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DIRECTORS' AND OFFICERS' LIABILITY INSURANCE AND FIRM VALUE

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ABSTRACT

This study examines the effect of directors' and officers' liability (D&O) insurance on firm value. Previous studies are divided on the value implication of D&O insurance: some argue for various benefits of being covered by D&O insurance, whereas others focus on the managerial opportunism stemming from being insured. In order to address whether D&O insurance increases firm value, we utilize a sample of quoted Korean companies from a period in which the disclosure of D&O insurance information was mandatory and there was a significant cross-sectional variation in the firms' coverage of D&O insurance. We find that controlling for the endogeneity of D&O insurance coverage, D&O insurance increases firm value compared to noninsured firms. We also find evidence that the increase in firm value is pronounced for firms with greater growth opportunities, which suggests that D&O insurance can help firms to better convert growth opportunities into higher firm value.

We examine the effects of directors' and officers' liability insurance (hereafter referred to as "D&O insurance") on firm value. D&O insurance covers corporate directors and officers against claims arising from their activities as representatives of the firm. Being covered by D&O insurance can affect the incentives of directors and managers, and these incentives can in turn affect corporate decision making and consequently firm value. Although earlier studies have argued for the different benefits of D&O insurance to the insured company (Mayers and Smith, 1982; Holderness, 1990; Core, 1997, Zou and Adams, 2008), recent studies stress the agency cost stemming from having D&O insurance (Chalmers, Dann, and Harford, 2002; Lin, Officer, and Zou, 2011; Chen, Li, and Zou, 2015). Considering that the empirical evidence so far does not provide a clear answer to whether D&O insurance acts as a value-adding or a

-destroying mechanism to the company, we explore how D&O insurance affects future firm value by using a unique sample of D&O insurance data.

When firms are faced with lawsuits, many of them, typically under an indemnification arrangement, reimburse directors, and officers for the costs of lawsuits. D&O insurance in turn reimburses the firm for these costs. Therefore, a firm purchases D&O insurance in order to cover directors and managers for legal liability on behalf of the company. D&O insurance usually provides both corporate and personal coverage. Corporate coverage reimburses the firm when the firm indemnifies directors or officers for the costs of a suit. Personal coverage provides direct payment to directors or officers when the firm is not able to indemnify them for legal reasons or because of financial distress.[1] Typically, D&O insurers will pay the claim as long as directors and officers have acted in good faith (Ferris et al., 2007).[2] Therefore, as D&O insurance can change the liability risk of managers and directors, D&O insurance can affect their behaviors in corporate decision making.

Studies are divided between documenting the positive side of D&O insurance and the negative side thereof. On the positive side, studies argue that D&O insurance can provide various benefits to the insured company. For example, D&O insurers can provide valuable monitoring services to the firm, such as scrutinizing the firm's governance structure during the underwriting process (Bhagat, Brickley, and Coles, 1987; Holderness, 1990; O'Sullivan, 1997; Core, 2000), have a comparative advantage in providing claims adjudication or settlement services to the firm (Mayers and Smith, 1982), help attract competent and talented directors and officers and reduce the compensation necessary for these people if D&O insurance serves as a substitute of conventional form of compensation (Mayers and Smith, 1982),[3] and lower the firm's likelihood of bankruptcy (Core, 1997; Zou and Adams, 2008). Another potential benefit that has not been addressed in the literature is the possibility that D&O insurance can alleviate the risk averseness of decision makers. If a firm is covered by D&O insurance, directors and officers can become less risk averse and less likely to reject risky but value-adding projects. This aspect of D&O insurance implies that the insurance will be more beneficial to firms with greater investment opportunities.

As for the negative side of D&O insurance, studies that examine the factors of D&O insurance coverage decision find results that are generally consistent with the managerial opportunism argument. As the purchase of the insurance typically does not need shareholder approval, directors and officers can purchase D&O insurance in order to serve their own interests. Core (1997) finds that for Canadian firms, corporate

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[1]More specifically, a typical D&O insurance policy (1) provides litigation costs for claims made against individual directors and officers for their wrongful acts to the extent which indemnification does not apply (personal coverage or "A-Side Coverage"), (2) reimburses the firm for its indemnification payments (corporate reimbursement coverage or "B-Side Coverage"), and (3) provides optional coverage for the corporation's own liability (entity securities coverage or "Insuring Agreement C").

[2]In many cases, litigations are settled without trial, and directors and officers are presumed to have upheld their fiduciary duty as long as they do not admit to bad faith.

