DOES DIRECTORS AND OFFICERS (D&O) LIABILITY INSURANCE HELP A COMPANY INCREASE EFFICIENCY DURING THE COVID-19 PANDEMIC?

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OPEN ACCESS

How to cite this paper: Chen, C.-W., & Wang, Y. (2024). Does directors and officers (D&O) liability insurance help a company increase efficiency during the COVID-19 pandemic? *Corporate Ownership & Control, 21*(3), 69–76. https://doi.org/10.22495/cocv21i3art6

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ISSN Online: 1810-3057
ISSN Print: 1727-9232

Received: 07.03.2024
Accepted: 04.07.2024

JEL Classification: G0, G2, G3
DOI: 10.22495/cocv21i3art6

Abstract

This study examines the relationship between firms' directors and officers (D&O) liability insurance and firm performance during the COVID-19 pandemic in Taiwan. It has been found that while the COVID-19 pandemic has had a negative impact on firm performance, D&O insurance indeed significantly mitigates this negative impact. Specifically, with 2,924 firm-year observations of 1,462 listed firms in Taiwan in the years of 2018 and 2020, we show that D&O insurance reduces the negative impact of the COVID-19 pandemic on net operating revenue by approximately 20 percent for insured firms. The main contribution of this article is that it provides valuable information for firms and investors by providing direct evidence that clearly shows the association between D&O insurance and firm performance during unexpected significant external shocks such as a pandemic.

Keywords: Directors and Officers Liability Insurance, D&O Insurance, Firm Performance, COVID-19, Pandemic, Taiwan

Authors' individual contribution: Conceptualization — C.-W.C. and Y.W.; Methodology — C.-W.C. and Y.W.; Software — C.-W.C. and Y.W.; Validation — C.-W.C. and Y.W.; Formal Analysis — C.-W.C. and Y.W.; Investigation — C.-W.C. and Y.W.; Data Curation — C.-W.C. and Y.W.; Writing — Original Draft — C.-W.C.; Writing — Review & Editing — Y.W.; Visualization — C.-W.C. and Y.W.; Supervision — C.-W.C. and Y.W.; Funding Acquisition — C.-W.C. and Y.W.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

Directors and officers (D&O) liability insurance (D&O insurance) helps firms cover the monetary losses of the board of directors and executive officers in the event of litigation. Reducing the threat of legal liability to firms' D&O insurance reduces the likelihood of underinvestment in favor of shareholders (Bhagat et al., 1987; Core, 1997). Furthermore, it also helps improve board capability by making it easier for firms to find and retain competent outside directors (Priest, 1987; O'Sullivan, 1997). Although existing literature has enriched our understanding of D&O insurance, there is not any research that studies the effect of this insurance on firm performance during an unexpected external shock. As a result, the purpose for this paper is to examine the relationship between D&O insurance and firm performance during unexpected significant external shocks such as a pandemic.

To study the association between D&O insurance and firm performance during a pandemic, we empirically examined data from 1,462 firms listed on either the Taiwan Stock Exchange (TWSE) or Taipei Exchange (formerly the GreTai Securities Market — GTSM) in Taiwan over the 2018–2020 period, in which the COVID-19 erupted in the area. The results show that although the COVID-19 pandemic brought a negative impact on firm performance, D&O insurance significantly mitigates

this negative impact. Specifically, with 2,924 firm-year observations of 1,462 listed firms in Taiwan from 2018 and 2020, our empirical findings suggest that D&O insurance reduces the negative impact of the COVID-19 pandemic on net operating revenue by approximately 20 percent for the insured firms. Our results are robust to various measures of firm performance, various measures of D&O insurance, firms' corporate governance quality, firm size, financial leverage, industry characteristics, various sample selections, fixed-effect analysis, and random-effect analysis. This paper provides direct evidence that shows although an external shock, such as a pandemic could decrease firm performance, D&O insurance indeed helps alleviate this negative impact.

The remainder of this paper is organized as follows. Section 2 provides a review of the relevant literature. Section 3 outlines the research methodology. Section 4 presents the empirical results and robustness tests. Finally, Section 5 concludes the paper by considering its limitations and outlining directions for future research.

