

Hsin-Yi Chi (Taiwan)

Does directors' and officers' liability insurance affect firms' investment decisions?

Abstract

The author examines directors' and officers' (D&O) insurance coverage affects a firm's investment decisions. Once managers mitigate their personal legal liability through D&O insurance coverage, their behaviors will be more opportunistic. The author finds that managers are more likely to over-invest when their personal legal liability is covered by abnormally high level of D&O insurance coverage. The author also finds that over-investing firms with excess D&O insurance coverage appear to have poor investment decisions that result in inferior subsequent performance. The author further finds that managers with excess D&O insurance coverage tend to over-invest in R&D. The authors' results are consistent with the argument that the agency conflicts are aggravated by excess D&O insurance coverage which provides the managements with more room to pursuit private personal benefits via inefficient investments decisions.

Keywords: directors' and officers' insurance coverage, investment decisions.

JEL Classification: G22, G32, G34, J44.

Introduction

This paper examines whether directors' and officers' (D&O) liability insurance coverage affects firms' investment efficiency. Recent studies demonstrate that D&O insurance provisions provide a company's directors and officers (i.e., managers or insiders) with protection against liability lawsuits stemming from their professional activities on behalf of the business (Chung and Wynn, 2008; Wynn, 2008; Lin et al., 2011). However, the debate on the merits and demerits of legal liability coverage is still open. One view is that legal liability coverage is beneficial to shareholders because D&O insurance coverage is dependent on the scrutiny and approval of insurers and thus plays a monitoring role (Holderness, 1990; Core, 2000). Moreover, D&O insurance provisions can help a firm to attract and maintain competent directors and officers (Bhagat et al., 1987) and may decrease the compensation differential in executive pay (Mayers and Smith, 1982). The other view is that D&O insurance provisions provide essential layers of protection to a company's directors and officers and therefore lessen the effectiveness of litigation as a monitoring tool (Chalmers et al., 2002; Chung and Wynn, 2008; Wynn, 2008).

Managers are firm's most critical person whose motives and ethical choices have fundamental influence on firms' resources allocation and therefore overall performance. If D&O insurance

coverage induces moral hazard and agency problem amongst well-protected managers, managers maximizing their personal welfares are inclined to make investments that are not in the best interests of shareholders. Thus, we predict that over-investing firms with excess D&O insurance coverage appear to have poor investment decisions that result in inferior subsequent performance. We conceptually define a firm as investing inefficiently if it undertakes projects with negative net present value and then causes a lower Tobin's Q.

Our paper contributes to the literature in at least two ways. First, we find that a positive relationship over-investment and legal liability coverage, as reflected in excess D&O insurance. Prior research (e.g., Masulis et al., 2007; Lin et al., 2011) has been documented that managers who are well protected from shareholder discipline or D&O insurance make poor acquisition decisions, but most of these studies detect this relationship in conjunction with major events such as mergers and acquisitions that are relatively unusual for most corporations. Therefore, we complement this line of research by showing that abnormal liability coverage lead to managerial opportunistic behavior through over-investment decisions. This result is in line with prior research documents a negative consequence of large D&O insurance coverage. Second, extensive prior research investigates whether D&O insurance policy is associated with firms' mispricing and disclosure behaviors (Chalmers et al., 2002; Wynn, 2008; Chung and Wynn, 2008; Lin et al., 2011), but empirical research of the relationship between managerial legal liability and investment efficiency is lacking. There is much less evidence of the importance of managerial incentives for more routine corporate decisions. To our knowledge, there is no study that examines that effect of

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Hsin-Yi Chi, Ph.D., Associate Professor of Accounting, College of Management, National Chung Hsing University, Taiwan.

I acknowledge the comments of participants at the 2012 American Accounting Association Annual Meeting (2012 AAA) and 2012 Business and Information (2012 BAI). I also appreciate the seminar participants at National Chung Hsing University, and Feng Chia University for their helpful comments and suggestions. Professor Chi acknowledges the financial support of the National Science Committee in Taiwan.

managers' excess D&O insurance coverage on a firm's over-investment behavior. Thus, our study provides the first empirical evidence that excess legal liability coverage is related to manager's moral hazard problems and agency conflicts and then leads to inefficient or opportunistic investment decisions.