[3]However, Core (1997) finds no empirical support for this hypothesis.

governance and managerial entrenchment affect the decision to purchase D&O insurance. Specifically, firms with greater insider voting control are more likely to purchase D&O insurance and carry higher coverage. Core (2000) observes that these firms also pay higher insurance premiums. According to Zou et al. (2008), the demand for D&O insurance in China has a positive relationship with respect to the degree of conflict between controlling shareholders and minority shareholders, which suggests that D&O insurance is used to protect controlling shareholders and their agents (directors and managers) against the litigation risks arising from the expropriation of minority interests. Boyer and Stern (2012) find that at the time of an IPO for Canadian firms, income trusts pay more for the same D&O insurance coverage than common equity firms. They argue that because income trusts have a more opaque governance structure, the higher D&O insurance premium for income trusts reflects their litigation and governance risks. In a recent study, Boyer and Tennyson (2015) estimate the determinants and effects of D&O insurance for firms in Canada and show that greater D&O insurance coverage leads to more aggressive earnings management, which is consistent with moral hazard argument.

The aforementioned evidence so far suggests that the value implication of D&O insurance is unclear.[4] There are some studies that examine how D&O insurance affects outcomes of certain corporate events. For example, Lin, Officer, and Zou (2011) examine the effect of D&O insurance on the outcomes of mergers and acquisitions (M&A) decisions in Canada and find that acquirers with higher levels of D&O insurance coverage experience lower announcement-period stock returns, pay higher acquisition premiums, and exhibit lower synergies. Chalmers, Dann, and Harford (2002) use a proprietary data of 72 IPO firms and find that firms with greater coverage of D&O insurance have worse 3-year post-IPO stock returns. The general theme of these studies is that considering that D&O insurance insulates directors and officers from the cost of litigation, these people are more likely to act in a self-interested and opportunistic manner. Although these studies examine the effects of D&O insurance coverage, the analyses are limited to certain corporate events, such as M&A and IPO, during which the likelihood of litigation is high. Another study that provides a value implication of D&O insurance is the study by Bhagat, Brickley, and Coles (1987), who report a *positive* stock price response to a relatively small sample of 25 New York firms around the announcement of a D&O insurance purchase. Overall, previous literature does not provide a definitive answer to the effect of D&O insurance on firm value. This study contributes to the literature by directly examining the relationship between D&O insurance and firm value using a large sample of D&O insurance data.

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[4]For example, Lin et al. (2011, p. 508) notes "... while our study identifies one potential cost of D&O insurance in the M&A setting, it cannot address whether D&O insurance unambiguously increases or decreases firm value." Other related studies find insignificant results with respect to the changes in director liability. Janjigian and Bolster (1990) study the impact of Delaware's decision to allow companies to eliminate director liability and find no significant difference between the performance of firms in Delaware and other states. Brook and Rao (1994) examine the effect of the firm's adoption of provisions aimed at limiting director liability and find insignificant stock price reactions. These studies suggest that there must be both benefits and costs to the changes in directors' liability coverage.

The data that we use to test the effect of D&O insurance on firm value come from the Korean D&O insurance market. Korea provides an ideal opportunity to examine our research question because (1) firms were required to disclose the details of their D&O insurance policies in their annual reports in the sample period 2002–2008 and (2) there was a significant cross-sectional variation in the firms' decision to have D&O insurance coverage during the sample period. These features are in contrast to the environment in the United States, as firms in the United States are not required to disclose information on D&O insurance, including the coverage amount or the insurance premium.[5] The typical source of D&O insurance data for firms in the United States is the survey of Tillinghast-Towers Perrin.[6] However, relying on the survey data invokes concerns over the sample selection bias toward large firms. On the other hand, because Korean firms were required to disclose their D&O insurance purchase data during our sample period, we are able to study the determinants and the effects of D&O insurance without worrying about the sample selection bias of the survey data. Likewise, some studies (e.g., Core, 1997, 2000; Chung and Wynn, 2008; Wynn, 2008; Lin, Officer, and Zou, 2011; Boyer and Stern, 2012; Boyer and Tennyson, 2015) rely on Canadian data because following the 1992 Dey Report, firms needed to disclose information on D&O insurance purchases in their annual proxy statements. However, a limitation of using firms in Canada (as well as in the United States) for recent time periods is that almost all firms are covered by D&O insurance. For this reason, many studies of D&O insurance using Canadian data rely on the coverage amount or the insurance premium information instead of analyzing the effect of the binary decision of carrying D&O insurance.[7] The research setting provided by our sample in terms of the mandatory disclosure requirement of D&O insurance policies and a significant cross-sectional variation in the firm's decision to have D&O insurance coverage, makes our empirical analyses a meaningful contribution to the study of D&O insurance.[8]

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[5]In general, firms also do not disclose this information voluntarily through 13K filings or through the IPO prospectus.

[6]These surveys are now conducted by Towers Watson. Another way of conducting a study of D&O insurance is utilizing a proprietary set of data, such as Chalmers, Dann, and Harford (2002), who use proprietary information on 72 IPO firms in the United States.