2. LITERATURE REVIEW

The essential idea of D&O insurance is to provide liability protection to the board of directors and executive officers to encourage them to actively perform their duties. This should enhance the firm's functionality, which should be beneficial to shareholders. Research shows that D&O insurance not only could transfer the liability risk from shareholders to the insurer, but also provide external monitoring from the insurance company that may decrease the likelihood of corporate wrongdoing (Romano, 1991; Core, 1997; O'Sullivan, 1997).

There is no empirical consensus regarding the impact of D&O insurance on firm performance. Some studies suggest that D&O insurance plays a governance role because the insurer always has an incentive to scrutinize the insured. Holderness (1990) suggests that D&O insurance has an important governance role in publicly owned companies. O'Sullivan (1997) relates the D&O insurance purchase decisions of 366 firms in the United Kingdom to their corporate governance characteristics and concludes that D&O insurance serves as a form of monitoring of D&O. Bhagat et al. (1987) examines the stock returns of New York firms around the announcement of the purchase of D&O insurance and find no evidence that shareholder wealth is reduced by purchases of this type of insurance. Similarly, Brook and Rao (1994) report insignificant stock price reactions to firms' adoption of provisions intended to limit director liability. Chen et al. (2011) find that purchases of D&O insurance tend to increase stock market liquidity for firms in Taiwan. This indicates that firms with D&O insurance are more attractive to investors because they feel better protected. Hwang and Kim (2018) find that D&O insurance can help firms to better convert growth opportunities into higher firm value. These empirical results suggest that the effect of D&O insurance on shareholder wealth may indeed be positive.

Although some previous studies examine the relationship between D&O insurance and firm financial performance (Wynn, 2008; Lin et al., 2013; Chan & Chen, 2014; Li & Liao, 2014; Chen et al., 2016), there are also studies which focus on the association between D&O insurance and shareholder wealth during special events such as initial public offerings (IPOs) (Chalmers et al., 2002) and corporate acquisitions (Lin et al., 2011). There are also studies that show D&O insurance could actually reduce a company's performance. Chung and Wynn (2008) indicate that legal liability insurance has a stronger influence on earnings conservatism. In a similar vein, Zou et al. (2008) show that the announcement of D&O insurance decisions in firms that engage in earnings management seems to have a negative wealth effect on the listed firms in China. Extending the research breadth to corporate events, Chalmers et al. (2002) analyse a sample of IPO firms and find a significant negative relation between post-offering stock performance and the insurance coverage purchased in conjunction with the IPOs. Lin et al. (2011) study the cases of mergers and acquisitions, and find that acquirers with a higher level of D&O insurance coverage tend to pay higher acquisition premiums and suffer lower abnormal stock returns surrounding the announcement dates. Furthermore, Aguir et al. (2014), and Chen (2014) reveal that target firms, which have D&O insurance, appear to have lower cumulative abnormal returns as well. From the perspective of the costs of capital, Lin et al. (2013) uncover a positive relation between D&O insurance coverage and loan spreads, implying that lenders view this insurance as increasing credit risk. Therefore, the cost of debt increases with the use of this insurance. Consistently, Chen et al. (2016) also discover a positive relation between D&O insurance and the cost of equity. They also find that the higher cost of equity associated with this insurance adversely affects corporate ability to raise external capital through seasoned equity offerings. This suggests that investors tend to charge a higher cost of equity for the firms which have high D&O insurance coverage.

3. RESEARCH METHODOLOGY

In the analysis, we use observations of Taiwan-listed firms for 2018 and 2020. The decision to use data from these two non-consecutive years was based on two facts. First, the global outbreak of the COVID-19 pandemic began in late 2019, and the first confirmed cases in Taiwan were reported in 2020. Secondly, vaccines for the virus became available to most countries after the second quarter of 2021. Therefore, 2020 was the year when the impact of COVID-19 in Taiwan was the most sudden, as it was the first time that Taiwan was directly affected by this pandemic. Furthermore, Taiwanese companies were faced with enormous uncertainty as this was the only year of the entire pandemic in which there were no funds available to combat the virus[1]. To compare firm performance in the pandemic year to a regular year, 2018 simply represents a year in which firm performance was not affected by this pandemic at all.