The rest of the paper is structured as follows. In Section 1, we provide institutional background and develop our hypothesis. In Section 2, we describe measurements of variables and empirical model for excess D&O insurance coverage and over-investment. In Section 3, we present the sample selection process and the results of empirical and various sensitivity tests. The Final Section provides some concluding remarks.

1. Hypothesis development

1.1. Legal liability coverage and investment decision. The original intention of liability coverage is to protect directors and officers from lawsuits when they are acting in good faith, but it shields directors and officers from the discipline of shareholder litigation and then causes agency problem and moral hazard. D&O insurance coverage may change the liability risk profile of directors and managers and thereby affect their incentives in corporate decisions. It has been suggested that D&O liability insurance coverage encourages managers or allows them to act opportunistically (Core, 1997; Baker and Griffith, 2010). Hence, managers may work recklessly, negligently, or engage in opportunistic behaviors that benefit themselves at the expense of shareholders. Existing empirical studies have suggested that insured managers may reduce financial reporting and disclosure quality due to their opportunistic behaviors (e.g., Chung and Wynn, 2008; Wynn, 2008).

As D&O insurance coverage is exerted to protect company directors and managers against the litigation risks arising from the expropriation of outside investors, this agency conflict may cause the impact of managers' personal characteristics on investment decisions. If managers have higher level of free cash flow or their compensation plans place a heavy emphasis on near-term stock returns, they may invest more than they would have in order to meet capital market expectations or meet bonus targets (Murphy, 1985; Jensen, 1986; Stulz, 1990; Richardson, 2006; McNichols and Stubben, 2008). This is because managers feel that their compensation, power and job satisfaction are enhanced by managing a growing firm. For example, Jensen (1986) and Blanchard et al. (1994) argue that managers have incentives to consume

perquisites and to grow their firms beyond the optimal size. Lan and Wang (2006) find that managers may engage in wasteful expenditure in order to increase their private benefits, which further destroy shareholders' wealth. Specially, the managers maximizing their personal welfares are inclined to make some investments that are not in the best interests of shareholders (Jensen and Meckling, 1976; Stulz, 1990). The result of this myopic behavior could be over-investment. That is, the severe agency conflict, that increases the managers' incentives to over invest and pursue future private benefits (Albuquerque and Wang, 2008).

Although agency conflict can provide financial motivation for managers to engage in over-investment decision (Jensen, 1986; Stulz, 1990; Richardson, 2006), those firms which over-invest are more likely to be targets for shareholder lawsuits (McTier and Wald, 2011). Thus, managerial decisions on over-investment may suffer from higher level of the firm's litigation risk. McTier and Wald (2011) suggest that firms which over-invest, acquire more, and payout less cash are more likely to be sued. Peng and Roell (2008) find that the probability of lawsuit is positively associated with acquisition activities.

However, managers could mitigate their personal legal liability against the failure of investment policy through D&O insurance coverage, because D&O insurance policy can provide litigation costs for claims made against individual directors and officers for their wrongful acts to the extent which indemnification does not apply (Chung and Wynn, 2008; Wynn, 2008). Core (1997) argues that D&O insurance purchases induce the directors to be less risk averse and less likely to reject attractive new risky projects. Lin et al. (2011) find that managers carrying high levels of D&O insurance coverage make poor acquisition decisions that primarily generate private benefits to themselves rather than to shareholders. As managers covered by higher *excess* liability coverage, their investment decisions are prone to depart from the optimal level and they are more likely to undertake risky investment projects (Core, 1997). Therefore, reduced managers' expected legal liability via D&O insurance coverage could induce moral hazard problem among directors and officers by protecting them from shareholder lawsuits (Baker and Griffith, 2010). They are thereby likely to over invest on self-serving projects at the cost of outside shareholders. Based on discussion above, we expect that managers with *excess* D&O insurance coverage may over invest for the purpose of their private benefits, and formulate the following hypothesis:

Hypothesis 1: The excess D&O insurance coverage is positively associated with over-investment.

