Julian, 2020; Zhang, Shan and Chang, 2021).

At the same time, a substantial body of research documents a salient behavioral characteristic of boards of directors and top management—overconfidence—which is reflected in the tendency of decision makers to overestimate their relative abilities, exaggerate their degree of control over outcomes, and underestimate risks, giving rise to illusions of control, excessive optimism, and calibration bias (Gervais, Heaton and Odean, 2011; Goel and Thakor, 2008; Ben-David, Graham and Harvey, 2013; Malmendier and Tate, 2005a,b; Skala, 2008; Graham, Harvey and Puri, 2013). When ESG performance is viewed as a hedging or risk management mechanism (Sen and Bhattacharya, 2001; Godfrey, 2005; Peloza, 2006; Godfrey, Merrill and Hansen, 2009; Minor and Morgan, 2011; Koh, Qian and Wang, 2014), firms led by overconfident boards and managers may underestimate the likelihood or severity of adverse outcomes and, consequently, allocate fewer resources to ESG-related activities, resulting in weaker ESG performance. Moreover, overconfident managers are less inclined to follow prevailing market or industry trends (Lin, 2016). Given the documented peer effects in ESG-related investments within industries (Yang, Ye and Zhu, 2017; Cao, Liang and Zhan, 2019; Hsu and Tsai, 2021), such reduced tendency to conform may further dampen ESG investment when industry peers increase their ESG engagement. Under this behavioral perspective, managerial and board overconfidence is therefore expected to be negatively associated with corporate ESG performance.

This study investigates the effects of D&O insurance coverage and the overconfidence of boards of directors and top management on firm ESG performance, using a sample of 1,590 non-financial firms listed on the Taiwan Stock Exchange and the Taipei Exchange over the period 2015–2020. The extent of D&O insurance coverage is measured using multiple proxies, including an indicator variable for the presence of such insurance, the amount of insurance coverage, the average insurance coverage per director or supervisor, the ratio of insurance coverage to total assets, the ratio of insurance coverage to total equity, the ratio of insurance coverage to net sales, and the number of insurance companies underwriting D&O insurance. To capture overconfidence, this study follows the conceptual framework of Malmendier and Tate (2005a,b) and jointly considers overconfidence at both the board and management levels. Specifically, overconfidence is inferred from insider trading behavior reflecting excessive optimism about firm prospects and stock price performance. The study constructs several overconfidence indicators for directors and management, including cases in which profitability declines while insiders increase their shareholdings, as well as situations in which increases in insider shareholdings are followed by subsequent declines in firm profitability.

To operationalize firm-level ESG performance, this study employs multiple complementary measures. First, it adopts the Taiwan ESG (TESG) Sustainable Development Index for publicly listed firms in Taiwan, constructed based on data from the Taiwan Economic Journal (TEJ) database. The TESG measures include (i) an overall ESG performance classification consisting of seven ordinal levels, (ii) a continuous composite ESG score ranging from 0 to 100, (iii) disaggregated scores

for the environmental (E), social (S), and corporate governance (G) dimensions, and (iv) industry-relative rankings derived from these indices. In addition, the study constructs alternative proxies for CSR performance using social responsibility rankings published by the *Common Wealth* and the *Global Views Monthly*, two widely recognized Taiwanese business publications. Furthermore, following the constituent selection criteria of the Shanghai Stock Exchange Corporate Social Responsibility Index, the study calculates firms' social contribution value, social return on assets, and social contribution value per share, which are employed as additional proxy variables for firm CSR performance.

Using correlation analyses and multivariate regression estimations, the empirical results generally indicate that higher levels of D&O insurance coverage are associated with superior ESG performance and enhanced CSR outcomes, whereas the presence of overconfidence among the board of directors and top management is systematically related to poorer ESG and CSR performance. These findings provide important implications for government regulatory authorities by clarifying the governance-enhancing role of D&O insurance as well as the potential risks arising from overconfident behavioral traits at the board and managerial levels, which may ultimately jeopardize stakeholder interests. Accordingly, the evidence facilitates the identification of key regulatory focus areas and supports the development of proactive supervisory and preventive measures. Furthermore, the empirical results assist investors in better understanding how D&O insurance arrangements and managerial overconfidence jointly shape firms' commitment to stakeholder welfare and influence their long-term sustainability performance.

This study makes potential contributions in four aspects. Firstly, while most existing research on directors' and supervisors' liability insurance focuses on how such coverage affects financial indicators of companies, such as performance and value (Chen, Wang, Wu and Wu, 2015; Yi, Chen and Lin, 2018), funding costs (Chen, Li and Zou, 2016; Yi, Chen and Zhao, 2013), credit ratings (Liao, Tang and Lee, 2017), earnings quality and financial restatements (Tang, Liao and Lee, 2014; Tang, Liao and Lee, 2015), audit fees (Chan, Sue and Liu, 2014), tax avoidance (Lee and Tang, 2019; Liao, Sang and Kao, 2021), and stock price crash risk (Yuan, Sun and Cao, 2016), this study proposes a potential negative relationship between directors' and supervisors' liability insurance coverage and company ESG performance. This reveals that while safeguarding against directors' and supervisors' litigation risks, companies may inadvertently create moral hazards among board members and executives, potentially sacrificing the interests of stakeholders. Thus, the cost implications of directors' and supervisors' liability insurance extend beyond financial metrics to encompass ESG performance.

Secondly, while most existing research on determinants of company ESG performance explores how external and internal factors influence such performance, such as a company's legal environment, openness, profitability, and institutional ownership (Liang and Renneboog, 2017; Kim, Kim, Kim and Park, 2019; Dyck, Lins, Roth and Wagner, 2019; Nofsinger, Sulaeman and Varma, 2019; Li, Wang and Wu, 2021), peer corporate social responsibility performance (Cao, Liang and

Zhan, 2019), family control (El Ghoul, Guedhami, Wang and Kwok, 2016), market competition (Flammer, 2015; Lee, Byun and Park, 2018), and cross-listing (Boubakri, El Ghoul, Wang, Guedhami and Kwok, 2016), this study suggests that safeguarding against directors' and supervisors' litigation risks may instead be detrimental to resource allocation toward stakeholders. Directors' and supervisors' liability insurance coverage emerges as a negative determinant of company ESG performance. On one hand, it diminishes the potential benefits of such coverage for enhancing corporate governance, leading to concerns about moral hazards and conflicts of interest among board members and executives, indirectly indicating that when companies view ESG performance from an insurance perspective as a risk management strategy (Godfrey, 2005; Koh, Qian and Wang, 2014; Minor and Morgan, 2011; Shiu and Yang, 2017), increasing protection against litigation risks may reduce attention to and resource allocation toward other stakeholders. Thus, these two risk management strategies become substitutes rather than complementary approaches.

Thirdly, this study quantifies the extent of overconfidence among management teams and boards of directors in Taiwanese listed and over-the-counter companies over the past seven years, based on the methods defined in the literature. It proposes the argument that overconfidence among management teams and boards of directors is negatively associated with a company's ESG performance, aligning with the viewpoint of McCarthy, Oliver and Song (2017). This complements the determination of how incorporating ESG performance into the company's decision-making process is essential for risk management, as suggested by McCarthy, Oliver and Song (2017). The tendency of overconfidence among a company's board of directors and management reduces the necessity for risk management, thereby diminishing the company's demand for ESG performance. Consequently, the overconfidence of boards of directors and management becomes an additional negative factor in determining a company's ESG performance.

Fourthly, this study employs relatively novel ESG quantification variables specific to the Taiwanese region. It further disaggregates the overall ESG performance variable into performance variables for different dimensions, including scores and industry rankings for environmental, social, and corporate governance performance. This approach enhances the specificity and comprehensiveness of quantifying corporate social responsibility performance, contributing to the improvement of ESG performance assessment practices.

The next section is literature review and hypothesis development, followed by the third section on the introduction of variables, econometric model, firm samples, and data resource. The fourth section presents empirical results, and the final section concludes with recommendations.

2. Literature Review and Hypothesis Development

2.1 D&O Insurance and ESG Performance

Existing research suggests that a company's corporate social responsibility (CSR) performance can be viewed as a risk management and insurance strategy concerning its relationship with the social environment and stakeholders (Godfrey, 2005; Godfrey, Merrill and Hansen, 2009; Koh, Qian and Wang, 2014). Peloza (2006) indicates that a company's investment in CSR serves as an insurance factor for its performance during economic downturns or negative events. Minor and Morgan (2011) argue that a company's CSR performance helps in building reputation capital, whereby investing in social responsibility helps portray the company as being unlucky rather than poorly managed in the event of negative occurrences, resulting in lesser punitive actions from the public. Kytle and Ruggie (2005) assert that a company's investment in CSR helps mitigate two types of risks: regulatory risk and social risk. In countries with efficient legal enforcement, companies are subject to external oversight and exposed to litigation risks, and CSR serves as a mitigating factor for regulatory risk. Companies focusing on and investing in CSR aid in identifying potential issues and conflicts of interest with internal policies and stakeholders, thereby building reputation and reducing potential court penalties when litigation occurs (Francis and Armstrong, 2003). Brown, Helland and Smith (2006) also note that CSR serves to create goodwill with regulatory bodies and serves as a mechanism for reputation and performance protection. For instance, in the United States, when negative events occur, companies demonstrating efforts to enforce safety commitments typically receive reduced fines from the Occupational Safety and Health Administration (OSHA). Consequently, a company's CSR acts similarly to other risk management policies by both reducing the probability of risk events occurring beforehand and mitigating losses after they occur.

Chen, Shiu and Chang (2015) utilized event study methodology and found that a company's established image through fulfilling social responsibilities on ordinary days helps mitigate the extent of stock price declines when faced with unfavorable news coverage. Kao, Shiu and Lin (2016) analyzed data from Chinese listed companies between 2008 and 2012 and discovered a significant negative relationship between corporate social responsibility and overall company risk. Shiu and Yang (2017) observed that companies with sustained, long-term engagement in corporate social responsibility experience relatively lower declines in stock and bond prices when confronted with negative events. Gupta and Krishnamurti (2018) found that a company's social responsibility performance contributes to the establishment of moral and exchange capital, which can aid the company in overcoming bankruptcy. Lins, Servaes and Tamayo (2017) pointed out that a company's corporate social responsibility performance helps in building trust in financial markets. They discovered that during the financial crisis, companies with strong social responsibility performance enjoyed higher levels of trust among investors and in the market, leading to better profitability, higher sales per employee, and increased access to loans. Jia, Gao and Julian (2020) examined the Securities

and Exchange Commission's (SEC) policy changes regarding the removal of short-selling restrictions (SHO regulations) as exogenous negative shocks to company stock price risk. They found that among companies experiencing negative shocks, those with better social responsibility performance exhibited lower tendencies for their stocks to be short-sold.

While investment in corporate social responsibility (CSR) helps reduce the likelihood of negative events occurring and mitigates losses after such events, directors' and supervisors' liability insurance may potentially affect the level of CSR investment by companies. Because directors' and supervisors' liability insurance is a form of insurance, it may still give rise to moral hazard issues as per insurance theory. As previously mentioned, the purchase of directors' and supervisors' liability insurance transfers part of the legal and financial responsibilities of directors and management to the insurance company, thereby reducing their legal liability, which may lead to moral hazard and induce speculative behavior (Gutierrez, 2003; Baker and Griffith, 2007) and overinvestment problems (Li and Liao, 2014). The protection provided by directors' and supervisors' liability insurance may lead directors and executives to neglect risks, neglect their duties, become complacent, underestimate the importance of their responsibilities, reduce their commitment to and involvement in the company, have more time and space for speculative activities, pursue personal interests at the expense of the company, or even rely on the protection of directors' and supervisors' liability insurance to invest fewer resources in protecting and enhancing the interests of stakeholders, thereby reducing the company's investment in ESG. In this scenario, there may be a negative relationship between directors' and supervisors' liability insurance and company ESG performance. The hypothesis to be tested in this study is as follows:

Hypothesis 1A: The level of D&O insurance coverage negatively affects firm ESG performance; higher levels of D&O insurance coverage correspond to lower levels of ESG performance.

On the other hand, since directors' and supervisors' liability insurance serves as a form of insurance to compensate for litigation risk losses during the tenure of directors and supervisors, it is indeed a risk management practice aimed at safeguarding the stability of top management personnel and strengthening corporate governance. However, existing research such as Sen and Bhattacharya (2001), Godfrey (2005), Peloza (2006), Godfrey, Merrill and Hansen (2009), Minor and Morgan (2011), Koh, Qian and Wang (2014), Chen, Shiu and Chang (2015), Shiu and Yang (2017), Lins, Servaes and Tamayo (2017), Gupta and Krishnamurti (2018), Jia, Gao and Julian (2020), as well as Hung, Chang and Lin (2022), have all mentioned and confirmed that a company's corporate social responsibility performance can serve as a risk management and insurance strategy for its relationship with the social environment and stakeholders. Therefore, directors' and supervisors' liability insurance safeguards against potential litigation risks during their tenure, while a company's social responsibility performance can also be seen

as a strategic investment to reduce reputation and social relationship risks. Whether it's purchasing directors' and supervisors' liability insurance or actively investing in corporate social responsibility, both can play a role in mitigating the extent of operational and reputational damage during negative events, and can enhance the stability of directors, supervisors, and human resource quality before the occurrence of risk events, thereby reducing the probability of claims against the interests of stakeholders. Thus, a higher level of coverage for directors' and supervisors' liability insurance tends to correlate with greater investment in social responsibility, indicating a positive relationship between the two.

Many studies have addressed the impact of directors' and supervisors' liability insurance on various stakeholders' interests. For example, concerning the impact of directors' and supervisors' liability insurance coverage on the interests of creditors and shareholders, Liao, Tang and Li (2017) found that companies with directors' and supervisors' liability insurance tend to have better credit ratings, especially when they have an appropriate amount of insurance coverage based on their characteristics and risks (i.e., normal insurance amount), which leads to better credit ratings. Liao, Tang and Li (2016) utilized the earnings conservatism index proposed by Khan and Watts (2009) and discovered that companies with directors' and supervisors' liability insurance exhibit higher earnings quality conservatism, and the greater the insurance coverage, the higher the earnings conservatism. Tang, Liao and Lee (2015) found that companies with an appropriate amount of directors' and supervisors' liability insurance coverage based on their characteristics and risks have a reduced probability of financial statement restatements. Regarding how directors' and supervisors' liability insurance affects the relationship between companies and the government, Lee and Tang (2019) found that companies with directors' and supervisors' liability insurance tend to engage in less tax avoidance. Within companies that have purchased directors' and supervisors' liability insurance, the larger the insurance coverage, the less tax avoidance is observed. This implies that directors' and supervisors' liability insurance helps strengthen corporate governance mechanisms and suppress the tax avoidance behavior of management. From the above, it is evident that directors' and supervisors' liability insurance coverage has a positive impact on the interests of stakeholders at different levels.