We use annual observations based on the fact that D&O insurance information and firm characteristics variables are reported annually in

[1] This is based on the data from the Taiwan Centers for Disease Control (https://www.cdc.gov.tw).

Taiwan. We also use additional criteria to filter our final sample to make it unbiased. First, our sample excludes financial services firms and government-controlled firms because they face very different regulations and their primary goals may differ from those of other conventional firms.

Second, we exclude industries which have no clear and specific definition such as "General industry" or "Other industry." Foreign companies with Taiwan Depositary Receipts (TDRs) are not included in our sample because their main operations are highly likely located in a country where the business environment is quite different from that in Taiwan.

Third, because we use annual observations in our analyses, firms that do not use the calendar year are excluded from the sample. Moreover, all firms included in the final sample must have complete data available for both 2018 and 2020. Based on all selection criteria, our final sample contains 2,924 firm-year observations of 1,462 listed firms in Taiwan. The size of this sample represents 86% of all non-financial services firms in Taiwan in that time frame.

The key variables of our analyses are D&O insurance, firm performance, and COVID-19 indicators. Starting in 2019, all firms in Taiwan are required to have D&O insurance. For the D&O insurance variable, we use D&O insurance coverage, measured in millions of New Taiwan dollars (TWD, NT$). The sample also contains 288 observations without D&O insurance (for the period 2018–2020); for these observations, D&O insurance coverage is set to zero, and these observations do not affect research results. The D&O insurance coverage shows the amount of protection provided by this insurance to the board of directors and executive officers of the insured firms.

Table 1 shows that the mean and median of D&O insurance coverage are around NT$281 million and NT$92.2 million. Percentile P1 (NT$0) indicates that very few observations in our sample are uninsured, while percentile P99 (NT$4.717 million) shows that a few firms have high insurance coverage. This is probably because listed firms in Taiwan are hugely different in size, as we show in Table 2, there is a significantly positive association between D&O insurance coverage (*D&O coverage*) and firm size (*Total assets*).

Table 1. Summary statistics

Variable	*Mean (average)*	*P1*	*Median (middle value)*	*P99*
D&O coverage	281	0	92.2	4.717
Net operating revenue	18.880	19.8	2.600	269.911
COVID-19	0.5	0	0.5	1
Board holding	22.7	1.77	18.8	67.1
Institutional holding	41.5	1.92	40.4	89.6
Board independence	0.33	0.15	0.33	0.6
Total assets	22.014	224	3.919	377.516
Financial leverage	0.42	0.05	0.43	0.85

Note: The sample contains 2,924 firm-year observations of listed firms in Taiwan in the years 2018 and 2020. COVID-19 is a dummy indicator, which is 1 if the sample year is 2020 and 0 otherwise. Board (institutional) holding is the percentage of shares held by board members (institutions). Board independence is the number of independent board members scaled by the number of total board members. Financial leverage is total debt divided by total assets. D&O coverage, net operating revenue, and total assets are measured in millions of TWD.

Comparing the median of *D&O coverage* with that of total assets, we find that the average insurance coverage in Taiwan is just around 2.4% of the firm's total assets. Furthermore, the average insurance coverage becomes smaller when firms get larger. Moreover, when comparing insurance coverage to different firm-size measures such as total assets, revenues, and net wealth, results are dramatically different across firms and industries. This suggests that demand for D&O insurance may also be affected by factors other than firm size.

We use the firm's annual *Net operating revenue* as firm performance. This measure is used for firm performance because of two reasons. First, the economic impact of the COVID-19 pandemic was absolutely different from any other historical events which the world had been through in the past decades. This tragic pandemic certainly changed firms' operations when most employees were required to work from home. Furthermore, government quarantine policies also changed consumer behaviors significantly. Second, the outbreak of this pandemic started at the end of 2019, but vaccines and treatment methods for the virus were not available for most countries until the third quarter of 2021. This fact definitely created a great deal of pressure and uncertainty on firms and individuals.

Different industries were affected by the COVID-19 pandemic in diverse ways[2]. As a result, we use net operating revenue, measured in millions of NT$, to be the firm's performance in order to measure the direct effect of the impact from the pandemic. Table 1 shows that the amount of net operating revenue varies much across firms. This is confirmed by the great gap between P1 (NT$19.8 million) and P99 (NT$269.991 million), and the enormous difference between the mean (NT$18.800 million) and the median (NT$2.600 million).