If D&O insurance coverage induces agency problem and moral hazard amongst well-protected managers, the over-investing firms with abnormally high D&O insurance coverage are more likely to make poor investment decision. Managers maximizing their personal welfares are inclined to invest in negative net present value projects which are not in the best interests of shareholders (Jensen and Meckling, 1976). Recent research documents that poor future performance follows a firm's over-investment activities. Gordon and Myers (1998) find that over-investment is significantly associated with lower Tobin's Q. Titman et al. (2004) and Fairfield et al. (2003) find that firms with extensive capital investment activity and growth in net operating assets respectively, experience inferior future stock returns.

Because D&O insurance protects managers from the threat of lawsuits and personal financial liability incurred by business decision, it increases managerial incentives to act in accordance with their opportunistic behaviors (Chalmers et al., 2002; Wynn, 2008; Chung and Wynn, 2008). Thus, managers with lower litigation risk will have a tendency to over-invest by accepting marginal investment projects with negative net present values. That is, those managers are often tempted to expand the size of the company, even if the expansion is not profitable. Lin et al. (2011) find that managers carrying high level of D&O insurance make poor merger and acquisition decisions that cause lower stock returns around the acquisition date. Therefore, the managers who have abnormal legal liability coverage could divert these investments toward personal benefits at the expense of firm's value. Accordingly, we hypothesize that over-investing firms with excess D&O insurance coverage appear to have poor investment decisions and then result in poor subsequent operating performance.

Hypothesis 2: Over-investing firms with excess D&O insurance coverage have poor future performance.

2. Research design

2.1. Measure of over-investment. Following Richardson (2006), we measure over-investment using the following regression specification:

$$\begin{aligned} NEWINV_{it} = & \alpha_0 + \alpha_1 GROW_{it-1} + \alpha_2 LEV_{it-1} + \\ & + \alpha_3 CASH_{it-1} + \alpha_4 AGE_{it-1} + \alpha_5 SIZE_{it-1} + \\ & + \alpha_6 RET_{it-1} + \alpha_7 NEWINV_{it-1} + \varepsilon_{it}, \end{aligned} \quad (1)$$

where, for firm i and in year t (or $t-1$), $NEWINV$ denotes new investment of a firm scaled by average

total assets. $GROW$ is the growth of a company measured by the factor score obtained from a principal components factor analysis of book-to-market of equity, earnings-to-price ratios and Tobin's Q. LEV is the leverage measured by the ratio of total debts to total assets. $CASH$ is sum of cash, cash equivalents and short term investments scaled by lagged total assets. AGE is natural logarithm of the numbers of listing years. $SIZE$ is the size of the firm measured by the natural logarithm of the book value of total assets. RET is the annual stock return measured as the change in market value of the firm over that prior year.

For each firm in the sample, we obtain the residuals from the above expectations model of investment. Following previous studies (e.g., Biddle et al., 2009; Richardson, 2006), firms with positive residual are classified as group of over-investing companies, while firms with negative residuals are classified as under-investing group. $OVERINV$ is an indicator variable for over-investment and it takes the value of one when firms with positive residuals, and zero (i.e., negative residuals) otherwise. We also include year and industry dummies in all of our regressions to control the year effect and industry effect.

2.2. Measures of excess liability coverage. We identify excess liability coverage as the excess D&O insurance coverage. Following prior finance and economics literature (e.g., Wynn, 2008; Chung and Wynn, 2008; Chi and Weng, 2014), we measure excess D&O insurance coverage as the residual from the regression of a D&O insurance coverage measure on its determinants. The expected D&O insurance coverage model is described below:

$$\begin{aligned} DOCOV_{it} = & \beta_0 + \beta_1 SIZE_{it} + \beta_2 LEV_{it} + \beta_3 CROSS_{it} + \\ & + \beta_4 OUTDIR_{it} + \beta_5 OUROWN_{it} + \beta_6 RETVOL_{it} + \\ & + \beta_7 HITECH_{it} + \beta_8 CASH_{it} + \varepsilon_{it}, \end{aligned} \quad (2)$$