[7]There are some exceptions. Core (1997) examines the decision to purchase D&O insurance in Canada during the period of 1993 and 1994. The analysis was possible because the proportion of firms carrying D&O insurance in their sample of firms at that time was 63 percent. Boyer and Tennyson (2015) utilize panel data with the time period of 1996–2005 for Canadian firms, during which 74 percent of firms carried D&O insurance. Boyer and Tennyson (2015) use the D&O insurance ownership variable to examine the determinants of insurance ownership and to estimate effects of D&O insurance on board characteristics and abnormal accruals.

[8]A by-product of our research setting is that our sample is much larger than other studies on D&O insurance; we use 512 firms or 2,571 firm-year observations (814 firm-years with D&O insurance and 1,757 firm-years without D&O insurance). By comparison, Core (1997) uses a data set of 222 firms in Canada, O'Sullivan (1997) uses a sample of 366 companies in the United Kingdom, Chalmers, Dann, and Harford (2002) use proprietary data on 72 IPO firms in the United States, Zou et al. (2008) use 53 approvals of D&O insurance purchases for firms in China, and Boyer and Tennyson (2015) use 189 firms (1,524 firm-year observations) in Canada.

Our empirical analyses are categorized into two parts. In order to examine the relationship between D&O insurance and firm value, we need to account for the possibility that firms with D&O insurance have firm-specific characteristics that affect both the decision to obtain D&O insurance coverage and firm value. To this end, we first study the determinants of D&O insurance of our sample of firms. This process also serves the purpose of examining whether the determinants of D&O insurance in Korea, which is under a civil law jurisdiction, are different from the previous studies that examine firms from a common law jurisdiction. As studies in law and finance find that the legal origin of the country can have a varying impact on corporate decision making (e.g., La Porta et al., 2000, 2002), we make an additional contribution to the literature by analyzing the D&O insurance choice in a civil-law-based country.[9]

In the second part of our analyses, we explore the relationship between having D&O insurance coverage and firm value. We follow the convention in the literature and use Tobin's Q, defined as the market value of equity plus the book value of debt divided by total assets, to measure the firm's market valuation.[10] To control for the endogeneity of D&O insurance decision, we use the treatment effect model as our baseline model and then employ the dynamic panel data model, which accounts for the time-series pattern in Tobin's Q. We observe that for both models, firms that have D&O insurance experience higher market value. We also find that the value-increasing effect of D&O insurance is more pronounced when firms enjoy high growth. This result hints at a channel by which D&O insurance can engender a value-increasing effect: D&O insurance may alleviate the underinvestment problem by making firms behave in a less risk averse manner in high-growth firms.

The article is organized as follows. In the "D&O insurance in Korea and Descriptive Statistics" section, we describe the D&O insurance market in Korea and report the descriptive statistics of our sample firms. In the "Determinants of D&O Insurance" section, we examine the determinants of D&O insurance coverage. In the "D&O Insurance and Firm Value" section, we explore the effect of D&O insurance coverage on future firm value. We provide our concluding remarks in the "Concluding Remarks" section.

D&O Insurance in Korea and Descriptive Statistics

The sample of firms in our study comes from the companies listed on the Korea Stock Exchange, the data of which are available on the Korea Listed Companies Association

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[9]One study that investigates D&O insurance in a civil law environment is Zou et al. (2008), who examine the demand for D&O insurance by Chinese listed companies. However, their study only looks at the determinants of D&O insurance demand and does not examine the effect of D&O insurance on firm value. Other limitations of the study are that the data used in the study come from the shareholders' approval of D&O insurance purchase rather than the actual purchase data, and that it has a relatively small sample size of 53 firms that had D&O insurance approvals in the shareholders' meeting.

[10]Examples of studies that use Tobin's Q to measure the firm's market value are Morck, Shleifer, and Vishny (1988), Servaes (1996), Yermack (1996), Cummins, Lewis, and Wei (2006), and Jin and Jorion (2006).

database. Our sample period is between 2002 and 2008. The starting year of 2002 is selected because many firms decided to have D&O insurance coverage subsequent to the Asian financial crisis in the late 1990s when it became easier for shareholders to file lawsuits. One highly publicized incidence that sparked companies' interest in D&O insurance was when 294 minority shareholders filed the lawsuit of Korea Mobile Telecommunications Services Corporation (currently SK Telecom) in 1999 claiming KRW 47.96 billion (approx. US 4.57 million) in compensation, alleging that the company sold off their subsidiaries at unfair prices. We employ a cutoff point of 2008 because the disclosure of D&O insurance coverage was mandatory in Korea until 2008. From the initial sample of firms that are listed on the Korea Stock Exchange during our sample period of 2002–2008, we require that (1) the company has a fiscal year-end of December 31 and (2) the firm does not belong in the financial industry because of accounting differences and because many of financial firms do not perform R&D investment, which is one of our explanatory variables of firm value. We collect stock price information from the Dataguide of FnGuide and balance sheet items from the TS-2000 of Korea Listed Companies Association (KLCA). We hand-collect the variables related to D&O insurance from each company's annual reports on Data Analysis, Retrieval and Transfer System in the Financial Supervisory Service (http://dart.fss.or.kr).