We use a dummy variable to identify the COVID-19 pandemic (*COVID-19*). *COVID-19* value equals 1 if the sample year is from 2020, and 0 if the sample year is from 2018. In our regression analyses, we also test the interaction between *COVID-19* and *D&O coverage* to determine the impact of the pandemic on firm performance (*Net operating revenue*) through D&O insurance coverage. In Table 1, the mean of *COVID-19* is 0.5, which shows that our sample is constructed with observations equally from both sample years.

We use various control variables in our analyses to examine the effect of D&O insurance on

[2] The COVID-19 pandemic affected industries in diverse ways. For example, while sales of travel agencies experienced a great decline, firms produce cleaning supplies had an unexpected growth in sales.

firm performance. Besides control variables with regard to firm characteristics, we also include important corporate governance control variables in our regression analyses because D&O insurance may well affect a firm's corporate governance (Holderness, 1990; O'Sullivan, 1997).

Our corporate governance control variables are: *Board holding*, *Institutional holding*, and *Board independence*. These variables contain information about a firm's ownership composition and board structure. *Board holding* is the percentage of shares held by the firm's board members which may be positively associated with the board's effort level. As board members own more shares of the firm, interest conflict between board members and investors could be reduced. Consequently, as *Board holding* increases, board members' incentive to work hard also increases. Furthermore, institutional investors are believed to be professional and objective monitors of the invested firm. Therefore, as more shares are owned by institutional investors, it may be a positive signal for the firm's future growth. As a result, we expect a positive association between *Board holding* and firm performance, and *Institutional holding* and firm performance. Table 1 shows that, in our sample period, the mean and median of *Board holding* are around 20 percent, while the mean and median of *Institutional holding* are close to 40 percent. We calculate *Board independence* as the percentage of independent directors during the sample year. Literature shows that independent directors protect shareholder interest, particularly during specific events because their career success entirely relies on their reputation. The average percentage of independent directors in our sample is 33 percent, with P1 and P99 being 15 percent and 60 percent, respectively.

Besides corporate governance control variables, we also include *Total assets* and *Financial leverage* as additional control variables in our regression analyses. *Total assets* are the amount of total assets at year-end from the firm's balance sheet. *Financial leverage* is total debt divided by total assets from the firm's balance sheet at year-end. Total assets indicate a firm's size and financial leverage is associated with a firm's bankruptcy risk. We expect that large firms and low-leveraged firms to have better chances to survive the negative impact on firm performance which resulted from the COVID-19 pandemic.

Table 1 shows that *Total assets* are highly skewed with P99 being more than NT$377,516 million, while P1 is only about NT$224 million. This explains the significant difference between the mean (NT$22,014 million) and the median (NT$3,919 million). The mean and the median of *Financial leverage* are close to 42 percent, with P99 being around 85 percent. Table 1 clearly reports the distributions of the variables in our empirical analyses as well as the characteristics of our sample firms. We use a natural logarithm for variables with a skewed distribution. Moreover, we also control the industry effect and firm fixed effect in our regression analyses.

4. RESEARCH RESULTS

4.1. Correlation

Table 2 shows correlations between variables. Column (1) contains the correlations between *D&O coverage* and all the other variables. There is a significantly positive association between *D&O coverage* and *Net operating revenue*, *Institutional holding*, *Board independence*, *Total assets*, and *Financial leverage*. These positive correlations indicate that when D&O insurance coverage increases, *Institutional holding*, *Board independence*, *Total assets*, and *Financial leverage* will also increase. More importantly, firm performance will also improve. The moral hazard issue which is connected with the D&O insurance (Lin et al., 2011; Boyer & Stern, 2014) seems not to be a problem here.