In the current financial market environment, the trend of companies purchasing directors' and supervisors' liability insurance has become prevalent. However, the decision to purchase such insurance is not solely determined by the company's demand. The supply of directors' and supervisors' liability insurance, provided by insurance companies, also involves the final decision-making authority on underwriting and whether to agree to provide coverage. This includes determining policy details and exclusions, which serve as mechanisms to encourage the insured directors and supervisors to fulfill their fiduciary duties responsibly. The determination of insurance premiums and underwriting decisions by insurance companies undoubtedly considers both financial and non-financial information and prospects of the insured companies. Companies with higher levels of directors' and supervisors' liability insurance coverage are also expected to perform relatively

better in terms of corporate social responsibility. However, companies with high demand for directors' and supervisors' liability insurance but a notorious reputation in social responsibility performance are less likely to be willing to be underwritten by insurance companies. Moreover, the insurance premiums for such companies will be unusually expensive, as companies with poor social responsibility performance are at a significantly higher risk of being sued by stakeholders in the future. Based on the above reasoning, this study posits that there should be a positive relationship between directors' and supervisors' liability insurance and a company's ESG performance or corporate social responsibility performance. Therefore, this study sets forth Hypothesis 1B:

Hypothesis 1B: The level of D&O insurance coverage positively influences a firm's ESG performance; higher levels of D&O insurance coverage correspond to better ESG performance.

2.2 Overconfidence and ESG Performance

In the previous point, it was noted that a company's corporate social responsibility helps reduce the risks it faces. However, Gervais, Heaton and Odean (2011) point out that overconfident managers tend to underestimate the likelihood of these risks occurring or the expected losses if they do occur, thus overlooking the value of corporate social responsibility as a risk management and insurance tool. Overconfident managers believe their abilities are above average and are convinced that any investment decisions resulting in company losses are due to bad luck rather than capability issues (Alicke and Govorun, 2005). They also tend to underestimate the volatility of the company's future cash flows (Gervais, Heaton and Odean, 2011; Gervais and Goldstein, 2007). Individuals with overconfidence traits believe they are more likely to experience positive events and less likely to encounter negative events (Harris and Hahn, 2011). Similarly, overconfident managers believe that during their tenure, the probability of the company facing negative events is lower than average, meaning they tend to underestimate future risks (Hackbarth, 2008).
Companies with overconfident boards and management tend to underestimate the likelihood of negative events occurring and overlook the risk management and insurance effects brought by the company's investment in ESG. Companies with overconfident boards and management do not entirely deny the insurance effects that ESG may bring; however, they believe the probability of these effects being useful, i.e., the probability of something bad happening, is relatively low, stemming from their belief that the probability of something good happening is higher and something bad happening is lower due to their overconfidence traits. Since overconfident managers underestimate the probability of bad events occurring, the demand for ESG investment, which can act as insurance when bad events happen, decreases. Companies with overconfident boards and management tend to overlook ESG as a risk management and insurance mechanism for company operations, resulting in less investment in ESG. Hypothesis 2 of this study is as follows:

Hypothesis 2: There is a negative relationship between overconfidence of boards and management and firm's ESG performance; when the management and board exhibit overconfidence traits, the firm's ESG performance tends to be poorer.

3. Variable, Econometric Model, Samples and Data

3.1 Variable

3.1.1 Explained Variable-ESG/CSR Performance and Disclosure

The Taiwan Economic Journal (TEJ) database, developed by a well-known business database company in Taiwan, constructed and released the TESG sustainability development index (https://tesg.tej.com.tw/) for Taiwan's publicly traded firms in 2022. The "E" in TESG sustainability development index stands for environmental protection assessment, which mainly evaluates a firm's carbon emissions, waste management, and energy efficiency, to measure whether the firm has made efforts to maintain the environment and work towards environmental sustainability during its development process. The "S" in TESG sustainability development index stands for a firm's practice and protection of stakeholders' rights and interests in society, evaluating factors such as labor rights, social participation, and customer protection for consumers, and promoting the establishment of a good workplace environment and the implementation of social responsibility. The "G" in TESG sustainability development index stands for corporate governance, including a firm's compliance with government regulations at all levels, the relationship between the company's board of directors and senior management, supply chain management, and risk management, to evaluate the incentive mechanisms and efficiency of a firm's management in its operations.

The TESG sustainable development index has emerged multiple variables. First, while the ESG rating is divided into seven levels, including A+, A, B+, B, B-, C, and C-. Based on these seven levels, this study assigns discontinuous numerical values, ranging from 7 to 1 points (*esgrank*), the higher the point, the better the ESG rating, and the better the firm's overall performance in ESG. Second, ESG scores (*esgscore*), range from 0 to 100 points, with 0 being the worst and 100 being the best. Third, the ranking of the ESG score among all samples (*esgwr*). For example, if a specific firm's ESG score in a particular year ranks second among 25 sample companies, the notation in the database is (2/25). This study converts this notation to [100-(2/25)*100]=92. The higher the converted value, the higher the firm's rank among all samples and the better its overall performance in ESG among all samples. Fourth, the ranking of ESG score in the samples of main-industry classification by SASB (Sustainability Accounting Standards Board) (*esgmr*), which is similar to the conversion process of the previous variable. The higher the converted value, the better the firm's performance in the samples of main industry classification by SASB. Fifth, the ranking of ESG score in the samples of sub-industry classification by SASB (*esgsr*). The higher the value, the better the firm's performance in the samples of sub-industry classification by SASB.

This study further considers the performance of three ESG dimensions in TESG

evaluation, including the score of firm's performance on environmental aspect (*envscore*), the ranking of the score of environmental aspect in samples of SASB main industry classification (*envmr*) (using the same conversion method as before), the ranking of the score of environmental aspect in samples of SASB sub-industry classification (*envsr*), the score of firm's performance on social aspect (*socscore*), the ranking of the score of social aspect in samples of SASB main industry classification (*socmr*), the ranking of the score of social aspect in samples of SASB sub-industry classification (*socsr*), the score of firm's performance on corporate governance aspect (*govscore*), the ranking of the score of corporate governance aspect in samples of SASB main industry classification (*govmr*), the ranking of the score of corporate governance aspect in samples of SASB sub-industry classification (*govsr*). The higher the values of the above variables, the better the firm's performance in the individual aspect in ESG performance.

According to Chang (2011), Taiwan's leading business magazine, the *Common Wealth*, conducted a corporate citizenship survey in 2007 for publicly traded firms in the Taiwanese financial market. The survey referenced international indicators and assessment methods, including the United Nations Global Compact, OECD Guidelines for Multinational Enterprises, and the Dow Jones Sustainability Index. It evaluated companies in four aspects: corporate governance, corporate commitment, social engagement, and environmental protection, in order to select the "Best Corporate Citizens" among the evaluated companies. The process of selecting the Best Corporate Citizens list first filtered companies from publicly traded companies that had been profitable for three consecutive years. Subsequently, more than 500 institutional analysts, accountants, and experts from the business, government, and academics, who have long been concerned with CSR, rated the performance of the companies in above four aspects. The scores were then weighted to obtain the total scores for each corporation, and the top 50 with the highest total scores were named the "Best Corporate Citizens TOP50".

Similarly, according to Chang (2011), another Taiwan's leading business magazine, the *Global Views Monthly* began conducting a comprehensive survey on CSR for publicly listed companies in 2005. They referenced the rating weight criteria from the German social responsibility research institution, OEKOM. The evaluation focused on three aspects: social performance, environmental performance, and financial information of the evaluated companies, with weighted scoring. They also examined other information related to the evaluated companies, including, (1) audit questionnaire content and negative news reports, (2) external evaluations from organizations such as the Ministry of Environment, Ministry of Labor, Consumer Protection Committee in Executive Yuan, and other non-governmental organizations, (3) eliminating of companies involved in significant labor disputes, environmental pollution cases, major consumer disputes, and businesses whose owners had travel restrictions due to legal issues in the past two years, (4) eliminating of companies with three consecutive years of operating losses. Companies that scored well in these evaluations were awarded the annual "CSR Award".

This study constructs three variables to measure a firm's CSR performance based on the list of winning firms of the *Common Wealth*'s "Corporate Citizen Awards" and the *Global Views Monthly*'s "CSR Awards" from 2007 to 2020. The first variable is current performance of CSR (*csrdummy*), which is a dummy variable that equals 1 if the firm has won either of the two awards in a specific year, and 0 otherwise. The second is cumulative performance of CSR (*csrcumu*), defined as the total number of years a firm has been win either or both of the awards (either award is sufficient). For example, if a firm has been win either or both of the awards for four years (missing one year) at the fifth year, the value of *csrcumu* at the fifth year is set to 4. The third variable is continuous performance of CSR (*csrcont*), which is also a dummy variable that equals 1 for a firm in every year of the data period (6 years) if it has won either of the two awards every year, but equals 0 if it fails to win either of the two awards in any year. The fourth variable is overlap performance of CSR (*csrovlp*), which is a dummy variable that equals 1 if a firm has won both of the two awards in a specific year, and 0 otherwise.

In addition, this study refers to Huang and Chang (2021) to calculate the social contribution value of each firm-year sample as a measure of CSR performance. Social contribution value refers to the amount that a firm pays to its primary stakeholders, including shareholders, employees, government, and creditors each year. This includes the cash dividends paid to shareholders, salary expenses and benefits paid to employees, taxes paid to the government, and interest expenses paid to creditors. Adding up these four amounts gives the total value created by the firm for its primary stakeholders, and this social contribution value is used as a quantitative indicator of how much benefit the firm creates for society. This study takes the natural logarithm of the social contribution value (*scv*) as the second variable to measure CSR performance. At the same time, considering the firm's size, the social contribution value (not taken the natural logarithm) divided by the total assets of the firm to obtain the social returns of assets (*sroa*), which quantifies the benefits that each unit of assets brings to its primary stakeholders. In addition, the social contribution value divided by the number of outstanding shares in that year to obtain the social contribution value per share (*scvps*), which quantifies the benefits that each unit of common stock brings to its primary stakeholders.

This study measures the level of information disclosure in companies using the following five variables: First, whether the company discloses its sustainability report, represented by a binary variable (*csrrdis*), where 1 indicates disclosure and 0 indicates non-disclosure. Second, whether the disclosed sustainability report of the company is verified by the Big4 accounting firms, represented by a binary variable (*csrrcer*), where 1 indicates verification and 0 indicates non-verification. Third, the transparency score (*transp*) of the company in corporate governance evaluations, ranging from 0 to 100, where 0 represents the worst and 100 represents the best. Fourth, the ranking (*transpmid*) of the company's transparency score in the Sustainability Accounting Standards Board (SASB) primary industry classification. For instance, if a specific company's transparency score in a particular year ranks 2nd among 25 companies in the SASB primary industry classification, it is noted as

(2/25). This study converts this notation to [100-(2/25)*100]=92. A higher converted value indicates better performance of the company in transparency score within the SASB primary industry classification. Fifth, the ranking (*transpsid*) of the company's transparency score in the SASB sub-industry classification, which undergoes a similar conversion process as the previous variable. A higher converted value indicates a higher ranking of the company within the SASB sub-industry classification, reflecting better performance within that specific sub-industry.

3.1.2 Explanatory Variables - D&O Insurance Coverage and Overconfidence

The main explanatory variables in the study pertain to the extent of D&O insurance coverage, measured using seven distinct indicators. First, an indicator for whether a firm has D&O insurance coverage (*dolid*), which equals 1 if the total insurance coverage for D&O insurance is greater than zero, and 0 otherwise. Second, the total amount of D&O insurance coverage (*dolim*), measured as the natural logarithm of the insurance coverage amount. Third, the average D&O insurance per director/officer (dolia), calculated as the total D&O insurance coverage divided by the number of directors and officers and then take natural logarithm. Fourth, the ratio of D&O insurance to total assets (*dolita*), defined as the total D&O insurance coverage amount divided by total assets. Fifth, the ratio of D&O insurance to total equity (*dolite*), defined as the total D&O insurance coverage amount divided by total equity. Sixth, the ratio of D&O coverage to net sales (*dolits*), defined as the total D&O insurance coverage amount divided by net sales. Seventh, the number of insurance companies underwriting D&O coverage for a specific firm of a specific year (*dolini*). Higher values for each of these seven variables reflect a greater level of D&O insurance coverage.

Another main explanatory variable in this study is the presence of overconfidence characteristics in the company's management team and board of directors. Existing studies have mostly focused on measuring overconfidence characteristics in CEOs or management teams. For example, Malmendier and Tate (2005a,b) pointed out that overconfident managers tend to believe that the company's future performance will be better and are less likely to exercise their in-the-money employee stock options. Therefore, the percentage of in-the-money stock options held by managers can be used as a measure of their overconfidence. The relative frequency of optimistic versus pessimistic messages released by the management team can measure their level of overconfidence (Malmendier and Tate, 2008). Brown and Sarma (2007) indicated that when corporate managers exhibit overconfidence characteristics, companies tend to engage in more inefficient investment research. Therefore, the degree of overinvestment by the company can measure the overconfidence of the management team. For example, whether the company has a relatively higher capital expenditure ratio compared to the industry norm. Malmendier and Tate (2005a,b) suggested that overconfident management teams tend to be optimistic about the company's prospects and stock market performance, leading to an increase in their shareholdings. Thus, an increase in management team

ownership can be seen as an indication of overconfidence. Lin, Hu and Chen (2005) stated that if the difference between a company's predicted earnings and actual earnings is greater than 50%, it indicates overconfidence among the company's managers.

This study considers limitations in accessing employee stock option data for the management team during the data period of the sample. Therefore, following the references of Malmendier and Tate (2005a,b), Campbell, Gallmeyer, Johnson, Rutherford and Stanley (2011), as well as Ahmed and Duellman (2013), it considers whether the management team increases their ownership of the company's stock as an indication of overconfidence. Additionally, considering directors as important resources for the company and the board of directors as a crucial governance body with access to significant company information, this study also examines whether board members increase their ownership of the company's stock to assess their overconfidence characteristics.

This study measures the overconfidence characteristics of the management team and the board of directors using four variables, all of which are dummy variables: Negative Profit but Management Increases Holdings (*pfmmhi*): If the company's profit in the previous period is negative, but the management team's ownership ratio increases relative to the previous period, it is coded as 1; otherwise, it is coded as 0. Management Increases Holdings but Profit Decreases *(mhipfd*): If the management team's ownership ratio increases relative to the previous period, but the profit decreases in the next period compared to the current period, it is coded as 1; otherwise, it is coded as 0. Director Increases Holdings but Profit Decreases (*dhipfd*): If the director's ownership ratio increases relative to the previous period, but the profit decreases in the next period compared to the current period, it is coded as 1; otherwise, it is coded as 0.