where, for firm i and in year t , $DOCOV$ represents the D&O coverage limit scaled by lagged total assets. $SIZE$ is the natural logarithm of total assets. LEV is the debt ratio. $CROSS$ is a dummy variable that takes the value of one if the firm is cross-listed in exchanges outside of Taiwan, and zero otherwise. $OUTDIR$ is the percentage of outside director on the board. $OUTOWN$ is the percentage of common shares held by outside blockholders. $RETVOL$ is the volatility of stock returns measured by the natural logarithm of annualized variance of daily return over the current fiscal year. $HITECH$ is a dummy variable that takes the value of one if the firm is classified as a high-tech company, and zero otherwise. $CASH$ is sum of cash, cash equivalents and short term investments scaled by lagged total assets. We then obtain the measure of excess D&O insurance coverage ($EXDOCOV$) as the residual from the regression above.

2.3. Empirical specification. To test Hypothesis 1 over-investment, we estimate the following logistic regression model:

$$OVERINV_{it} = \gamma_0 + \gamma_1 EXDOCOV_{it} + \gamma_2 CEOOWN_{it} + \gamma_3 CEOOWN_{it}^2 + \gamma_4 NOBD_{it} + \gamma_5 OUTDIR_{it} + \gamma_6 GROUP_{it} + \gamma_7 INVOPP_{it} + \gamma_8 CFO + \gamma_9 CFOVOL_{it} + \gamma_{10} LEV_{it} + \gamma_{11} ROA_{it} + \gamma_{12} SIZE_{it} + \varepsilon_{it}, \quad (3)$$

where, for firm *i* and in year *t*:

<i>OVERINV</i>	=	indicator variable set equal to one if firms with positive residuals (estimated by using expected investment model of Richardson, 2006) and zero for otherwise;
<i>EXDOCOV</i>	=	excess D&O insurance coverage;
<i>CEOOWN</i>	=	percentage of outstanding common stock held by CEO;
<i>CEOOWN</i> ²	=	square of <i>CEOOWN</i> ;
<i>NOBD</i>	=	number of directors on the board;
<i>OUTDIR</i>	=	percentage of outside directors on the board;
<i>GROUP</i>	=	indicator variable set equal to one if parent company is a conglomerate (business group) and zero for otherwise;
<i>INVOPP</i>	=	capital expenditure scaled by lagged total assets;
<i>CFO</i>	=	operating cash flows divided by lagged total assets;
<i>CFOVOL</i>	=	standard deviation of operating cash flows;
<i>LEV</i>	=	ratio of total debt to the book value of total assets;
<i>ROA</i>	=	return on assets, measured as earnings divided by lagged total assets;
<i>SIZE</i>	=	natural logarithm of the book value of total assets;

To explore Hypothesis 2 whether over-investing firms with excess D&O insurance coverage exhibits a poor future performance, we run the following regressions:

$$NTQ_{it+1} = \theta_0 + \theta_1 OVERINV_{it} + \theta_2 EXDOCOV_{it} + \theta_3 EXDOCOV_{it} * OVERINV_{it} + \theta_4 FAM_{it} + \theta_5 NOBD_{it} + \theta_6 INST_{it} + \theta_7 INVOPP_{it} + \theta_8 RETVOL_{it} + \theta_9 LEV_{it} + \theta_{10} SIZE_{it} + \theta_{11} AGE_{it} + \varepsilon_{it}, \quad (4)$$

where, for firm *i* and in year *t*:

<i>NTQ</i>	=	next year's Tobin's Q calculated as market value of equity plus the book value of debt, divided by the book of total assets;
<i>FAM</i>	=	indicator variable set equal to one if the dominant shareholder is a family, and zero otherwise.
<i>INST</i>	=	percentage of outstanding shares held by institutional investors;
<i>AGE</i>	=	number of years since the firm's inception.