Table 2. Correlation matrix

Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
***(1)** D&O coverage*	1						
***(2)** Net operating revenue*	0.36[a]	1					
***(3)** COVID-19*	0.01	0.01	1				
***(4)** Board holding*	-0.05[a]	-0.07[a]	-0.01	1			
***(5)** Institutional holding*	0.17[a]	0.11[a]	0.00	0.37[a]	1		
***(6)** Board independence*	0.10[a]	0.02	0.21[a]	-0.05[a]	0.10[a]	1	
***(7)** Total assets*	0.39[a]	0.87[a]	0.01	-0.08[a]	0.16[a]	0.04[b]	1
***(8)** Financial leverage*	0.08[a]	0.10[a]	0.06[a]	-0.03	0.08[a]	0.00	0.11[a]

Note: a, b indicates the levels of significance at 1% and 5%, respectively.

We also find that *Total assets* are positively associated with *Board independence*, *Institutional holding*, and *Financial leverage*. It is probably because large firms may have better reputations to hire independent directors, higher liquidity to attract institutional investors, and more capacity to use debt. It is also possible that these factors would improve firm growth together, and therefore have significant correlations among them.

The negative correlation between *D&O coverage* and *Board holding* suggests that when more company stocks are owned by board members, the demand for D&O insurance coverage will decrease. A plausible reason for this negative correlation is that when board members' ownership of the company increases, the misalignment between shareholder interest and management interest may be alleviated. This would reduce firm risk, and lead to a decrease in the demand for D&O insurance coverage.

Table 2 also shows that *COVID-19* is the only variable in the sample that is not significantly correlated with *D&O coverage*. Firms did not change their D&O insurance coverage much when the COVID-19 pandemic started. It is probably because the pandemic happened so suddenly and unexpectedly, therefore, most firms did not really have any reaction plans in 2020.

The majority of correlations are small in magnitude (the absolute correlation coefficients are

not higher than 0.4). This suggests that multicollinearity is not likely to pose a severe problem in multivariate analyses.

4.2. Regression results

Table 3 reports the relationship between D&O insurance coverage and firm performance during the COVID-19 pandemic in Taiwan. Column (1) shows a significantly positive relationship between D&O insurance coverage and firm performance as measured by net operating revenue. The D&O insurance coverage ratio is 0.252. Unsurprisingly, the relationship between the COVID-19 pandemic and firm performance is significantly negative. This shows that the unexpected pandemic has clearly reduced the performance of companies. Column (2) examines the relationship between D&O insurance coverage and firm performance with relevant corporate governance control variables and additional control variables for firm characteristics included in the regression. The coefficient of D&O insurance coverage is 0.068, which is statistically significant. Column (3) estimates the relationship between D&O insurance coverage and firm performance with all corporate governance and firm characteristics variables along with industry effect controlled. The coefficient of D&O insurance coverage is 0.037 and is still statistically significant. Moreover, the coefficient for the interaction between D&O insurance coverage and the COVID-19 pandemic is 0.073 and is statistically significant. This shows that D&O insurance reduces the negative impact of the COVID-19 pandemic on firm performance by approximately 20 percent for insured firms. The results of Table 3 consistently show that D&O insurance coverage and firm performance are positively associated. This result indicates that D&O insurance better aligns the interests of directors and shareholders. In addition, Table 3 also shows that firm performance is positively related to board holding, firm size, and financial leverage, and negatively related to institutional holding. This paper is the first to provide direct evidence that D&O insurance significantly mitigates the negative impact of the pandemic on firm performance.

Table 3. Regression results

Variable	*(1)*	*(2)*	*(3)*
Log (D&O coverage)	0.252***	0.068***	0.037***
	(12.83)	(5.57)	(3.23)
*Log (D&O coverage) * COVID-19*	0.535***	0.099***	0.073***
	(12.14)	(3.67)	(2.94)
COVID-19	-2.802***	-0.697***	-0.548***
	(-13.19)	(-5.32)	(-4.54)
Log (board holding)		0.052*	0.063**
		(1.81)	(2.36)
Log (institutional holding)		-0.108***	-0.044*
		(-3.83)	(-1.67)
Board independence		0.140	0.135
		(0.76)	(0.78)
Log (total assets)		0.963***	0.978***
		(60.48)	(63.03)
Financial leverage		0.902***	0.921***
		(8.76)	(9.19)
Industry dummies	No	No	Yes
R-squared	0.16	0.70	0.75

*Note: All regressions are ordinary least squares (OLS). The dependent variable in all regressions is the natural log of net operating revenue. ***, ** and * indicate the levels of significance at 1%, 5% and 10%, respectively.*

4.3. Robustness tests

Table 4 examines whether our findings are robust to fixed effect and random effect models. Column (1) shows the result of our fixed effect analysis, while Column (2) shows the result of the random effect analysis. The coefficient of the interaction term between D&O insurance coverage and the COVID-19 pandemic is 0.027 under the fixed effect model, and 0.047 under the random effect model. Results of Table 4 consistently show that D&O insurance indeed mitigates the negative impact of a pandemic on firm performance.