3.1.3 Control Variables

In addition to the negative impact on a company's ESG performance due to the extent of directors and officers liability insurance coverage and the overconfidence of the board of directors and management team, as proposed in this study, previous literature, such as Reverte (2009), Chih, Chih and Chen (2010), Kansal, Joshi and Singh Batra (2014), and Liang and Renneboog (2017), has identified numerous determinants influencing a company's engagement in corporate social responsibility (CSR) activities. These factors include both external environmental factors and internal company-specific factors, such as legal origins of the country where the company operates, industry competition, company size, profitability, board structure, ownership structure, managerial traits, and board diversity. For instance, Liang and Renneboog (2017) noted that companies in civil law countries (such as France and Germany) tend to have better CSR performance compared to those in common law countries (such as the UK and the US). Moreover, companies operating in more economically open countries tend to exhibit better CSR performance, while larger companies, those with higher profitability, and those with

higher levels of investor protection also tend to demonstrate better CSR performance.

This study, referencing research by Liang and Renneboog (2017), Shen and Chang (2009), El Ghoul, Guedhami, Kwok and Wang (2016), Dyck, Lins, Roth and Wagner (2019), Boubakri, El Ghoul, Guedhami and Wang (2021), Bear, Rahman and Post (2010), and Beji, Yousfi, Loukil and Omri (2021), considers controlling for variables that potentially influence a company's ESG performance. These variables include return on assets as a proxy for profitability (defined as earnings before interest, taxes, depreciation, and amortization divided by average assets: *roa*), total assets as a proxy for company size (defined as the natural logarithm of total assets: *asset*), debt ratio as a proxy for financial risk (defined as debt divided by assets: *debt*), the ratio of independent directors as a proxy for board independence (defined as the number of independent directors divided by the total number of directors: *indr*), a dummy variable indicating gender diversity on the board (1 for companies with female directors and 0 otherwise: *fdd*), institutional ownership ratio (defined as the number of shares held by institutional investors divided by the total outstanding shares: *insthold*), and whether the company is a family-owned enterprise (defined as 1 for companies controlled by a single family and 0 otherwise: *family*). Table 1 reports the English codes and definitions of these variables.

Table 1: The Abbreviation and Definition of Variables

Variable	Abbreviation	Definition
Explained Variable (I) - ESG performance		
ESG ratings	*esgrank*	ESG ratings is divided into 7 levels, including A+, A, B+, B, B-, C, and C-. Assigning an integer value of 7, 6,...1 to the seven TESG levels, respectively, and a higher score indicates a better TESG rating
ESG score	*esgscore*	The TESG score is ranged from 0 to 100 points, with 0 being the worst and 100 being the best
The rank of ESG score in full samples	*esgwid*	If a specific firm's ESG score in a particular year is ranked 2nd out of 25 firms in the full sample, the notation in the database is (2/25). This notation can be converted to [100 - (2/25)*100] = 92, where a higher value indicates that the firm has a higher ranking and better performance in the full sample
The rank of ESG score in SASB main industry classification	*esgmid*	If a specific firm's ESG score in a particular year is ranked 2nd out of 25 firms in the SASB main industry classification, the notation in the database is (2/25). This notation can be converted to [100 - (2/25)*100] = 92, where a higher value indicates that the firm has a higher ranking and better performance in the SASB main industry classification.
The rank of ESG score in SASB sub- industry classification	*esgsid*	If a specific firm's ESG score in a particular year is ranked 2nd out of 25 firms in the SASB sub-industry classification, the notation in the database is (2/25). This notation can be converted to [100 - (2/25)*100] = 92, where a higher value indicates that the firm has a higher ranking and better performance in the SASB sub-industry classification.
ESG environment score	*envscore*	The ESG environment score is ranged from 0 to 100 points, with 0 being the worst and 100 being the best
The rank of ESG environment score in SASB main industry classification	*envmid*	The ranking of a specific firm's ESG environmental score in the SASB main industry samples in a particular year.
The rank of ESG environment score in SASB sub- industry classification	*envsrid*	The ranking of a specific firm's ESG environmental score in the SASB sub-industry samples in a particular year.
ESG social score	*socscore*	The ESG social score is ranged from 0 to 100 points, with 0 being the worst and 100 being the best
The rank of ESG social score in SASB main industry classification	*socmid*	The ranking of a specific firm's ESG social score in the SASB main industry samples in a particular year.
The rank of ESG social score in SASB sub- industry classification	*socsid*	The ranking of a specific firm's ESG social score in the SASB sub-industry samples in a particular year.
ESG corporate governance score	*govscore*	The ESG corporate governance score is ranged from 0 to 100 points, with 0 being the worst and 100 being the best
The rank of ESG corporate governance score in SASB main industry classification	*govmid*	The ranking of a specific firm's ESG corporate governance score in the SASB main industry samples in a particular year.
The rank of ESG corporate governance score in SASB sub- industry classification	*govsid*	The ranking of a specific firm's ESG corporate governance score in the SASB sub-industry samples in a particular year.
Explained Variable (II) - CSR performance		
Current performance of CSR	*csrdummy*	A dummy variable of the current performance of CSR (*csrdummy*), which measures the performance of a firm based on the list of firms that have won the *Common Wealth*'s "Corporate Citizenship" and the *Global Views Monthly*'s "CSR Award". If a firm wins either or both of the awards in a specific year, the value of *csrdummy* is equal to 1 in that year, otherwise, if the firm does not win either award, the value *csrdummy* is 0.
Cumulative performance of CSR	*csrcumu*	The total number of years a firm has been win either or both of the awards (either award is sufficient). For example, if a firm has been win either or both of the awards for four years (missing one year) at a given year, the value of *csrcumu* is set to 4.
Continuous performance of CSR	*csrcont*	Set to 1 if a firm wins either or both of the awards every year during the data period (14 years). If the firm fails to win either award in any given year during the data period, *csrcont* is set to 0.

Overlap performance of CSR	*csrovlp*	Set to 1 if a firm wins both awards in a specific year. If the firm wins only one award or none at all in a specific year, *csrovlp* is set to 0.
Social contribution value	*scv*	The sum of interest expense, tax , employee salary and after tax net income, and then take the natural logarithm
Social return on assets	*sroa*	(Social contribution value / total assets)*100%
Social contribution value per share	*scvps*	(Social contribution value / number of shares outstanding)
Explained Variable (III) - CSR/ESG Disclosure		
Dummy of disclosing CSR report	*csrrdis*	If a specific firm discloses its CSR/ESG/Sustainability report, it is 1, and 0 otherwise
Dummy of CSR report is certified	*csrrcer*	If a firm's CSR/ESG/Sustainability report is certified by an independent third-party, it is 1, and 0 otherwise
Information disclosure score	*transp*	The information disclosure score in corporate governance evaluation, ranged from 0 to 100 points, with 0 being the worst and 100 being the best
The rank of information disclosure score in SASB main industry classification	*transplid*	The ranking of a specific firm's information disclosure score in the SASB main industry samples in a particular year.
The rank of information disclosure score in SASB sub-industry classification	*transpsid*	The ranking of a specific firm's information disclosure score in the SASB sub-industry samples in a particular year.
Main explanatory variable (I) - D&O Insurance Coverage		
Dummy of having D&O Insurance coverage	*dolid*	If a firm's D&O Insurance amount is greater than 0, it is equal to 1, and 0 otherwise
The total D&O Insurance amount	*dolim*	The nature logarithm of firm's D&O Insurance amount
The average D&O Insurance amount	*dolip*	The amount of D&O Insurance divided by the number of directors and managers
The total D&O Insurance amount to asset	*dolita*	The amount of D&O Insurance divided by total assets
The total D&O Insurance amount to equity	*dolite*	The amount of D&O Insurance divided by equity
The total D&O Insurance amount to net sales	*dolite*	The amount of D&O Insurance divided by net sales
The number insurance company for a firm with D&O Insurance coverage	*dolini*	The number of insurance companies underwriting D&O Insurance for a firm
Main explanatory variable (II) - Managerial and Directors' Overconfidence		
The management increases its shareholdings as firm's profit is negative	*pfmmhi*	If the management increases its shareholdings as firm's profit is negative, *pfmmhi* is 1, and 0 otherwise
The management increases its shareholdings as firm's profit is decreased	*mhipfd*	If the management increases its shareholdings as firm's profit is decreased in the next period, *mhipfd* is 1, and 0 otherwise
The directors increases its shareholdings as firm's profit is negative	*pfmdhi*	If the directors increases its shareholdings as firm's profit is negative, *pfmdhi* is 1, and 0 otherwise
The directors increases its shareholdings as firm's profit is decreased	*dhipfd*	If the directors increases its shareholdings as firm's profit is decreased in the next period, *dhipfd* is 1, and 0 otherwise
Control Variable		
Returns on assets	*roa*	Earnings before interest and tax divided by total assets
Firm size	*scale*	The total assets and then takes the natural logarithm
Debt ratio	*debtr*	Total liabilities divided by total assets
Independent director ratio	*indr*	The number of independent director to total number of director
Female director dummy	*fdd*	A dummy variable indicating whether the firm has female director, with a value of 1 if the firm has at least one female director and 0 if it has none
Institutional investors' shareholdings	*insthold*	(number of shares hold by institutional investors / number of shares outstanding) * 100%
Family control	*family*	If the type of corporate control is single-family controlled, then it is 1, and 0 otherwise.

Note: this table reports the abbreviations and definitions of the variables. The variable definitions are based on the Taiwan Economic Journal (TEJ) database and the author's own definitions. The first to the fourth CSR performance variables are constructed based on the annual name lists of the *Common Wealth*'s "Best Corporate Citizen" (https://topic.cw.com.tw/csr/report.aspx) and the *Global Views Monthly*'s "CSR Awards"(https://csr.gvm.com.tw/2021/award.html).

3.2 Econometric Model

This study employs multiple regression to estimate how D&O insurance, and managerial and board overconfidence, affect firm's ESG and CSR performance. The regression equation is:

$$\mathbf{ESG/CSR}_{i,t} = \beta_0 + \beta_1 \cdot \mathbf{D\&O}_{i,t} + \beta_2 \cdot \mathbf{OC}_{i,t} + \beta_3 \cdot \mathbf{D\&O}_{i,t} \cdot \mathbf{OC}_{i,t} + \beta_4 \cdot roa_{i,t} + \beta_5 \cdot scale_{i,t} + \beta_6 \cdot debtr_{i,t} + \beta_7 \cdot indr_{i,t} + \beta_8 \cdot fdd_{i,t} + \beta_9 \cdot insthold_{i,t} + \beta_{10} \cdot family_{i,t} + \partial \cdot \mathbf{INDUSTRY}_i + \gamma \cdot \mathbf{YEAR}_t + \varepsilon_{i,t} \quad (1)$$

where subscripts i and t denote firm i in year t, respectively. **ESG** represents a vector of ESG performance variables, including: ESG rating (*esgrank*), ESG score (*esgscore*), ESG score industry-wide ranking (*esgwid*), ESG score within SASB primary industry ranking (*esgmid*), ESG score within SASB sub-industry ranking (*esgsid*), environmental dimension score (*envscore*), environmental dimension score within SASB primary industry ranking (*envmid*), environmental dimension score within SASB sub-industry ranking (*envsid*), social dimension score (*socscore*), social dimension score within SASB primary industry ranking (*socmid*), social dimension score within SASB sub-industry ranking (*socsid*), governance dimension score (*govscore*), governance dimension score within SASB primary industry ranking (*govmid*), and governance dimension score within SASB sub-industry ranking (*govsid*). **D&O** denotes a vector of variables capturing the extent of D&O insurance coverage, including: an indicator for whether the firm has D&O insurance coverage (*dolid*), the total amount of D&O insurance coverage (*dolim*), the average D&O insurance coverage per director/officer (*dolia*), the ratio of D&O insurance coverage to total assets (*dolita*), the ratio of D&O insurance to total equity (*dolite*), the ratio of D&O insurance coverage to net sales (*dolits*), and the number of insurers providing D&O coverage (*dolini*). **OC** represents the overconfidence of the management team and board of directors, measured by: negative profit while the management team increases shareholdings (*pfmmhi*), management team increases shareholdings despite declining profit (*mhipfd*), negative profit while directors increase shareholdings (*pfmdhi*), and directors increase shareholdings despite declining profit (*dhipfd*). Control variables include: return on assets (*roa*), firm size (*asset*), debt ratio (*debtr*), proportion of independent directors (*indr*), board gender diversity (*fdd*), institutional ownership ratio (*insthold*), and family ownership/control (*family*). In addition, the study incorporates 30 industry dummy variables (covering 31 industries) and 5 year dummy variables (2015–2020, spanning six years) to account for heterogeneity in ESG performance across industries and over time. All regression models are estimated using pooled ordinary least squares (OLS) estimation.

3.3 Sample and Data

This study employs non-financial industry listed firms on the Taiwan Stock Exchange and the Taipei Exchange (excluding the firms of banking, insurance, billing, securities and financial holdings companies) as the research samples, with a total of 1,590 firms. The data is yearly ranged from 2015 to 2020. The data of board member's gender and characteristics, the data of firm's disclosure of CSR reports, ESG performance variables, D&O insurance coverages, financial characteristics, governance variables is collected from the Taiwan Economic Journal (TEJ) database. The first four CSR performance variable is constructed by the annual name-lists of the *Common Wealth*'s "Top Corporate Citizen" (https://topic.cw.com.tw/csr/report.aspx) and the *Global Views Monthly*'s "CSR Awards"(https://csr.gvm.com.tw/2021/award.html).

4. Empirical Result

4.1 Summary Statistics and Correlation Analysis

Table 2 reports the descriptive statistics of the study variables. Panel A presents statistics for the full sample, while Panel B reports the means and mean differences for subsamples based on the presence of D&O insurance coverage (*dolid* = 1 vs. *dolid* = 0), as well as the presence of overconfident boards of directors (*pfmdhi* = 1 vs. *pfmdhi* = 0) and overconfident management teams (*pfmmhi* = 1 vs. *pfmmhi* = 0). For the full sample, the mean of the indicator variable for D&O insurance coverage (*dolid*) is 0.8542, indicating that approximately 85% of firms in the sample maintain such liability coverage. The mean ratio of D&O insurance coverage to total assets (*dolita*) is approximately 4.12%, implying that, on average, each 100 units of total assets are associated with 4.12 units of D&O insurance coverage. The mean ratio of D&O insurance coverage to total equity (*dolite*) is approximately 7.01%, and the mean ratio of D&O insurance coverage to net sales (*dolits*) is also approximately 7.01%. These descriptive statistics provide an overview of the prevalence and relative magnitude of D&O insurance coverage across the sample firms.