The variable definitions of *EXDOCOV*, *OVERINV*, *NOBD*, *INVOPP*, *LEV*, and *SIZE* are defined the same as in equation (2) and (3).

3. Data sample and empirical results

3.1. Sample. The initial sample for this study consists of all firms listed on the Taiwan Stock Exchange. Because the insurance data had not been officially and fully disclosed until 2008, the sample period runs from 2008 to 2010. We obtain the insurance data from Taiwan Economics Journal (TEJ) database. The financial accounting data, corporate governance data, and stock price data are also drawn from the TEJ database. Table 1 summarizes our sample selection procedure. As outlined in Table 1, we indentify a total of 1.365 firms (4,086 firm-years) over the period of 2008-2010. We delete 51 firms (153 firm-years) in financial institutions and regulated utilities from the sample to avoid the confounding effects of regulation. We then remove 2,038 firm-years of 607 firms without details on D&O coverage. We

also delete 120 firms-years of 45 firms with insufficient data to estimate over-investment and excess D&O liability coverage, and compute a set of control variables. Finally, to mitigate the effect of outliers, we winsorize observations that fall in the top 1% and bottom 1% of the empirical distribution for each variable. The final sample is comprised of 662 firms with 1.775 firm-year observations; 543 in 2008, 603 in 2009 and 629 in 2010¹.

Table 1. Sample selection criteria

	Number of firms	Number of firm-years
Initial sample in Taiwan Stock Exchange during 2008-2010	1.365	4.086
Less:		
Firms in financial services and regulated industries	(51)	(153)
Firms without D&O insurance	(607)	(2.038)
Firms with insufficient data for over-investment and excess liability coverage calculation, and missing control variable data	(45)	(120)
Final sample	662	1.775

3.2. Descriptive statistics. Table 2 outlines the descriptive statistics of the sample. Panel A of

¹ As we examine the effect of excess D&O insurance on the subsequent performance of over-investment, the sample period is restricted to 2008-2009 and sample size is reduced to 1.146 firm-years.

Table 2 shows that about half of the sample firms (51%) have over-investment during the sample period. The average (median) D&O coverage limit is \$268 million (\$160 million), and the mean (median) excess D&O coverage (*EXDOCOV*) is -0.001 (-0.013). In addition, Panel B of Table 2 indicates that the mean (median) subsequent Tobin's Q (*NTQ*) is 1.608 (1.365).

Table 2. Summary statistics

This Table reports descriptive statistics of the variables used in the analyses. *OVERINV* is an indicator variable equal to one if the firm's with positive residuals (estimated by using Richardson's (2006) investment model) and zero otherwise. *DOCOV* is D&O coverage limits scaled by lagged total assets. D&O coverage is D&O insurance coverage limits at the end of the fiscal year (in \$ millions). *EXDOCOV* is the residual derived from the regression of D&O insurance coverage on determinants of D&O insurance. *CEOOWN* is the percentage of CEO stock ownership. *NOBD* is the total number of directors on the board. *OUTDIR* is the percentage of outside directors that sit on the board. *GROUP* is an indicator variable equal to one if parent company is a group company and zero for otherwise. *INVOPP* is capital expenditure scaled by lagged total assets. *CFO* is operating cash flow scaled by lagged total assets. *CFOVOL* is the standard deviation of operating cash flows. *LEV* is the ratio of total debt to total assets. *ROA* is earnings before extraordinary items divided by lagged total assets. *SIZE* is the natural log of total assets. *NTQ* is the sum of market value of equity and the book value of debt scaled by the book value of total assets at $t + 1$. *FAM* is an indicator variable equal to one if the founding family is presence in the firm and zero for otherwise. *INST* is the percentage of stock held by institutional investors. *RETVOL* is the volatility of stock returns calculated as the natural logarithm of annualized variance of daily return over the current fiscal year. *AGE* is the number of year since first date of incorporation.