To examine whether board independence is a factor that could influence the impact of D&O insurance coverage on firm performance, we categorize our sample observations in the year 2020 into two sub-samples based on the level of board independence. Table 5, Column (1), shows the sample observations from the year 2020, when the percentage of independent directors on the board was above average.

Table 4. Robustness tests — Fixed-effect and random-effect

Variable	*(1)*	*(2)*
Log (D&O coverage)	-0.006	0.011
	(-0.68)	(1.35)
*Log (D&O coverage) * COVID-19*	0.027*	0.047***
	(1.82)	(3.38)
COVID-19	-0.254***	-0.387***
	(-3.41)	(-5.63)
Log (board holding)	0.017	0.041
	(0.36)	(1.40)
Log (institutional holding)	0.016	-0.019
	(0.30)	(-0.63)
Board independence	-0.318*	-0.071
	(-1.66)	(-0.46)
Log (total assets)	0.945***	0.994***
	(16.68)	(54.33)
Financial leverage	0.237	0.627***
	(1.55)	(6.10)
Industry dummies	No	Yes
R-squared	0.69	0.75

*Note: Regression (1) is a fixed-effect analysis, and regression (2) is a random-effect analysis. The dependent variable in all regressions is the natural log of net operating revenue. *** and * indicate the levels of significance at 1% and 10%, respectively.*

Table 5, Column (2), shows sample observations from the same year in which the percentage of independent directors on the board did not exceed the average. Obviously, the positive relationship between D&O insurance coverage and firm performance becomes stronger when a company's board of directors becomes more independent.

Table 5. Robustness tests — Percentage of independent directors

Variable	*(1)*	*(2)*
Log (D&O coverage)	0.117***	0.077
	(4.05)	(1.61)
Log (board holding)	0.056	0.071
	(1.43)	(0.89)
Log (institutional holding)	-0.012	-0.112*
	(-0.28)	(-1.81)
Board independence	-0.993**	-1.328
	(-2.36)	(-1.36)
Log (total assets)	0.938***	1.083***
	(38.05)	(26.24)
Financial leverage	0.988***	0.226
	(6.26)	(0.93)
Industry dummies	Yes	Yes
R-squared	0.79	0.78
N	975	487

*Note: The sample contains firm-year observations of listed firms in Taiwan in the year 2020. Regression (1) only includes observations with a percentage of independent directors that is greater than the sample median. Regression (2) only includes observations with a percentage of independent directors that is less than or equal to the sample median. All regressions are ordinary least squares (OLS). The dependent variable in all regressions is the natural log of net operating revenue. ***, ** and * indicate the levels of significance at 1%, 5% and 10%, respectively.*

It is clear that tourism in many countries has been severely affected by the COVID-19 pandemic due to travel bans and quarantines imposed on permitted travelers in many countries. In Table 6, we use only sample observations of the tourism industry to examine the relationship between D&O insurance coverage and firm performance. The results continue to show that D&O insurance coverage and firm performance are positively related. The coefficient of D&O insurance coverage is 0.832 and is statistically significant.