Observing Panel B, it is evident that firms with D&O insurance coverage (*dolid* = 1) exhibit a higher mean ESG rating (*esgrank*) of 4.06, compared to 3.42 for firms without such coverage (*dolid* = 0). The mean difference between the two groups is positive (0.6337) and statistically significant, indicating that firms with D&O insurance coverage tend to achieve superior ESG ratings on average. Furthermore, firms with D&O demonstrate significantly higher ESG scores (*esgscore*) and higher rankings within both SASB primary and sub-industry classifications, suggesting that these firms outperform their counterparts without such coverage. This pattern is consistent across the individual ESG dimensions, implying that D&O insurance coverage is associated with stronger environmental, social, and governance performance, even after accounting for industry-specific benchmarks. These observations are consistent with Hypothesis 1B of this study.

An examination of CSR performance variables indicates that, on average, firms with D&O insurance coverage exhibit a *csrdummy* value of 0.0465, compared to 0.0165

for firms without such coverage. This implies that approximately 4.65% of firms with D&O insurance were recognized with CSR awards by both the *Common Wealth* and the *Global Views Monthly* during the sample period, whereas only 1.65% of firms without D&O insurance received similar recognition. The difference between the two groups is statistically significant. Additional CSR performance measures further indicate that firms with D&O insurance are significantly more likely to receive CSR awards consistently over the sample period and to obtain awards from both rating agencies within the same year. Moreover, these firms outperform their counterparts without D&O insurance coverage in terms of per share social contribution value (*scvps*) and social return on assets (*sroa*). Collectively, these findings suggest that D&O insurance coverage is positively associated with stronger CSR performance across multiple measures.

An examination of CSR information disclosure variables indicates that approximately 32.05% of firms with D&O insurance coverage disclose their CSR reports, compared to only 16.39% of firms without such coverage. The difference between these two groups is statistically significant. Moreover, among firms with D&O insurance, a significantly higher proportion of disclosed CSR reports are externally assured by third parties. Additionally, firms with D&O insurance outperform their counterparts without such coverage in terms of corporate governance evaluation transparency scores (*transp*), as well as rankings of information transparency within both SASB primary (*transpmid*) and sub-industry (*transpsid*) classifications. Comparisons across CSR performance and CSR information disclosure variables reveal patterns consistent with the findings for overall ESG performance: firms with D&O insurance consistently exhibit superior ESG outcomes, stronger CSR engagement, and higher levels of information disclosure. These results are in line with Hypothesis 1B of this study, indicating that D&O liability insurance coverage is positively associated with enhanced stakeholders' management.

Observing the sample in Panel B, firms with overconfident boards of directors (*pfmdhi* = 1) exhibit a lower mean ESG rating (*esgrank*) of 3.2812, compared to a mean of 3.9790 for firms without overconfident boards (*pfmdhi* = 0). The mean difference between the two groups is negative (-0.6979) and statistically significant, indicating that firms with overconfident boards tend to achieve lower ESG ratings. Furthermore, an examination of ESG scores (*esgscore*) and rankings within both SASB primary and sub-industry classifications shows that firms with overconfident boards consistently exhibit lower ESG scores and rankings than those without overconfident boards. This pattern is consistent across the individual ESG dimensions, including environmental, social, and governance aspects, even after accounting for industry-specific benchmarks. These results support Hypothesis 2 of the study, suggesting that overconfidence in boards is negatively associated with firm ESG performance.

An examination of CSR performance variables indicates that the mean current CSR performance (*csrdummy*) is 0.0014 for firms with overconfident boards of directors (*pfmdhi* = 1), compared to 0.0423 for firms without overconfident boards (*pfmdhi*

= 0). This suggests that approximately 0.14% of firms with overconfident boards received CSR awards from the *Common Wealth* and the *Global Views Monthly*, whereas 4.23% of firms without overconfident boards were recognized. The difference between the two groups is negative and statistically significant, indicating that firms with overconfident boards exhibit weaker CSR performance. Additional CSR performance measures further reveal that firms with overconfident boards have significantly lower probabilities of receiving CSR awards consistently throughout the sample period or from multiple rating agencies in the same year. Metrics such as social contribution value (*scv*), social contribution value per share (*scvps*), and social return on assets (*sroa*) are also significantly lower for firms with overconfident boards, reinforcing the observation that overconfident boards are associated with poorer CSR performance. Similarly, firms with overconfident boards exhibit lower levels of CSR information disclosure, including a reduced likelihood of disclosing CSR reports and a lower probability of having these reports certified by third parties. Their corporate governance evaluation transparency scores (*transp*), as well as rankings within SASB primary (*transpmid*) and sub-industry (*transpsid*) classifications, are also significantly lower relative to firms without overconfident boards. Collectively, these results indicate that overconfidence in boards is negatively associated with both CSR performance and information disclosure, consistent with Hypothesis 2 of the study.

Similar patterns are observed when examining firms with overconfident management teams (*pfmmhi* = 1) relative to those without overconfident management (*pfmmhi* = 0). Across nearly all ESG performance variables, CSR performance measures, and information disclosure indicators, firms with overconfident management consistently exhibit weaker outcomes. These findings suggest that overconfidence at the management level is negatively associated with ESG performance, CSR engagement, and the quality and extent of information disclosure.

Table 2: Summary Statistics

Variable	Panel A. Full samples					Panel B. Sub-samples mean *t*-tests								
						Samples with DOLI coverage (*dolid*=1) v.s samples without DOLI coverage (*dolid*=0)			Samples with board overconfidence (*pfmdhi*=1) v.s samples without board overconfidence (*pfmdhi* =0)			Samples with managerial overconfidence (*pfmmhi* =1) v.s samples without managerial overconfidence (*pfmmhi* =0)		
	No. of Obs.	Mean	St. dev.	Min.	Max.	Mean	Mean	Diff. in Mean	Mean	Mean	Diff. in Mean	Mean	Mean	Diff. in Mean
tesgrank	9,315	3.9249	1.5183	1.0000	7.0000	4.0632	3.4295	0.6337***	3.2812	3.9790	-0.6979***	3.4540	3.9523	-0.4983***
tesgscore	9,315	54.599	7.6290	32.930	83.730	55.274	52.184	3.0894***	51.357	54.872	-3.5150***	52.206	54.738	-2.5326***
tesgmid	9,315	56.205	28.316	0.0000	99.878	58.796	46.880	11.916***	44.196	57.217	-13.021***	47.745	56.699	-8.9537***
tesgsid	9,315	54.694	28.393	0.0000	99.762	57.200	46.055	11.146***	43.788	55.613	-11.825***	46.819	55.153	-8.3345***
envscore	9,315	54.759	10.728	25.350	90.350	55.410	52.723	2.6879***	52.051	54.989	-2.9378***	52.795	54.875	-2.0806***
envmid	9,315	54.847	27.965	0.0000	99.878	56.550	49.770	6.7792***	47.923	55.437	-7.5139***	49.846	55.145	-5.2992***
envsid	9,315	53.667	27.602	0.0000	99.762	55.242	49.201	6.0410***	47.554	54.189	-6.6347***	49.261	53.930	-4.6695***
socscore	9,315	55.161	10.088	28.550	91.000	55.887	52.474	3.4123***	51.680	55.456	-3.7760***	52.910	55.294	-2.3842***
socmid	9,315	56.276	28.141	0.0000	99.878	58.301	48.772	9.5286***	46.768	57.080	-10.312***	51.115	56.580	-5.4652***
socsid	9,315	54.853	28.268	0.0000	99.762	56.746	48.220	8.5260***	46.679	55.546	-8.8671***	50.544	55.109	-4.5646***
govscore	9,315	53.967	10.776	19.650	84.410	54.618	51.527	3.0902***	50.388	54.266	-3.8777***	50.953	54.140	-3.1868***
govmid	9,315	52.330	29.321	0.0000	99.878	54.224	44.993	9.2305***	42.713	53.133	-10.421***	44.307	52.791	-8.4840***
govsid	9,315	51.118	29.282	0.0000	99.757	52.877	44.524	8.3537***	42.199	51.864	-9.6652***	43.390	51.563	-8.1727***
csrdummy	9,540	0.0393	0.1943	0.0000	1.0000	0.0465	0.0165	0.0300***	0.0014	0.0423	-0.0409***	0.0000	0.0414	-0.0414***
csrcumu	9,540	0.1906	1.0687	0.0000	14.0000	0.1902	0.1671	0.0231	0.2535	0.1857	0.0677	0.2485	0.1876	0.0609
csrcont	9,540	0.0031	0.0560	0.0000	1.0000	0.0039	0.0008	0.0031***	0.0000	0.0034	-0.0034***	0.0000	0.0033	-0.0033***
csrovlp	9,540	0.0051	0.0715	0.0000	1.0000	0.0066	0.0000	0.0066***	0.0000	0.0056	-0.0056***	0.0000	0.0055	-0.0055***
scv	9,091	10.567	7.2867	-11.454	15.512	10.555	10.335	0.2207	3.8849	11.115	-7.2298***	4.9660	10.881	-5.9150***
sroa	9,091	12.210	9.9447	-5.6244	32.328	11.976	10.781	1.1952***	3.8729	12.893	-9.0203***	4.6639	12.633	-7.9690***
scvps	8,555	4.7112	4.7155	-0.9054	16.700	4.9425	3.5568	1.3857***	0.9963	5.0330	-4.0367***	1.2079	4.9167	-3.7088***
csrrdis	9,315	0.2860	0.4519	0.0000	1.0000	0.3205	0.1639	0.1566***	0.1607	0.2966	-0.1359***	0.1722	0.2927	-0.1204***
csrrcer	9,315	0.1367	0.3435	0.0000	1.0000	0.1578	0.0559	0.1018***	0.0554	0.1435	-0.0881***	0.0528	0.1416	-0.0887***
transp	9,315	56.587	26.550	16.380	99.300	60.212	45.568	14.644***	47.550	57.353	-9.8029***	50.529	56.945	-6.4161***
transpmid	9,315	56.459	26.570	15.517	99.155	60.103	45.370	14.732***	47.491	57.220	-9.7284***	50.472	56.813	-6.3417***
transpsid	9,315	55.176	26.537	0.0000	98.936	58.697	44.598	14.100***	46.678	55.896	-9.2178***	49.887	55.489	-5.6018***

dolid	8,704	0.8542	0.3529	0.0000	1.0000	1.0000	0.0000	1.0000	0.8828	0.8517	0.0310**	0.8747	0.8530	0.0218
dolim	8,704	10.044	4.2626	0.0000	15.989	11.759	0.0000	11.759***	10.341	10.019	0.3222**	10.2670	10.031	0.2359
dolia	8,704	8.1900	3.5212	0.0000	13.686	9.5879	0.0000	9.5878***	8.4514	8.1674	0.2839**	8.4074	8.1771	0.2303
dolita	8,704	4.1201	5.2790	0.0000	20.207	4.8233	0.0000	4.8233***	6.6213	3.9044	2.7169***	6.1889	3.9975	2.1914***
dolite	8,704	7.0079	8.7200	0.0000	33.731	8.2040	0.0000	8.2040***	11.176	6.6485	4.5277***	10.527	6.7994	3.7274***
dolits	8,703	7.4554	10.919	0.0000	42.549	8.7280	0.0000	8.7280***	14.464	6.8509	7.6133***	14.126	7.0608	7.0649***
dolini	8,700	1.0052	0.7698	0.0000	11.000	1.1768	0.0000	1.1768***	0.9986	1.0057	-0.0072***	0.9836	1.0065	-0.0229
pfmmhi	9,499	0.0538	0.2256	0.0000	1.0000	0.0573	0.0481	0.0092	0.3158	0.0322	0.2835***	1.0000	0.0000	1.0000
pfmdhi	9,499	0.0760	0.2650	0.0000	1.0000	0.0820	0.0638	0.0182**	1.0000	0.0000	1.0000	0.4462	0.0550	0.3912***
mhipfd	9,309	0.1437	0.3508	0.0000	1.0000	0.1501	0.1111	0.0390***	0.1914	0.1397	0.0517***	0.6059	0.1169	0.4889***
dhipfd	9,309	0.1894	0.3918	0.0000	1.0000	0.1984	0.1600	0.0384***	0.5950	0.1553	0.4397***	0.2706	0.1847	0.0859***
roa	9,473	6.9580	10.964	-150.88	81.620	6.8262	5.8767	0.9495***	-3.1987	7.7960	-10.995***	-2.4479	7.4943	-9.9422***
asset	9,505	15.144	1.4297	7.2633	21.924	15.274	14.888	0.3857***	14.573	15.192	-0.6196***	14.605	15.176	-0.5706***
debt	9,505	36.177	18.130	0.0000	98.850	35.983	36.521	-0.5378	36.505	36.142	0.3633	35.839	36.189	-0.3496
idr	9,309	33.065	11.479	0.0000	80.000	34.309	25.849	8.4597***	33.281	33.047	0.2336	33.995	33.011	0.9839**
fdd	9,540	0.6121	0.4873	0.0000	1.0000	0.6261	0.6036	0.0225	0.6177	0.6144	0.0033	0.5969	0.6157	-0.0188
insthold	9,301	41.154	22.685	0.0000	100.00	41.715	36.559	5.1556***	31.286	41.983	-10.697***	31.029	41.741	-10.713***
family	9,306	0.6176	0.4860	0.0000	1.0000	0.5934	0.7392	-0.1457***	0.5992	0.6191	-0.0199	0.5540	0.6212	-0.0672***

Note: this table reports the basic summarize statistics of each variable, including the number of non-missing observations, mean, standard deviation, minimum and maximum of full samples (Panel A). Panel B reports t-tests of means for three pairs of subsamples, namely, samples with DOLI coverage (dolid=1) v.s samples without DOLI coverage (dolid=0), samples with board overconfidence (pfmdhi=1) v.s samples without board overconfidence (pfmdhi =0), and samples with managerial overconfidence (pfmmhi =1) v.s samples without managerial overconfidence (pfmmhi =0). The data period is from 2015 to 2020. *, * * and * * * show that the differences in means reach 10%, 5% and 1% significant level, respectively.

Table 3 reports the Pearson correlation coefficient matrix for pairwise correlations among variables. Panel A reports the correlations between D&O insurance measures and ESG performance variables. Inspection of these correlations indicates that the majority of D&O insurance are positively and significantly associated with ESG performance, suggesting that higher levels of D&O insurance correspond to stronger ESG outcomes, consistent with Hypothesis 1B. However, the D&O insurance ratio variables—reflecting the proportion of insurance coverage relative to total assets, total equity, and net sales—exhibit negative correlations with ESG performance. This pattern is largely attributable to the tendency of larger firms, which typically achieve higher ESG performance, to maintain relatively lower proportions of D&O insurance coverage, thereby generating the observed inverse association.