Panel A: Descriptive statistics for the analysis of over-investment ($n = 1.775$)					
Variables	Mean	Standard deviation	First quartile	Median	Third quartile
<i>OVERINV</i>	0.509	0.500	0.000	1.000	1.000
<i>DOCOV</i>	0.075	0.093	0.019	0.044	0.092
D&O coverage (m \$)	268.000	386.000	95.800	160.000	320.000
<i>EXDOCOV</i>	-0.001	0.074	-0.041	-0.013	0.019
<i>CEOOWN</i>	0.019	0.024	0.002	0.009	0.026
<i>NOBD</i>	6.824	1.804	5.000	7.000	7.000
<i>OUTDIR</i>	0.428	0.203	0.286	0.429	0.571
<i>GROUP</i>	0.602	0.490	0.000	1.000	1.000
<i>INVOPP</i>	0.026	0.058	0.002	0.008	0.031
<i>CFO</i>	0.074	0.116	0.010	0.068	0.141
<i>CFOVOL</i>	0.607	4.719	0.317	0.642	1.277
<i>LEV</i>	0.352	0.171	0.218	0.337	0.458
<i>ROA</i>	0.039	0.111	0.001	0.046	0.100
<i>SIZE</i>	15.257	1.436	14.252	15.096	16.032
Panel B: Descriptive statistics for the analysis of future performance ($n = 1.146$)					
<i>NTQ</i>	1.608	0.809	1.095	1.365	1.832
<i>OVERINV</i>	0.535	0.499	0.000	1.000	1.000
<i>EXDOCOV</i>	-0.001	0.074	-0.041	-0.011	0.020
<i>FAM</i>	0.580	0.494	0.000	1.000	1.000
<i>NOBD</i>	6.818	1.810	5.000	7.000	7.000
<i>INST</i>	0.358	0.218	0.175	0.324	0.513
<i>INVOPP</i>	0.023	0.052	0.001	0.007	0.028
<i>RETVOL</i>	0.001	0.000	0.001	0.001	0.001
<i>LEV</i>	0.354	0.173	0.216	0.341	0.464
<i>SIZE</i>	15.248	1.448	14.224	15.086	16.030
<i>AGE</i>	22.437	10.842	13.000	20.000	29.000

3.3. Primary results. **3.3.1. Excess D&O insurance coverage and over-investment.** We conduct logistic regression to investigate whether excess D&O insurance coverage increases the likelihood of over-investment. Table 3 presents the results for logistic regression. In the Table, we report z -values that computed using standard errors adjusted for clustering

at firm level. As shown in Table 3, the coefficient on *EXDOCOV* is highly significant with the expected positive sign at less than the 1% level. The finding strongly supports our first hypothesis that, ceteris paribus, firms with excess D&O coverage result in opportunistic managers to undertake excessive investments for personal benefits.

Table 3. Excess D&O insurance coverage and over-investment

This Table reports the results of logistic regression of over-investment on excess D&O liability coverage and control variables. All variables definition see in Table 2. Year and industry fixed effects are included but not reported for brevity. *z*-statistics, based on robust standard errors with firm-level clustering, are given in parentheses. *, **, ***: statistically significantly different from zero at the 10%, 5%, and 1% level (two-tailed), respectively.

Variables	Predicted sign	Dependent variable: <i>OVERINV</i>	
		Coefficient	(<i>z</i> -statistic)
<i>EXDOCOV</i>	+	3.238***	(4.28)
<i>CEOOWN</i>	+	9.485	(1.35)
<i>CEOOWN</i> ²	-	-63.820	(-0.83)
<i>NOBD</i>	+	-0.054	(-1.36)
<i>OUTDIR</i>	+	0.182	(0.56)
<i>GROUP</i>	+	0.287**	(2.07)
<i>INVOPP</i>	+	17.076***	(8.66)
<i>CFO</i>	+	1.765***	(3.25)
<i>CFOVOL</i>	-	0.014	(1.31)
<i>LEV</i>	-	-1.843***	(-4.44)
<i>ROA</i>	-	-0.322	(-0.54)
<i>SIZE</i>	-	0.123**	(2.21)
Year dummies		Included	
Industry dummies		Included	
Pseudo- <i>R</i> ²		0.132	
<i>n</i>		1.775	