Table 6. Robustness tests — Vulnerable industry

Variable	*Regression*
Log (D&O coverage)	0.832***
	(2.97)
Log (board holding)	0.101
	(0.28)
Log (institutional holding)	-0.336
	(-0.96)
Board independence	0.709
	(0.44)
Log (total assets)	0.676***
	(3.37)
Financial leverage	0.270
	(0.29)
Industry dummies	Yes
R-squared	0.49

*Note: The sample contains 39 firm-year observations of listed firms from the tourism industry in Taiwan in the year 2020. The regression is ordinary least squares (OLS). The dependent variable is the natural log of net operating revenue. *** indicates the level of significance at 1%.*

In Table 7, we calculate firm performance using different methods and reexamine the relationship between D&O insurance coverage and firm performance. Column (1) of Table 7 defines firm performance as the ratio of the firm's market-to-book (M/B) value. When we use the firm's M/B ratio as a proxy for firm performance, D&O insurance coverage and firm performance remain positively related during the COVID-19 pandemic. The coefficient of the interaction term between D&O insurance coverage and the COVID-19 pandemic is 0.098 and is statistically significant. Column (2) calculates firm performance as the natural logarithm of the firm's net operating revenue. Furthermore, referring to prior studies (O'Sullivan, 2002; Regan & Hur, 2007), we substitute D&O insurance coverage with D&O insurance residual to address potential endogeneity. First, we use the natural logarithm of D&O insurance coverage as the dependent variable in a probit regression on the natural logarithm of total assets, financial leverage, the natural logarithm of board size, board independence, the natural logarithm of board holding, standard deviation of daily stock returns, and industry and year dummy variables. Then we calculate the D&O insurance residual, which is the difference between the predicted D&O insurance coverage based on the probit regression and the actual D&O insurance coverage. As shown in Column (2), the coefficient of the D&O insurance residual is 0.036, and the coefficient of the interaction term between the D&O insurance residual and the COVID-19 pandemic is 0.063. Both coefficients are statistically significant and consistent with the results reported in Table 3. This further indicates that D&O insurance coverage certainly could help a firm's performance during the COVID-19 pandemic, regardless of the reason the firm had for purchasing this insurance.

Table 7. Robustness tests — Various measures of firm performance and D&O insurance

Variable	*(1)*	*(2)*
Log (D&O coverage)	-0.012	
	(-0.66)	
D&O residual		0.036***
		(2.89)
*Log (D&O coverage) * COVID-19*	0.098**	
	(2.54)	
*D&O residual * COVID-19*		0.063**
		(2.18)
COVID-19	-0.166	-0.178***
	(-0.88)	(-5.22)
Log (board holding)	-0.229***	0.065**
	(-5.45)	(2.43)
Log (institutional holding)	0.336***	-0.044
	(7.96)	(-1.64)
Board independence	-0.053	0.264
	(-0.20)	(1.53)
Log (total assets)	-0.266***	1.014***
	(-10.97)	(70.22)
Financial leverage	-0.105	0.917***
	(-0.67)	(9.14)
Industry dummies	Yes	Yes
R-squared	0.13	0.75

*Note: All regressions are ordinary least squares (OLS). The dependent variable in regression (1) is the market-to-book ratio which is the market value of common shares at the end of the year plus total debt and then scaled by total assets. The dependent variable in regression (2) is the natural log of net operating revenue. D&O residual is the residual obtained from regressing log (D&O coverage) on the natural log of total assets, financial leverage, natural log of board size, board independence, natural log of board holding, standard deviation of daily stock returns, and industry and year dummy variables. ***, ** and * indicate the levels of significance at 1%, 5% and 10%, respectively.*

5. CONCLUSION

This paper shows that although the COVID-19 pandemic decreased firm performance, D&O insurance helped alleviate this negative impact. We examined 1,462 listed firms in Taiwan over the 2018–2020 period, in which COVID-19 erupted in the area. We find that although the COVID-19 pandemic brought a negative impact on firm performance, D&O insurance significantly mitigates this negative impact. Our empirical findings suggest that D&O insurance reduces the negative impact of the COVID-19 pandemic on firm performance by approximately 20 percent for insured firms. Our results are robust to various measures of firm performance, various measures of D&O insurance, firms' corporate governance quality, firm size, financial leverage, industry characteristics, various sample selections, fixed-effect analysis, and random-effect analysis. The contribution of this research is that it provides valuable information for firms and investors by presenting direct evidence that clearly shows the association between D&O insurance and firm performance during unexpected significant external shocks such as a pandemic. This research could not be extended to examine the association between D&O insurance and firm performance immediately after the pandemic years due to the limitation of available data. It will certainly be an interesting and valuable research topic to study whether the association between D&O insurance and firm performance has become any different after this pandemic.

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