Panels C and E reveal that higher levels of D&O insurance coverage are also positively and significantly correlated with CSR performance and information disclosure metrics, indicating that greater D&O insurance coverage is associated with enhanced CSR engagement and more comprehensive disclosure practices. Panel B reports the correlations between board- and management-level overconfidence and CSR performance variables. The results show that overconfidence in both boards and management is negatively and significantly correlated with ESG performance, suggesting that firms with overconfident decision-makers tend to exhibit weaker ESG outcomes, consistent with Hypothesis 2. Similarly, Panels D and F indicate that firms characterized by overconfident boards and management display lower CSR performance and reduced information disclosure.

Table 3: Correlation Matrix

Panel A. Correlation between D&O Insurance Coverage and ESG Performance

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*	*(20)*
(1) tesgrank	1.0000																			
(2) tesgscore	0.9725*	1.0000																		
(3) tesgmid	0.9610*	0.9569*	1.0000																	
(4) tesgsid	0.9146*	0.9101*	0.9525*	1.0000																
(5) envscore	0.6730*	0.7027*	0.6385*	0.6206*	1.0000															
(6) envmid	0.6461*	0.6605*	0.6340*	0.6141*	0.9336*	1.0000														
(7) envsid	0.6205*	0.6329*	0.6100*	0.6368*	0.9003*	0.9616*	1.0000													
(8) socscore	0.7312*	0.7545*	0.7107*	0.6572*	0.4735*	0.4421*	0.4165*	1.0000												
(9) socmid	0.7086*	0.7162*	0.7184*	0.6698*	0.4389*	0.4256*	0.4068*	0.9511*	1.0000											
(10) socsid	0.6686*	0.6755*	0.6778*	0.7111*	0.4328*	0.4185*	0.4379*	0.8836*	0.9350*	1.0000										
(11) govscore	0.6938*	0.7036*	0.7056*	0.6775*	0.2116*	0.2092*	0.2012*	0.2017*	0.1866*	0.1751*	1.0000									
(12) govmid	0.6861*	0.6873*	0.7066*	0.6784*	0.2086*	0.2063*	0.1992*	0.2000*	0.1846*	0.1723*	0.9739*	1.0000								
(13) govsid	0.6591*	0.6599*	0.6804*	0.7009*	0.2069*	0.2046*	0.2176*	0.1810*	0.1691*	0.1925*	0.9378*	0.9623*	1.0000							
(14) dolid	0.1470*	0.1421*	0.1488*	0.1388*	0.0877*	0.0853*	0.0770*	0.1190*	0.1199*	0.1069*	0.1003*	0.1106*	0.1002*	1.0000						
(15) dolim	0.2090*	0.2074*	0.2062*	0.1929*	0.1453*	0.1393*	0.1284*	0.1907*	0.1827*	0.1663*	0.1228*	0.1324*	0.1212*	0.9735*	1.0000					
(16) dolia	0.2128*	0.2117*	0.2099*	0.1967*	0.1502*	0.1439*	0.1337*	0.1944*	0.1866*	0.1701*	0.1247*	0.1345*	0.1238*	0.9610*	0.9975*	1.0000				
(17) dolita	-0.1250*	-0.1353*	-0.1184*	-0.1139*	-0.1400*	-0.1296*	-0.1177*	-0.1353*	-0.1187*	-0.1156*	-0.0397*	-0.0269*	-0.0271*	0.3225*	0.3593*	0.3720*	1.0000			
(18) dolite	-0.1365*	-0.1473*	-0.1335*	-0.1304*	-0.1369*	-0.1284*	-0.1194*	-0.1425*	-0.1317*	-0.1332*	-0.0567*	-0.0418*	-0.0426*	0.3320*	0.3713*	0.3847*	0.9510*	1.0000		
(19) dolits	-0.1593*	-0.1727*	-0.1551*	-0.1457*	-0.1795*	-0.1705*	-0.1501*	-0.1514*	-0.1333*	-0.1205*	-0.0747*	-0.0620*	-0.0624*	0.2821*	0.2992*	0.3072*	0.7948*	0.7388*	1.0000	
(20) dolini	0.2190*	0.2241*	0.2058*	0.1875*	0.1425*	0.1335*	0.1113*	0.2620*	0.2249*	0.2043*	0.1019*	0.1126*	0.1011*	0.5396*	0.6086*	0.6158*	0.2106*	0.2234*	0.1791*	1.0000

Panel B. Correlation between Board and Managerial Overconfidence and ESG Performance

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*	*(20)*	*(21)*
(1) tesgrank	1.0000																				
(2) tesgscore	0.9725*	1.0000																			
(3) tesgmid	0.9610*	0.9569*	1.0000																		
(4) tesgsid	0.9146*	0.9101*	0.9525*	1.0000																	
(5) envscore	0.6730*	0.7027*	0.6385*	0.6206*	1.0000																
(6) envmid	0.6461*	0.6605*	0.6340*	0.6141*	0.9336*	1.0000															
(7) envsid	0.6205*	0.6329*	0.6100*	0.6368*	0.9003*	0.9616*	1.0000														
(8) socscore	0.7312*	0.7545*	0.7107*	0.6572*	0.4735*	0.4421*	0.4165*	1.0000													
(9) socmid	0.7086*	0.7162*	0.7184*	0.6698*	0.4389*	0.4256*	0.4068*	0.9511*	1.0000												
(10) socsid	0.6686*	0.6755*	0.6778*	0.7111*	0.4328*	0.4185*	0.4379*	0.8836*	0.9350*	1.0000											
(11) govscore	0.6938*	0.7036*	0.7056*	0.6775*	0.2116*	0.2092*	0.2012*	0.2017*	0.1866*	0.1751*	1.0000										
(12) govmid	0.6861*	0.6873*	0.7066*	0.6784*	0.2086*	0.2063*	0.1992*	0.2000*	0.1846*	0.1723*	0.9739*	1.0000									
(13) govsid	0.6591*	0.6599*	0.6804*	0.7009*	0.2069*	0.2046*	0.2176*	0.1810*	0.1691*	0.1925*	0.9378*	0.9623*	1.0000								
(14) sdmhi	-0.0347*	-0.0342*	-0.0316*	-0.0208*	-0.0246*	-0.0197	-0.0124	-0.0259*	-0.0162	-0.0068	-0.0293*	-0.0287*	-0.0196	1.0000							
(15) sddhi	-0.0607*	-0.0617*	-0.0599*	-0.0443*	-0.0379*	-0.0346*	-0.0295*	-0.0431*	-0.0427*	-0.0280*	-0.0544*	-0.0542*	-0.0404*	0.3120*	1.0000						
(16) pfdmhi	-0.0088	-0.0080	-0.0045	0.0010	-0.0135	-0.0084	-0.0041	-0.0092	0.0003	0.0066	-0.0012	-0.0014	0.0054	0.6013*	0.1514*	1.0000					
(17) pfddhi	-0.0238*	-0.0236*	-0.0223*	-0.0148	-0.0181	-0.0160	-0.0119	-0.0135	-0.0114	-0.0021	-0.0200	-0.0193	-0.0122	0.1638*	0.6060*	0.3043*	1.0000				
(18) roammhi	-0.0706*	-0.0713*	-0.0678*	-0.0649*	-0.0526*	-0.0506*	-0.0454*	-0.0520*	-0.0435*	-0.0399*	-0.0555*	-0.0550*	-0.0527*	0.2623*	0.0432*	0.1229*	-0.0098	1.0000			
(19) roamdhi	-0.1063*	-0.1064*	-0.1065*	-0.0960*	-0.0664*	-0.0692*	-0.0617*	-0.0927*	-0.0918*	-0.0807*	-0.0765*	-0.0766*	-0.0707*	0.0434*	0.2850*	-0.0133	0.1126*	0.3220*	1.0000		
(20) pfmmhi	-0.0747*	-0.0756*	-0.0720*	-0.0668*	-0.0442*	-0.0432*	-0.0385*	-0.0538*	-0.0442*	-0.0368*	-0.0673*	-0.0659*	-0.0636*	0.3059*	0.0520*	0.1646*	-0.0006	0.8455*	0.2604*	1.0000	
(21) pfmdhi	-0.1229*	-0.1232*	-0.1230*	-0.1114*	-0.0732*	-0.0719*	-0.0643*	-0.1001*	-0.0980*	-0.0839*	-0.0962*	-0.0950*	-0.0883*	0.0558*	0.3228*	-0.0025	0.1519*	0.2660*	0.8543*	0.3331*	1.0000

Panel C. Correlation between D&O Insurance Coverage and CSR Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) csrdummy	1.0000													
(2) csrcumu	0.0038	1.0000												
(3) csrcont	0.2777*	-0.0048	1.0000											
(4) csrovlp	0.3552*	-0.0060	0.3888*	1.0000										
(5) scv	0.1102*	-0.0077	0.0348*	0.0491*	1.0000									
(6) sroa	0.0699*	0.0186	0.0428*	0.0231*	0.5918*	1.0000								
(7) scvps	0.1583*	0.0126	0.0518*	0.0369*	0.4766*	0.7885*	1.0000							
(8) dolid	0.0527*	0.0078	0.0187	0.0311*	0.0104	0.0428*	0.1022*	1.0000						
(9) dolim	0.0968*	0.0031	0.0256*	0.0558*	0.0298*	0.0409*	0.1216*	0.9735*	1.0000					
(10) dolia	0.1000*	0.0020	0.0279*	0.0586*	0.0282*	0.0385*	0.1230*	0.9610*	0.9975*	1.0000				
(11) dolita	-0.0854*	0.0221*	-0.0372*	-0.0524*	-0.2459*	-0.0127	-0.1349*	0.3225*	0.3593*	0.3720*	1.0000			
(12) dolite	-0.0860*	0.0222*	-0.0379*	-0.0524*	-0.2666*	-0.0664*	-0.1528*	0.3320*	0.3713*	0.3847*	0.9510*	1.0000		
(13) dolits	-0.0891*	0.0162	-0.0345*	-0.0466*	-0.3798*	-0.2039*	-0.2587*	0.2821*	0.2992*	0.3072*	0.7948*	0.7388*	1.0000	
(14) dolini	0.2059*	0.0100	0.0531*	0.1392*	0.0460*	-0.0117	0.0600*	0.5396*	0.6086*	0.6158*	0.2106*	0.2234*	0.1791*	1.0000

Panel D. Correlation between Board and Managerial Overconfidence and CSR Performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) csrdummy	1.0000														
(2) csrcumu	0.0038	1.0000													
(3) csrcont	0.2777*	-0.0048	1.0000												
(4) csrovlp	0.3552*	-0.0060	0.3888*	1.0000											
(5) scv	0.1102*	-0.0077	0.0348*	0.0491*	1.0000										
(6) sroa	0.0699*	0.0186	0.0428*	0.0231*	0.5918*	1.0000									
(7) scvps	0.1583*	0.0126	0.0518*	0.0369*	0.4766*	0.7885*	1.0000								
(8) sdmhi	-0.0045	0.0031	-0.0030	-0.0126	-0.0415*	-0.0653*	-0.0775*	1.0000							
(9) sddhi	-0.0259*	0.0018	-0.0207*	-0.0134	-0.0758*	-0.1360*	-0.1374*	0.3120*	1.0000						
(10) pfdmhi	0.0115	-0.0062	-0.0142	-0.0119	-0.0403*	-0.0638*	-0.0555*	0.6013*	0.1514*	1.0000					
(11) pfddhi	0.0021	0.0069	-0.0192	-0.0150	-0.0703*	-0.1230*	-0.1074*	0.1638*	0.6060*	0.3043*	1.0000				
(12) roammhi	-0.0408*	0.0081	-0.0114	-0.0146	-0.2021*	-0.1720*	-0.1672*	0.2623*	0.0432*	0.1229*	-0.0098	1.0000			
(13) roamdhi	-0.0496*	0.0145	-0.0138	-0.0177	-0.2831*	-0.2291*	-0.2131*	0.0434*	0.2850*	-0.0133	0.1126*	0.3220*	1.0000		
(14) pfmmhi	-0.0481*	0.0128	-0.0134	-0.0172	-0.1821*	-0.1797*	-0.1799*	0.3059*	0.0520*	0.1646*	-0.0006	0.8455*	0.2604*	1.0000	
(15) pfmdhi	-0.0559*	0.0168	-0.0161	-0.0207*	-0.2626*	-0.2401*	-0.2319*	0.0558*	0.3228*	-0.0025	0.1519*	0.2660*	0.8543*	0.3331*	1.0000

Panel E. Correlation between D&O Insurance Coverage and Information Disclosure												
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
(1) csrrdis	1.0000											
(2) csrrcer	0.6286*	1.0000										
(3) transp	0.4478*	0.3532*	1.0000									
(4) transpmid	0.4469*	0.3529*	0.9996*	1.0000								
(5) transpsid	0.4053*	0.3122*	0.9554*	0.9555*	1.0000							
(6) dolid	0.1209*	0.1027*	0.1963*	0.1974*	0.1891*	1.0000						
(7) dolim	0.1895*	0.1738*	0.2472*	0.2484*	0.2380*	0.9735*	1.0000					
(8) dolia	0.1946*	0.1792*	0.2505*	0.2518*	0.2420*	0.9610*	0.9975*	1.0000				
(9) dolita	-0.1713*	-0.1463*	-0.0892*	-0.0881*	-0.0762*	0.3225*	0.3593*	0.3720*	1.0000			
(10) dolite	-0.1729*	-0.1386*	-0.1091*	-0.1080*	-0.0979*	0.3320*	0.3713*	0.3847*	0.9510*	1.0000		
(11) dolits	-0.1702*	-0.1523*	-0.1023*	-0.1009*	-0.0913*	0.2821*	0.2992*	0.3072*	0.7948*	0.7388*	1.0000	
(12) dolini	0.2575*	0.2946*	0.2548*	0.2553*	0.2385*	0.5396*	0.6086*	0.6158*	0.2106*	0.2234*	0.1791*	1.0000

Panel F. Correlation between Board and Managerial Overconfidence and Information Disclosure													
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*
(1) csrrdis	*1.0000*												
(2) csrrcer	0.6286*	1.0000											
(3) transp	0.4478*	0.3532*	1.0000										
(4) transplid	0.4469*	0.3529*	0.9996*	1.0000									
(5) transpsid	0.4053*	0.3122*	0.9554*	0.9555*	1.0000								
(6) sdmhi	-0.0146	-0.0341*	-0.0114	-0.0111	-0.0005	1.0000							
(7) sddhi	-0.0179	-0.0209*	-0.0175	-0.0177	-0.0058	0.3120*	1.0000						
(8) pfdmhi	-0.0168	-0.0317*	0.0143	0.0147	0.0210*	0.6013*	0.1514*	1.0000					
(9) pfddhi	-0.0032	-0.0200	0.0146	0.0140	0.0168	0.1638*	0.6060*	0.3043*	1.0000				
(10) roammhi	-0.0536*	-0.0555*	-0.0554*	-0.0547*	-0.0506*	0.2623*	0.0432*	0.1229*	-0.0098	1.0000			
(11) roamdhi	-0.0732*	-0.0583*	-0.0935*	-0.0927*	-0.0902*	0.0434*	0.2850*	-0.0133	0.1126*	0.3220*	1.0000		
(12) pfmmhi	-0.0607*	-0.0588*	-0.0550*	-0.0544*	-0.0481*	0.3059*	0.0520*	0.1646*	-0.0006	0.8455*	0.2604*	1.0000	
(13) pfmdhi	-0.0804*	-0.0686*	-0.0987*	-0.0979*	-0.0929*	0.0558*	0.3228*	-0.0025	0.1519*	0.2660*	0.8543*	0.3331*	1.0000

Note: this table reports the pairwise Pearson correlation coefficients among variables. Panel A reports correlation between DOLI coverage and ESG performance, Panel B reports correlation between board and managerial overconfidence and ESG performance, Panel C reports correlation between D&O Insurance coverage and CSR performance, Panel D reports correlation between board and managerial overconfidence and CSR performance, Panel E reports correlation between D&O Insurance coverage and information disclosure, Panel F reports correlation between board and managerial overconfidence and information disclosure. The data period is from 2015 to 2020. The asterisk mark means that a correlation coefficient reaches a significance level of 5%.