3.3.2. *Future performance for over-investing firms with excess D&O insurance coverage.* Table 4 presents the OLS regression results of subsequent performance of over-investing firms with excess D&O insurance coverage. We report *t*-values that are based on standard errors adjusted for clustering at firm level. As shown, the coefficient on *EXDOCOV* is significantly negative while the coefficient on *OVERINV* is not significant negative. This is consistent with Chalmers et al. (2002) that

firms with poor future performance as managers are overly covered. In addition, the coefficient on the interaction term *OVERINV * EXDOCOV* has the expected negative sign and is significant at the 1% level, supporting the second hypothesis that, ceteris paribus, over-investing firms with abnormally high coverage have a poor subsequent performance. Therefore, managers carrying excess D&O insurance coverage will have a tendency to over-invest the projects with negative net present values.

Table 4. Future performance for over-investing firms with excess D&O insurance coverage

This Table reports the results of logistic regression of future performance on over-investment, excess D&O liability coverage, and control variables. All variables definition see Table 2. Year and industry fixed effects are included but not reported for brevity. *t*-statistics, based on robust standard errors with firm-level clustering, are given in parentheses. *, **, ***: statistically significantly different from zero at the 10%, 5%, and 1% level (two-tailed), respectively.

Variables	Predicted sign	Dependent variable: <i>NTQ</i>	
		Coefficient	(<i>t</i> -statistic)
<i>Intercept</i>	?	2.219***	(5.18)
<i>OVERINV</i>	-	-0.020	(-0.36)
<i>EXDOCOV</i>	-	-2.028***	(-3.66)
<i>OVERINV * EXDOCOV</i>	-	-2.316***	(-3.15)
<i>FAM</i>	+/-	0.349***	(7.33)
<i>NOBD</i>	-	-0.007	(-0.46)
<i>INST</i>	+	0.636***	(4.07)
<i>INVOPP</i>	+	-0.078	(-0.14)
<i>RETVOL</i>	-	-320.175***	(-4.40)
<i>LEV</i>	-	-0.448**	(-2.10)
<i>SIZE</i>	-	-0.076***	(-2.69)
<i>AGE</i>	-	-0.010***	(-3.19)
Year dummies		Included	
Industry dummies		Included	
Adjusted- <i>R</i> ²		0.193	
<i>n</i>		1.146	

3.4. Robustness checks. *3.4.1. Controlling for self-selection bias.* Because our sample only included companies who purchased D&O insurance, there was a possibility of self-selection bias if certain companies tended to purchase D&O insurance. We thus run two-stage Heckman regressions to control for possible self-selection bias (Heckman, 1979). In the first regression, the dependent variable, *PURCHASE*, is a dummy variable if the company purchases D&O insurance, and zero otherwise. Following prior research (Core, 1997; O'Sullivan, 2002; Chung and Wynn, 2008), explanatory variables include firm size (*SIZE*), dummy for cross-listed status

(*CROSS*), market to book ratio (*MB*), dummy for membership in high-tech industry (*HITECH*), debt ratio (*LEV*), dummy for increase in the book value of total assets (*ACQUIRER*)¹, dummy for decrease in the book value of total assets (*DIVESTOR*)², CEO ownership measured by the percentage of common shares held by the CEO (*CEOOWN*), outside blockholders' ownership (*OUTOWN*), and excess cash (*EXCAS*)³. The first stage regression is based on the entire sample of 3,933 observations (excluding financial and utility firms and missing data), of which 2,038 observations do not purchase D&O insurance (51.82%).

$$PURCHASE_{it} = \eta_0 + \eta_1 SIZE_{it} + \eta_2 CROSS_{it} + \eta_3 MB_{it} + \eta_4 HITECH_{it} + \eta_5 LEV_{it} + \eta_6 ACQUIRER_{it} + \eta_7 DIVESTOR + \eta_8 CEOOWN_{it} + \eta_9 OUTOWN_{it} + \eta_{10} EXCASH_{it} + \varepsilon_{it}. \quad (6)$$

We estimate the Inverse Mills ratio (*Lamda*) from equation (6)⁴ and then test our hypothesis by including *Lamda* in equations (3) and (4). Untabulated results show that the coefficients for *EXDOCOV* and *EXDOCOV * OVERINV* remain significant with the expected positive and negative signs respectively.

results show that our primary result is robust to this alternative proxy.