4.2 Regression Result

Table 4 reports the results from ordered probit models and ordinary least squares (OLS) regressions examining whether the presence and extent of D&O insurance coverage are associated with firms' ESG ratings (esgrank) and ESG scores (esgscore). Specifically, Panel A reports the ordered probit estimates using TESG ratings (esgrank) as the dependent variable, whereas Panel B reports the OLS estimates using ESG scores (esgscore) as the dependent variable. Across both panels, Models (1)~(7) alternatively employ a comprehensive set of proxies capturing the breadth and intensity of D&O insurance coverage, including an indicator for the existence of D&O insurance (dolid), the total amount of D&O insurance coverage (dolim), the average D&O insurance coverage per director or officer (dolia), the ratio of D&O insurance coverage to total assets (dolita), the ratio of D&O insurance coverage to total equity (dolite), the ratio of D&O insurance coverage to net sales (dolits), and the number of insurers providing D&O insurance coverage for a specific firm for specific year (dolini).

An examination of the estimated coefficients on the main explanatory variables reveals that all coefficients associated with the D&O insurance measures are positive and statistically significant at least at the 10% level. These results indicate that firms with D&O insurance coverage, larger D&O insurance coverage amounts, higher average coverage per director or officer, a greater number of insurers, and higher ratios of D&O insurance coverage relative to total assets, equity, and net sales tend to exhibit superior ESG ratings and higher ESG scores. Overall, these findings are consistent with Hypothesis 1B of this study, supporting the view that more extensive D&O insurance coverage is positively associated with enhanced firm-level ESG performance.

Table 4: Regression Result of the Effects of D&O Insurance on Overall ESG Performance

Explanatory Variable	Panel A. Explained variable: ESG Ratings (*esgrating*)							Panel B. Explained variable: ESG Score (*esgscore*)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
dolid	0.279***							1.662***						
	(8.46)							(7.84)						
dolim		0.0300***							0.184***					
		(10.79)							(10.34)					
dolia			0.0369***							0.228***				
			(10.86)							(10.44)				
dolita				0.0261***							0.167***			
				(10.37)							(10.34)			
dolite					0.0146***							0.0921***		
					(9.59)							(9.45)		
dolits						0.00658***							0.0371***	
						(5.45)							(4.77)	
dolini							0.138***							0.822***
							(8.68)							(8.23)
asset	0.317***	0.306***	0.305***	0.376***	0.373***	0.344***	0.303***	2.142***	2.069***	2.060***	2.506***	2.487***	2.300***	2.047***
	(33.12)	(31.62)	(31.42)	(34.89)	(34.47)	(33.71)	(30.66)	(36.27)	(34.61)	(34.38)	(37.99)	(37.46)	(36.49)	(33.40)
roa	0.0173***	0.0176***	0.0177***	0.0188***	0.0188***	0.0191***	0.0179***	0.113***	0.115***	0.115***	0.123***	0.123***	0.123***	0.117***
	(15.42)	(15.69)	(15.76)	(16.59)	(16.56)	(16.12)	(15.88)	(15.85)	(16.11)	(16.18)	(17.07)	(17.01)	(16.34)	(16.28)
debt	-0.00393***	-0.00378***	-0.00377***	-0.00376***	-0.00511***	-0.00355***	-0.00385***	-0.0249***	-0.0239***	-0.0238***	-0.0236***	-0.0322***	-0.0228***	-0.0243***
	(-6.15)	(-5.91)	(-5.89)	(-5.88)	(-7.89)	(-5.48)	(-6.02)	(-6.06)	(-5.83)	(-5.81)	(-5.77)	(-7.76)	(-5.47)	(-5.92)

idr	0.00266***	0.00207**	0.00176*	0.00405***	0.00410***	0.00454***	0.00348***	0.0193***	0.0151**	0.0131**	0.0269***	0.0273***	0.0306***	0.0237***
	(2.61)	(2.03)	(1.71)	(4.12)	(4.16)	(4.62)	(3.50)	(2.95)	(2.32)	(2.00)	(4.27)	(4.32)	(4.83)	(3.70)
fdd	-0.0330	-0.0332	-0.0321	-0.0285	-0.0297	-0.0316	-0.0265	-0.177	-0.179	-0.172	-0.152	-0.160	-0.169	-0.140
	(-1.44)	(-1.45)	(-1.40)	(-1.24)	(-1.30)	(-1.38)	(-1.16)	(-1.20)	(-1.22)	(-1.17)	(-1.04)	(-1.09)	(-1.15)	(-0.95)
insthold	0.00169***	0.00160***	0.00159***	0.00120**	0.00120**	0.00148***	0.00145***	0.0129***	0.0124***	0.0123***	0.00969***	0.00972***	0.0119***	0.0115***
	(3.09)	(2.93)	(2.91)	(2.19)	(2.17)	(2.70)	(2.64)	(3.67)	(3.51)	(3.49)	(2.74)	(2.74)	(3.33)	(3.25)
family	-0.270***	-0.258***	-0.257***	-0.256***	-0.260***	-0.277***	-0.276***	-1.767***	-1.686***	-1.680***	-1.662***	-1.690***	-1.817***	-1.795***
	(-11.72)	(-11.18)	(-11.14)	(-11.07)	(-11.24)	(-12.06)	(-12.00)	(-11.96)	(-11.40)	(-11.36)	(-11.22)	(-11.41)	(-12.28)	(-12.18)
constant								20.98***	21.73***	21.90***	15.86***	16.52***	19.27***	22.87***
								(23.90)	(24.80)	(24.98)	(15.59)	(16.39)	(19.86)	(25.43)
No. of Obs.	8,698	8,698	8,698	8,698	8,698	8,697	8,694	8,698	8,698	8,698	8,698	8,698	8,697	8,694
Pseudo R^2	0.0737	0.0751	0.0752	0.0748	0.0743	0.0724	0.0738							
Prob. > Chi^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
Adjusted R^2								0.250	0.254	0.254	0.254	0.252	0.247	0.251
Prob. > *F*-stat.								0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: This table reports the regression estimation results of the effect of D&O coverage on firm's ESG ratings (*esgrating*) (Table A) and ESG score (*esgscore*) (Table B). Models (1) to (7) employ various D&O coverage variables, including the dummy of whether a firm has D&O coverage, the amount of D&O coverage (*dolim*), the average amount of D&O covrage per insured persons (*dolia*), the ratio of total D&O amount to assets (*dolita*), the ratio of D&O amount equity (*dolite*), the ratio of D&O amount to net sales (*dolits*), and the number of insurance companies underwriting D&O to a specific firm (*dolini*). Control variables include firm size (*scale*), return on assets (*roa*), debt ratio (*debt*), independent director ration (*idr*), dummy variable indicating the presence of female director (*fdd*), institutional investors shareholdings (*insthold*), and dummy variable indicating family-controlled firm (*family*). The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values (*z*-values in Pane A) of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 5 reports the OLS regression results examining the association between D&O insurance coverage and the ranking of ESG scores within SASB primary industries (tesgmid, Panel A) and SASB sub-industries (tesgsid, Panel B). Inspection of the estimated coefficients on the main explanatory variables indicates that all coefficients associated with the D&O insurance measures are positive and statistically significant at least at the 10% level. Specifically, firms with D&O insurance coverage, higher total coverage amounts, greater average coverage per director or officer, a larger number of insurers providing coverage, and higher ratios of D&O insurance relative to total assets, equity, and net sales tend to achieve superior rankings within both SASB primary and sub-industry classifications.

Above results are consistent with Hypothesis 1B of this study, suggesting that greater D&O insurance coverage is positively related to firm-level ESG performance as reflected in industry-specific ESG rankings. Based on the findings from Tables 4 and 5, the positive association between D&O insurance coverage and firms' ESG scores and industry rankings suggests several economic and financial implications. D&O insurance mitigates personal legal and financial risks for directors and executives, reducing managerial short-termism and encouraging long-term ESG investments. Firms with higher coverage, greater average coverage per director/officer, and multiple insurers appear better positioned to commit resources to sustainability initiatives, enhancing stakeholders' value and competitive ESG standing within their industry.

Table 5: Regression Result of the Effects of D&O Insurance Coverage on Industry-Adjusted Overall ESG Performance

Explanatory Variable	Panel A. Explained variable: Rankings in ESG score among SASB main-industry classification (*esgmid*)							Panel B. Explained variable: Rankings in ESG score among SASB sub-industry classification (*esgsid*)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
dolid	7.132***							6.495***						
	(8.93)							(7.97)						
dolim		0.745***							0.684***					
		(11.09)							(9.98)					
dolia			0.917***							0.845***				
			(11.17)							(10.09)				
dolita				0.599***							0.504***			
				(9.86)							(8.13)			
dolite					0.330***							0.278***		
					(8.99)							(7.42)		
dolits						0.148***							0.117***	
						(5.03)							(3.93)	
dolini							2.942***							2.523***
							(7.81)							(6.56)
asset	7.125***	6.841***	6.807***	8.468***	8.396***	7.768***	6.822***	6.772***	6.509***	6.477***	7.917***	7.856***	7.308***	6.523***
	(32.03)	(30.39)	(30.16)	(34.03)	(33.53)	(32.70)	(29.50)	(29.86)	(28.35)	(28.14)	(31.18)	(30.76)	(30.18)	(27.67)
roa	0.460***	0.467***	0.469***	0.495***	0.494***	0.501***	0.472***	0.417***	0.423***	0.425***	0.446***	0.445***	0.449***	0.427***
	(17.11)	(17.39)	(17.46)	(18.20)	(18.14)	(17.58)	(17.46)	(15.21)	(15.46)	(15.52)	(16.08)	(16.03)	(15.45)	(15.49)
debt	-0.103***	-0.0993***	-0.0989***	-0.0992***	-0.130***	-0.0950***	-0.102***	-0.123***	-0.119***	-0.119***	-0.120***	-0.146***	-0.117***	-0.122***
	(-6.66)	(-6.43)	(-6.41)	(-6.42)	(-8.30)	(-6.05)	(-6.57)	(-7.78)	(-7.57)	(-7.56)	(-7.60)	(-9.13)	(-7.30)	(-7.71)
idr	0.0773***	0.0639***	0.0560**	0.114***	0.116***	0.127***	0.103***	0.0808***	0.0681***	0.0607**	0.116***	0.117***	0.127***	0.106***
	(3.14)	(2.60)	(2.27)	(4.80)	(4.85)	(5.30)	(4.26)	(3.22)	(2.72)	(2.40)	(4.78)	(4.82)	(5.22)	(4.31)
fdd	-0.519	-0.520	-0.492	-0.409	-0.437	-0.482	-0.363	-0.709	-0.711	-0.686	-0.608	-0.632	-0.666	-0.575
	(-0.93)	(-0.94)	(-0.89)	(-0.74)	(-0.79)	(-0.87)	(-0.65)	(-1.25)	(-1.26)	(-1.21)	(-1.07)	(-1.11)	(-1.17)	(-1.01)
insthold	0.0171	0.0150	0.0147	0.00605	0.00618	0.0131	0.0127	0.00728	0.00529	0.00499	-0.00174	-0.00163	0.00457	0.00377
	(1.29)	(1.13)	(1.11)	(0.45)	(0.46)	(0.98)	(0.95)	(0.54)	(0.39)	(0.37)	(-0.13)	(-0.12)	(0.33)	(0.28)
family	-5.688***	-5.390***	-5.368***	-5.390***	-5.492***	-5.921***	-5.871***	-6.077***	-5.800***	-5.778***	-5.860***	-5.946***	-6.318***	-6.261***
	(-10.22)	(-9.68)	(-9.64)	(-9.65)	(-9.83)	(-10.62)	(-10.56)	(-10.71)	(-10.21)	(-10.17)	(-10.28)	(-10.43)	(-11.12)	(-11.05)
constant	-56.25***	-53.15***	-52.44***	-74.46***	-72.07***	-62.95***	-49.27***	-50.17***	-47.33***	-46.68***	-65.42***	-63.41***	-55.37***	-44.13***
	(-17.02)	(-16.11)	(-15.87)	(-19.40)	(-18.96)	(-17.21)	(-14.52)	(-14.89)	(-14.06)	(-13.85)	(-16.71)	(-16.35)	(-14.85)	(-12.76)
No. of Obs.	8,698	8,698	8,698	8,698	8,698	8,697	8,694	8,698	8,698	8,698	8,698	8,698	8,697	8,694
Adjusted R^2	0.216	0.220	0.220	0.218	0.216	0.211	0.214	0.190	0.193	0.193	0.190	0.189	0.185	0.188
Prob. > *F*-stat.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: This table reports the regression estimation results of the effect of D&O insurance coverage on firm's industry-adjusted overall ESG performance, which is proxied by rankings in ESG score among SASB main-industry classification (*esgmid*) (Panel A) and rankings in ESG score among SASB sub-industry classification (*esgsid*) (Panel B), respectively. In both panels, models (1) to (7) employ various D&O coverage variables, including the dummy of whether a firm has D&O coverage, the amount of D&O coverage (*dolim*), the average amount of D&O covrage per insured persons (*dolia*), the ratio of total D&O amount to assets (*dolita*), the ratio of D&O amount equity (*dolite*), the ratio of D&O amount to net sales (*dolits*), and the number of insurance companies underwriting D&O to a specific firm (*dolini*). Control variables include firm size (*scale*), return on assets (*roa*), debt ratio (*debt*), independent director ration (*idr*), dummy variable indicating the presence of female director (*fdd*), institutional investors shareholdings (*insthold*), and dummy variable indicating family-controlled firm (*family*). The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 6 reports the OLS regression results examining the association between D&O insurance coverage and firms' performance across the individual ESG dimensions. Panel A reports environmental performance outcomes, including environmental performance scores (envscore), rankings within SASB primary industries (envmid), and rankings within SASB sub-industries (envsid). Panel B presents social performance outcomes, including social performance scores (socscore), rankings within SASB primary industries (socmid), and rankings within SASB sub-industries (socsid). Panel C reports governance performance outcomes, including governance performance scores (govscore), rankings within SASB primary industries (govmid), and rankings within SASB sub-industries (govsid).