Conclusion

3.4.2. Controlling for endogeneity. A potential bias for our finding is that the excess D&O liability insurance coverage and over investment may be endogenously determined. For example, firms with extensive capital investment activity may be the reason for carry high insurance coverage. That is, firms determine to carry high liability coverage based on the extent of investment. We examine this issue by adopting a simultaneous equation analysis (2SLS). We replace the excess coverage variable, *EXDOCOV* with *HIDOCOV*. *HIDOCOV* is a dummy variable set to one if the fitted value of coverage limits is greater or equal to its median, and zero otherwise. Untabulated results show that our results are not driven by endogeneity problem associated with D&O liability coverage.

Managerial legal liability coverage shields directors and officers from lawsuits by shareholders (and other parties) when their decisions are made on the behalf of the firm. Several existing studies suggest that legal liability coverage plays a governance monitoring device since an insurer thoroughly scrutinizes the insured (Holderness, 1990; Core, 2000). However, prior research generally suggests that the existence of managerial legal liability coverage could cause moral hazard among directors and officers and thus provides them with incentives to undertake value-destroying decisions (Chalmers et al., 2002; Chung and Wynn, 2008; Wynn, 2008; Lin et al., 2011). We extend this research by examining how abnormally high level of D&O insurance coverage affects a firm's investment efficiency.

3.4.3. Alternative over-investment measure. As in prior analyses, we measure over-investment using the expect investment model of Richardson (2006) and create a dummy variable. As a robustness check, we follow prior research (e.g., Malmendier and Tate, 2005; Biddle et al., 2009) and use capital investment to measure over-investment, which is measured as the ratio of the net increase in fixed asset investment over a particular year scaled by the total fixed at the beginning of that year. We use this new dependent variable and conduct OLS regression. Untabulated

Using the sample of Taiwanese listed firms, which carry D&O insurance coverage during the period 2008-2010, we provide evidence that firms with higher legal liability coverage, as measured by excess D&O insurance, are more prone to over-invest. We also find that over-investing firms with excess D&O insurance coverage appear to have poor investment decisions that result in inferior subsequent operating performance. We further find that managers covered by excess D&O insurance tend to make more R&D investment projects. That is, those managers become less risk averse and hide their opportunism and poor talent. Our main results are also robust to a series of robustness checks.

¹ *ACQUIRER* takes the value of one if the book value of total assets at the fiscal year-end increases by more than 25% from the beginning of the fiscal year, and zero otherwise.

² *DIVESTOR* takes the value of one if the book value of total assets at the fiscal year-end decrease by more than 25% from the beginning of the fiscal year, and zero otherwise.

³ Following Wynn (2008), the excess cash, *EXCASH*, is the residual derived from the regression of cash on determinants of cash holding which including firm size, growth opportunities, cash flows, financial distress, net working capital, governance quality, cross-listing status, volatility of stock returns, a membership in high-tech industry, and D&O coverage limits.

⁴ The inverse Mills ratio, calculated from the probit model, equals the probability density function divided by the cumulative density function.

In sum, our results are consistent with the argument that the agency conflicts and moral hazard problems are aggravated by excess coverage which provides the directors and managers with more room to pursue private/personal benefits via inefficient investments decisions. Our study also complements existing literature (e.g., Lin et al., 2011) which documents that managers who are protected from D&O insurance make poor merger and acquirers (M&A) decisions.

A potential limitation of this paper lies in the measures of excess litigation coverage and over-investment by the firm. In particular, the validity of our findings is subject to the condition that our measures of excess D&O insurance coverage and over-investment reasonably capture opportunistic incentives and avenue of pursuing personal benefits. Thus, potentially fruitful areas of further research may include refinement of existing methods for measuring excess D&O insurance coverage and over-investment.

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