An examination of the estimated coefficients on the main explanatory variables reveals that the majority of coefficients associated with the D&O insurance measures are positive and statistically significant at least at the 10% level. Specifically, firms with D&O insurance coverage, higher total coverage amounts, greater average coverage per director or officer, and a larger number of insurers providing coverage tend to exhibit superior individual ESG performance scores and higher rankings within both SASB main and sub-industry classifications. These findings are consistent with Hypothesis 1B of this study, indicating that D&O insurance contributes positively to firm-level ESG outcomes across the environmental, social, and governance dimensions.

Table 6: Regression Result of the Effects of D&O Coverage on Individual ESG Performance and Industry-Adjusted Individual ESG Performance

Panel A. Explanatory Variable	**Environment score (*envscore*)**				**Environment score in SASB main industry classification (*envmid*)**				**Environment score in SASB sub industry classification (*envsid*)**			
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
dolid	1.612***				4.687***				4.008***			
	(5.11)				(5.67)				(4.84)			
dolim		0.191***				0.534***				0.478***		
		(7.18)				(7.67)				(6.86)		
dolia			0.243***				0.683***				0.621***	
			(7.49)				(8.03)				(7.29)	
dolini				0.320**				1.042***				0.463
				(2.15)				(2.67)				(1.18)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Panel B. Explanatory Variable	**Social score (*socscore*)**				**Social score in SASB main industry classification (*socmid*)**				**Social score in SASB sub industry classification (*socsid*)**			
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
dolid	2.286***				6.867***				5.932***			
	(8.23)				(8.64)				(7.32)			
dolim		0.257***				0.738***				0.649***		
		(11.03)				(11.05)				(9.52)		
dolia			0.320***				0.925***				0.817***	
			(11.23)				(11.33)				(9.81)	
dolini				1.701***				3.982***				3.469***
				(13.07)				(10.66)				(9.10)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Panel C. Explanatory Variable	**Corporate Governance score (*socscore*)**				**Corporate Governance score in SASB main industry classification (*socmid*)**				**Corporate Governance score in SASB sub industry classification (*socsid*)**			
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
dolid	1.066***				3.778***				2.948***			
	(3.24)				(4.22)				(3.28)			
dolim		0.111***				0.384***				0.316***		
		(4.01)				(5.09)				(4.17)		
dolia			0.130***				0.454***				0.375***	
			(3.83)				(4.93)				(4.06)	
dolini				0.425***				1.757***				1.440***
				(2.74)				(4.17)				(3.40)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the effect of D&O insurance coverage on firm's individual ESG performance and industry-adjusted individual ESG performance. Panel A reports environment performance, proxied by environment score (*envscore*), environment score in SASB main industry classification (*envmid*), and environment score in SASB sub industry classification (*envsid*). Panel B reports social performance, proxied by social score (*socscore*), social score in SASB main industry classification (*socmid*), and social score in SASB sub industry classification (*socsid*). Panel C reports corporate governance performance, proxied by corporate governance score (govscore), corporate governance score in SASB main industry classification (*govmid*), and corporate governance score in SASB sub industry classification (*govsid*). In each panel, models (1) to (4) employ various D&O coverage variables, including the dummy of whether a firm has D&O coverage, the amount of D&O coverage (*dolim*), the ratio of total D&O amount to assets (*dolita*), and the number of insurance companies underwriting D&O to a specific firm (*dolini*). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 7 reports the OLS regression results examining the relationship between D&O insurance coverage and firms'CSR performance and information disclosure. Panel A reports CSR-related outcomes, including current CSR performance (csrdummy), cumulative CSR performance (csrcumu), continuous CSR engagement (csrcont), repeated CSR performance (csrovlp), social contribution value (scv), social return on assets (sroa), and social contribution value per share (scvps). Panel B reports information disclosure-related outcomes, including a dummy variable for sustainability report disclosure (csrrdis), a dummy variable indicating whether the disclosed sustainability report is externally assured by a big4 accounting firm (csrrcer), the information transparency score from corporate governance evaluations (transp), and the rankings of transparency scores within SASB primary (transpmid) and sub-industry classifications (transpsid). Inspection of the estimated coefficients on the main explanatory variables indicates that, for the majority of D&O insurance measures, the coefficients are positive and statistically significant at least at the 10% level. These results suggest that firms with higher D&O insurance coverage, as well as higher ratios of D&O coverage relative to total assets, tend to exhibit superior CSR performance and higher levels of information disclosure. D&O insurance mitigates the personal legal and financial risks faced by executives and board members, reducing managerial risk aversion and short-termism, which enables greater commitment to long-term CSR initiatives and transparent reporting. Table 8 reports the regression results examining the effects of managerial overconfidence—proxied by negative earnings accompanied by an increase in managerial shareholdings (pfmmhi)—and board-level overconfidence—proxied by negative earnings accompanied by an increase in directors' shareholdings (pfmdhi)—on firms' overall ESG performance and industry-based ESG rankings. In Panels A, B, and C, dependent variables are 13 ESG-related measures derived from prior ESG rating systems. An examination of the estimated coefficients on the main explanatory variables across these panels reveals that, for the majority of the specifications involving managerial and board overconfidence, the coefficients are negative and statistically significant. These findings indicate that firms characterized by overconfident management and boards tend to exhibit inferior ESG performance, consistent with Hypothesis 2 of this study.

Table 7: Regression Result of the Effects of D&O Coverage on CSR Performance and Information Disclosure

Panel A. Explanatory Variable	**Explained variable: CSR performance**									
	csrdummy	***csrdummy***	***csrcumu***	***csrcumu***	***csrovlp***	***csrovlp***	***sroa***	***sroa***	***scvps***	***scvps***
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
dolim	0.000537		0.00184		0.0000124		0.0876***		0.0577***	
	(1.05)		(0.65)		(0.06)		(5.87)		(6.44)	
dolita		0.00277***		0.00103		0.000663***		0.124***		0.0416***
		(6.03)		(0.40)		(3.72)		(9.22)		(5.12)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Panel B. Explanatory Variable	**Explained variable: Information disclosure**									
	csrrdis	***csrrdis***	***csrrcer***	***csrrcer***	***transp***	***transp***	***transpmid***	***transpmid***	***transpsid***	***transpsid***
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
dolim	0.0389***		0.0408***		0.922***		0.929***		0.894***	
	(8.82)		(6.73)		(14.62)		(14.72)		(13.95)	
dolita		0.0481***		0.0508***		1.122***		1.131***		1.094***
		(8.93)		(6.89)		(14.54)		(14.65)		(13.97)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the effect of D&O insurance coverage on firm's CSR performance (Table A) and information disclosure (Table B). In panel A, firm's CSR performance is proxied by the current performance of CSR (*csrdummy*), cumulative performance of CSR (*csrcumu*), continuous performance of CSR (*csrcont*), overlap performance of CSR (*csrovlp*), social contribution value (*scv*), social return on assets (*sroa*), and social contribution value per share (*scvps*). In panel B, firm's information disclosure is proxied by the dummy of disclosing CSR report (*csrrdis*), dummy of CSR report is certified (*csrrcer*), information disclosure score (*transp*), the ranking of information disclosure score in SASB main industry classification (*transpmid*), and the ranking of information disclosure score in SASB sub-industry classification (*transpsid*). Models (1)~(2) employ two D&O coverage variables, respectively, the amount of D&O coverage (*dolim*), and the ratio of total D&O amount to assets (*dolita*). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 8: Regression Result of the Effects of Board and Managerial Overconfidence on Overall versus Individual ESG Performance

Panel A. Explanatory Variable	**Explained variable: Overall ESG Performance**							
	tesgrank	***tesgscore***	***tesgmid***	***tesgsid***	***tesgrank***	***tesgscore***	***tesgmid***	***tesgsid***
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
pfmmhi	-0.0627	-0.252	-0.833	-1.032				
	(-1.00)	(-0.81)	(-0.71)	(-0.86)				
pfmdhi					-0.210***	-0.955***	-3.935***	-3.538***
					(-3.87)	(-3.56)	(-3.86)	(-3.41)
Controls	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes
Panel B. Explanatory Variable	**Explained variable: Individual ESG Performance**								
	envscore	***envmid***	***envsid***	***socscore***	***socmid***	***socsid***	***govscore***	***govmid***	***govsid***
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
pfmmhi	0.174	0.397	0.519	0.474	2.139*	2.154*	-1.359***	-3.871***	-4.212***
	(0.38)	(0.33)	(0.43)	(1.16)	(1.82)	(1.80)	(-2.83)	(-2.95)	(-3.21)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes
Panel C. Explanatory Variable	**Explained variable: Individual ESG Performance**								
	envscore	***envmid***	***envsid***	***socscore***	***socmid***	***socsid***	***govscore***	***govmid***	***govsid***
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
pfmdhi	-0.489	-1.350	-0.987	-0.688*	-2.109**	-1.473	-1.675***	-4.837***	-4.705***
	(-1.23)	(-1.29)	(-0.94)	(-1.95)	(-2.08)	(-1.42)	(-4.04)	(-4.27)	(-4.15)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the effect of board overconfidence (the dummy of whether the management increases its shareholdings as firm's profit is negative: *pfmmhi*) and managerial overconfidence (the dummy of whether the directors increases its shareholdings as firm's profit is negative: *pfmdhi*) on firm's overall ESG performance (Panel A) and individual ESG performance (Panel B and Panel C). In panel A, firm's overall ESG performance is proxied by ESG ratings (*esgrating*), ESG score (*esgscore*), rankings in ESG score among SASB main-industry classification (*esgmid*), rankings in ESG score among SASB sub-industry classification (*esgsid*). In Panel B and Panel C, individual ESG performance is proxied by environment score (*envscore*), environment score in SASB main industry classification (*envmid*), environment score in SASB sub industry classification (*envsid*), social score (*socscore)*, social score in SASB main industry classification (*socmid*), social score in SASB sub industry classification (socsid), corporate governance score (*govscore*), corporate governance score in SASB main industry classification (*govmid*), and corporate governance score in SASB sub industry classification (govsid). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 9 reports the regression estimates assessing whether managerial overconfidence (pfmmhi) and board overconfidence (pfmdhi) are associated with firms' CSR performance and information disclosure outcomes. In Panel A, Models (1)~(7) use prior CSR performance measures as the dependent variables, whereas Panel B, Models (1)~(5) employ prior information disclosure measures as the dependent variables. Inspection of the estimated coefficients on the main explanatory variables in both panels shows that, for most specifications, the coefficients associated with managerial and board overconfidence are negative and statistically significant. These results suggest that firms exhibiting overconfident management and boards are more likely to demonstrate lower levels of CSR engagement and reduced information disclosure quality.

Table 10 reports the regression results examining the interaction effects between D&O insurance coverage—measured by whether a firm has D&O insurance coverage (dolid)—and managerial overconfidence, proxied by negative earnings accompanied by an increase in managerial shareholdings (pfmmhi), as well as board-level overconfidence, proxied by negative earnings accompanied by an increase in directors' shareholdings (pfmdhi), on firms' overall ESG performance, individual ESG performance, and industry-based ESG rankings. Focusing on the estimated coefficients of D&O insurance coverage (dolid) reported in Panel A, the results indicate that these coefficients are uniformly positive and statistically significant across all model specifications, suggesting that the presence of D&O insurance coverage is associated with enhanced firm-level ESG performance. In contrast, the estimated coefficients on the interaction terms between D&O insurance coverage and managerial overconfidence (dolid × pfmmhi) fail to attain statistical significance, implying that the positive effect of D&O insurance coverage on ESG performance is not materially weakened when management exhibits overconfident behavior. Consistent findings are observed in Panel B, which examines the interaction between D&O insurance coverage and board-level overconfidence. Specifically, the estimated coefficients on the interaction terms between D&O insurance coverage and board overconfidence (dolid × pfmdhi) are not statistically significant, indicating that even when the board of directors displays overconfident characteristics, such behavior does not significantly attenuate the beneficial impact of D&O insurance coverage on firms' ESG performance.

Table 9: Regression Result of the Effects of Board and Managerial Overconfidence on CSR Performance and Information Disclosure

Panel A. Explanatory Variable	**Explained variable: CSR performance**													
	csrdummy	***csrcumu***	***csrcont***	***csrovlp***	***scv***	***sroa***	***scvps***	***csrdummy***	***csrcumu***	***csrcont***	***csrovlp***	***scv***	***sroa***	***scvps***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
pfmmhi	-0.0138	0.0539	0.0000116	0.00108	-1.538***	-1.080***	-0.585***							
	(-1.60)	(1.08)	(0.00)	(0.33)	(-5.81)	(-4.14)	(-3.76)							
pfmdhi								-0.00896	0.0636	0.000243	0.00180	-2.421***	-1.271***	-0.548***
								(-1.20)	(1.47)	(0.11)	(0.63)	(-10.66)	(-5.66)	(-4.11)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Panel B. Explanatory Variable	**Explained variable: Information disclosure**									
	csrrdis	***csrrcer***	***transp***	***transplid***	***transpsid***	***csrrdis***	***csrrcer***	***transp***	***transplid***	***transpsid***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
pfmmhi	-0.00136	-0.00637	-0.295	-0.255	-0.103					
	(-0.08)	(-0.46)	(-0.26)	(-0.23)	(-0.09)					
pfmdhi						-0.00706	0.00206	-2.950***	-2.904***	-2.979***
						(-0.46)	(0.17)	(-3.06)	(-3.00)	(-3.04)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the the effect of board overconfidence (the dummy of whether the management increases its shareholdings as firm's profit is negative: *pfmmhi*) and managerial overconfidence (the dummy of whether the directors increases its shareholdings as firm's profit is negative: *pfmdhi*) on firm's CSR performance (Table A) and information disclosure (Table B). In model (1)~(7) in panel A, firm's CSR performance is proxied by the current performance of CSR (*csrdummy*), cumulative performance of CSR (*csrcumu*), continuous performance of CSR (*csrcont*), overlap performance of CSR (*csrovlp*), social contribution value (*scv*), social return on assets (*sroa*), and social contribution value per share (*scvps*). In model (1)~(5) in panel B, firm's information disclosure is proxied by the dummy of disclosing CSR report (*csrrdis*), dummy of CSR report is certified (*csrrcer*), information disclosure score (*transp*), the ranking of information disclosure score in SASB main industry classification (*transpmid*), and the ranking of information disclosure score in SASB sub-industry classification (*transpsid*). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 10: Interaction Effects of D&O Coverage and Overconfidence on Overall versus Individual ESG Performance

Panel A. Explanatory Variable	**Explained variable: Overall and individual ESG performance**												
	tesgrank	***tesgscore***	***tesgmid***	***tesgsid***	***envscore***	***envmid***	***envsid***	***socscore***	***socmid***	***socsid***	***govscore***	***govmid***	***govsid***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
dolid	0.380***	1.711***	7.265***	6.570***	1.658***	4.738***	4.099***	2.342***	6.876***	5.921***	1.121***	3.870***	3.010***
	(8.73)	(7.88)	(8.89)	(7.88)	(5.13)	(5.60)	(4.83)	(8.24)	(8.46)	(7.15)	(3.33)	(4.23)	(3.28)
*dolid*pfmmhi*	-0.211	-0.914	-2.439	-1.188	-0.963	-1.114	-1.984	-1.265	-0.743	-0.344	-0.723	-0.741	-0.0258
	(-1.13)	(-0.98)	(-0.69)	(-0.33)	(-0.69)	(-0.31)	(-0.54)	(-1.03)	(-0.21)	(-0.10)	(-0.50)	(-0.19)	(-0.01)
pfmdhi	0.106	0.470	1.052	-0.277	0.948	1.286	2.231	1.539	2.724	2.386	-0.855	-3.620	-4.615
	(0.60)	(0.54)	(0.32)	(-0.08)	(0.73)	(0.38)	(0.65)	(1.34)	(0.83)	(0.71)	(-0.63)	(-0.98)	(-1.25)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Panel B. Explanatory Variable	**Explained variable: Overall and individual ESG performance**												
	tesgrank	***tesgscore***	***tesgmid***	***tesgsid***	***envscore***	***envmid***	***envsid***	***socscore***	***socmid***	***socsid***	***govscore***	***govmid***	***govsid***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
dolid	0.383***	1.747***	7.312***	6.536***	1.690***	4.749***	4.081***	2.280***	6.690***	5.700***	1.254***	4.294***	3.449***
	(8.74)	(7.99)	(8.88)	(7.79)	(5.19)	(5.57)	(4.78)	(7.96)	(8.17)	(6.82)	(3.70)	(4.66)	(3.73)
*dolid*pfmdhi*	-0.115	-0.805	-0.656	1.285	-0.919	-0.162	-0.538	0.492	3.922	4.449	-2.076	-5.521	-5.376
	(-0.71)	(-0.99)	(-0.21)	(0.41)	(-0.76)	(-0.05)	(-0.17)	(0.46)	(1.29)	(1.43)	(-1.64)	(-1.61)	(-1.56)
pfmdhi	-0.138	-0.381	-3.980	-5.256*	0.202	-1.550	-0.757	-1.307	-6.023**	-5.809**	0.0758	-0.367	-0.284
	(-0.90)	(-0.50)	(-1.38)	(-1.79)	(0.18)	(-0.52)	(-0.25)	(-1.30)	(-2.10)	(-1.99)	(0.06)	(-0.11)	(-0.09)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the interaction effect of D&O insurance coverage and overconfidence (proxied by the dummy of whether the management increases its shareholdings as firm's profit is negative, *pfmmhi*, and the dummy of whether the directors increases its shareholdings as firm's profit is negative, *pfmdhi*) on firm's overall versus individual ESG performance. Firm's overall ESG performance is proxied by ESG ratings (*esgrating*), ESG score (*esgscore*), rankings in ESG score among SASB main-industry classification (*esgmid*), rankings in ESG score among SASB sub-industry classification (esgsid). Firm's individual ESG performance is proxied by environment score (*envscore*), environment score in SASB main industry classification (*envmid*), environment score in SASB sub industry classification (*envsid*), social score (*socscore*), social score in SASB main industry classification (*socmid*), social score in SASB sub industry classification (*socsid*), corporate governance score (*govscore*), corporate governance score in SASB main industry classification (*govmid*), and corporate governance score in SASB sub industry classification (*govsid*). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the *t*-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 11 reports the OLS regression results examining the interaction effects between D&O insurance coverage and managerial overconfidence (pfmmhi), as well as board-level overconfidence (pfmdhi), on firms' CSR performance and information disclosure. In Panel A, Models (1)~(5) employ alternative measures of CSR performance as the dependent variables, including current social responsibility (csrdummy), cumulative social responsibility (csrcumu), repeated social responsibility engagement (csrovlp), social return on assets (sroa), and social contribution value per share (scvps). Panel B presents Models (1)~(5) using information disclosure-related outcomes as dependent variables, namely an indicator variable for sustainability report disclosure (csrrdis), an indicator for whether the disclosed sustainability report is externally assured by a Big4 accounting firm, the information transparency score from corporate governance evaluations (transp), and the rankings of information transparency within SASB primary industry classifications (transpmid) and SASB sub-industry classifications (transpsid).

The results in Panel A indicate that the majority of the interaction terms between D&O insurance and managerial overconfidence are statistically insignificant. Only weak evidence suggests that managerial overconfidence attenuates the positive effect of D&O insurance on cumulative CSR performance (csrcumu). In contrast, board overconfidence exhibits a statistically significant negative moderating effect on the relationship between D&O liability insurance and current CSR performance (csrdummy), indicating that overconfident boards weaken the beneficial impact of D&O insurance on contemporaneous CSR engagement. Turning to Panel B, the empirical findings provide more consistent evidence that board-level overconfidence significantly diminishes the positive association between D&O insurance coverage and firms' information disclosure outcomes. Overall, these results suggest that while D&O insurance generally enhances CSR performance and disclosure quality, the presence of overconfident boards can substantially weaken these beneficial effects, particularly with respect to corporate transparency.

Table 11: Interaction Effects of D&O Coverage and Overconfidence on CSR Performance and Information Disclosure

Panel A. Explanatory Variable	**Explained variable: CSR performance**									
	csrdummy	***csrcumu***	***csrovlp***	***sroa***	***scvps***	***csrdummy***	***csrcumu***	***csrovlp***	***sroa***	***scvps***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
dolid	0.000887	0.0487	-0.000954	0.826***	0.667***	0.00224	0.0110	-0.000849	0.840***	0.676***
	(0.14)	(1.42)	(-0.40)	(4.56)	(6.14)	(0.36)	(0.32)	(-0.35)	(4.60)	(6.17)
*dolid*pfmmhi*	-0.0339	-0.455***	-0.00678	-0.912	-0.472					
	(-1.27)	(-3.09)	(-0.66)	(-1.14)	(-0.99)					
pfmmhi	0.0146	0.458***	0.00707	-0.246	-0.151					
	(0.59)	(3.32)	(0.73)	(-0.33)	(-0.34)					
*dolid*pfmdhi*						-0.0446*	0.214*	-0.00734	-0.527	-0.339
						(-1.92)	(1.67)	(-0.82)	(-0.78)	(-0.84)
pfmdhi						0.0289	-0.109	0.00828	-0.862	-0.312
						(1.32)	(-0.91)	(0.98)	(-1.35)	(-0.82)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Panel B. Explanatory Variable	**Explained variable: Information disclosure**									
	csrrdis	***csrrcer***	***transp***	***transplid***	***transpsid***	***csrrdis***	***csrrcer***	***transp***	***transplid***	***transpsid***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
dolid	0.0846***	0.0437***	9.750***	9.805***	9.311***	0.0893***	0.0468***	10.19***	10.25***	9.708***
	(6.78)	(4.48)	(12.69)	(12.76)	(11.94)	(7.10)	(4.77)	(13.18)	(13.24)	(12.37)
*dolid*pfmmhi*	0.00164	-0.0573	-2.724	-2.556	-3.084					
	(0.03)	(-1.37)	(-0.82)	(-0.77)	(-0.92)					
pfmmhi	-0.00631	0.0414	1.564	1.460	2.101					
	(-0.13)	(1.05)	(0.51)	(0.47)	(0.67)					
*dolid*pfmdhi*						-0.0659	-0.0918**	-7.290**	-7.162**	-6.810**
						(-1.41)	(-2.52)	(-2.53)	(-2.49)	(-2.33)
pfmdhi						0.0455	0.0790**	2.661	2.584	2.244
						(1.03)	(2.30)	(0.98)	(0.95)	(0.82)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Note: This table reports the regression estimation results of the interaction effect of D&O insurance coverage and overconfidence (proxied by the dummy of whether the management increases its shareholdings as firm's profit is negative, pfmmhi, and the dummy of whether the directors increases its shareholdings as firm's profit is negative, pfmdhi) on firm's CSR performance (Panel A) and information disclosure (Panel B). In model (1)~(5) in panel A, firm's CSR performance is proxied by the current performance of CSR (csrdummy), cumulative performance of CSR (csrcumu), overlap performance of CSR (csrovlp), social return on assets (sroa), and social contribution value per share (scvps). In model (1)~(5) in panel B, firm's information disclosure is proxied by the dummy of disclosing CSR report (csrrdis), dummy of CSR report is certified (csrrcer), information disclosure score (transp), the ranking of information disclosure score in SASB main industry classification (transpmid), and the ranking of information disclosure score in SASB sub-industry classification (transpsid). Control variables are similar with previous table, and are omitted in reporting their estimation result. The data yearly ranged from 2015~2020. The values in parentheses represent the t-values of the estimated coefficients, and *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively.

5. Conclusion and Suggestion

A growing body of literature has examined the economic consequences of D&O insurance across various firm-level outcomes. In contrast, relatively limited attention has been devoted to investigating the implications of D&O insurance for firms' ESG performance, CSR engagement, and information disclosure practices. Likewise, existing studies on managerial overconfidence predominantly focus on measuring the degree of overconfidence and its economic consequences from the perspective of top executives or CEO. Comparatively little research has explored the behavioral characteristics and economic effects of overconfident directors and boards of directors, particularly with respect to their influence on firms' ESG performance, CSR engagement, and disclosure quality. To address these gaps, this study employs a comprehensive sample of listed nonfinancial firms in Taiwan to examine these two underexplored issues.

From a theoretical perspective, D&O insurance may generate moral hazard concerns by attenuating the legal and financial liabilities faced by directors and senior management, potentially leading to a reduction in corporate investment in CSR-related activities. At the same time, however, D&O insurance can enhance corporate governance mechanisms by encouraging directors and executives to pursue long-term and sustainable projects rather than focusing exclusively on short-term shareholder value. Furthermore, D&O insurance may promote greater transparency through improved information disclosure to external stakeholders, thereby contributing to enhanced ESG performance, CSR outcomes, and overall disclosure quality. In contrast, when both the board of directors and top management exhibit overconfident traits, they are more likely to underestimate the probability and expected costs of adverse events. As a result, such decision-makers may allocate fewer resources to stakeholder-related concerns, ultimately leading to lower levels of investment in ESG initiatives and corporate social responsibility activities.

This study examines a sample of non-financial firms listed on the Taiwan Stock Exchange and the Taipei Exchange over the period 2015–2020. Employing univariate mean comparison tests, correlation analyses, and multivariate regression estimations, the empirical results indicate that the presence of D&O insurance is positively associated with firms' ESG performance, CSR engagement, and the quality of information disclosure. In contrast, firms in which both the board of directors and senior management exhibit overconfident characteristics demonstrate significantly lower levels of ESG performance, CSR activities, and disclosure quality. Moreover, the empirical evidence provides only limited support for the existence of an interaction effect between D&O insurance coverage and managerial or board-level overconfidence.

The findings of this study offer important implications for regulators and policymakers. Specifically, the continued promotion and institutionalization of D&O insurance-related regulations appear to incentivize firms to increase investments in ESG and CSR initiatives, while simultaneously encouraging more

comprehensive and timely disclosure practices that enhance corporate transparency. Such improvements are likely to benefit shareholder interests, promote the efficient functioning of capital markets, and support long-term sustainable development. At the same time, regulatory authorities should be cognizant that firms characterized by highly overconfident boards and management teams may pose elevated risks to stakeholder interests, thereby justifying heightened regulatory scrutiny and monitoring of such firms.

With respect to the limitations of this study and avenues for future research, this study measures D&O insurance at the firm level rather than at the level of individual board members or other insured executives. This empirical design is primarily constrained by existing regulatory requirements and the limited disclosure of D&O insurance-related information, which precludes the identification of coverage intensity for specific insured individuals, such as the chairperson or CEO. As a result, the analysis is unable to directly assess heterogeneity in D&O insurance coverage across different categories of insured persons. Future research may extend the present framework when more granular data become available, such as information on individual-level D&O insurance coverage or the insurance premiums borne by specific directors and executives. Access to such data would enable researchers to more precisely examine how D&O insurance coverage for key individuals—such as the chairperson, CEO, or independent directors—affects firms' ESG performance, CSR engagement, and the quality of information disclosure.

Second, the present study operationalizes managerial and board-level overconfidence using a single proxy—namely, whether members of the management team and the board of directors increase their shareholdings despite observing or anticipating a deterioration in firm performance. While this measure captures an important behavioral dimension of overconfidence, it may not fully reflect the multifaceted nature of overconfident decision-making. Future research could employ alternative or complementary proxies to more comprehensively capture overconfidence. For instance, researchers may examine whether firms exhibit abnormally high capital expenditure rates relative to industry peers, or whether prior-period revenue growth is used to predict capital investment levels that systematically exceed rational benchmarks. In addition, access to data on executive and director stock option grants—such as whether executives or directors hold employee stock options and refrain from exercising them despite the firm's stock price being deep in the money—would allow for the construction of option-based overconfidence measures. Such extensions would facilitate a more nuanced assessment of overconfidence among executives and directors and its implications for corporate decision-making, ESG performance, and other economic consequences.

Third, in light of the escalating severity of climate change and environmental degradation, firms worldwide are subject to mounting public scrutiny and pressure to address environmental challenges. Corporate performance and exposure in environmental-related domains have attracted increasing societal attention, and stakeholders place growing emphasis on whether firms adequately fulfill their

environmental responsibilities. Firm-level factors such as energy consumption, greenhouse gas and carbon emissions, environmental costs, and pollution-related risks arising from business operations, as well as firms' environmental policies and response strategies—including climate-related financial disclosures—play a critical role in shaping investors' assessments and valuation of firms. Accordingly, an important avenue for future research is to examine whether D&O insurance coverage and overconfidence influence the scope, depth, and quality of firms' environmental information disclosure. Such analyses would further illuminate the governance and behavioral mechanisms through which D&O insurance and managerial traits affect firms' environmental transparency and sustainability-related outcomes.

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