The specific terms of D&O insurance in Korea are similar to those in the United States, and many contracts are underwritten by the U.S. insurers. A few minor differences in the provisions of a typical D&O insurance contract is as follows: (1) the "Excess Side A" coverage, which provides additional coverage to directors and officers for lawsuits in which a firm does not provide indemnification, such as lawsuits involving environmental pollution and lawsuits related to Employee Retirement Income Security Act, is typically not included in D&O insurance in Korea, and (2) the severability clause, which separates the contract's valid parts or people that remain effective and enforceable from those which are declared void or innocent by the court, is applied to a smaller number of cases in Korea than in the United States.[11]

The major difference in the D&O insurance market in Korea compared to the United States is that the market is relatively young in Korea, as insurance coverage for corporate directors and officers first became available in 1991, which was underwritten by AIG (Yook, 2010). At the time, although corporations were not permitted to indemnify their directors and officers for legal costs, directors and officers did not perceive great litigation risk, and the market for D&O insurance coverage remained insignificant. The earliest known shareholder lawsuits were brought up by PSPD in 1997 against Korea First Bank and in 1998 against Samsung Electronics (Kim, 2006; Black, Cheffins, and Klausner, 2011). After the Asian financial crisis of 1997–1998, Korea introduced various reforms that facilitated shareholder lawsuits. Examples of such reforms in Korea include introducing fiduciary roles for company directors, reducing the shareholding requirements for initiating a

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[11]The severability clause is typically included in a D&O insurance contract in order to protect directors or officers who have not taken part in the wrongful act (e.g., misrepresentation or omission of a material fact) alleged in the lawsuits.

derivative suit, and lowering the shareholding requirements in order to access company records.[12] In 2004, Korea enacted the Securities Class Action Act of 2004, under which the class action procedure became available for small shareholders of large companies (asset size greater than KRW 2 trillion) beginning in 2005, and for all public companies from 2007.[13] With the increasing number of claims against corporations, along with the threat that directors and officers themselves could face significant personal liability, D&O insurance has become a crucial source of protection for directors and officers. Table 1 shows that in response to these changes in the litigation environment, there has been a steady increase in the demand for D&O insurance during the sample period. Table 1 shows that on average, 31.7 percent of the sample firms are covered by D&O insurance. This is in contrast to more than 90 percent of firms that are covered by D&O insurance in the United States, according to a survey by Tillinghast-Towers (2002). Therefore, the Korean market provides us with a nice environment to examine the effect of D&O insurance due to the cross-sectional divide between firms that are covered by D&O insurance and firms that are not.

Whereas numbers in Table 1 represent the numbers of firm-year observations, which total 2,571 firm-year observations, our sample includes 512 firms in total. Among these, 314 firms (61.3 percent) never had D&O insurance during the sample period, 140 firms (27.3 percent) had D&O insurance during the entire time they appeared in

TABLE 1
Trend of Firms With D&O Insurance

Year	Firms With D&O Insurance	Firms Without D&O Insurance	Total Number of Firms	Proportion of Firms With D&O Insurance
2002	80	230	310	0.258
2003	85	244	329	0.258
2004	103	248	351	0.293
2005	119	255	374	0.318
2006	130	258	388	0.335
2007	146	263	409	0.357
2008	151	259	410	0.368
Total	814	1,757	2,571	0.317

Note: This table shows the trend of variables related to D&O insurance within our sample period of 2002–2008. The sample of firms in our study comes from the companies listed on the Korea Stock Exchange, the data of which are available on the Korea Listed Companies Association database. We require that (1) the company has a fiscal year-end of December 31 and (2) the firm does not belong in the financial industry. Information on D&O insurance is collected from each company's annual reports on Data Analysis, Retrieval, and Transfer System in the Financial Supervisory Service (http://dart.fss.or.kr). Numbers represent the numbers of firm-year observations.

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[12]For more information, refer to Black, Cheffins, and Klausner (2011).
[13]We control for this event in our analyses of D&O insurance.

our sample period, and 58 firms (11.3 percent) changed their insurance status during the sample period. Among the 58 firms that show changes in their insurance coverage, 54 of these firms (10.5 percent) went from having no coverage to carrying insurance, 12 of these firms (2.3 percent) went from having insurance to dropping coverage thereof, and 8 of them (1.6 percent) incurred multiple status changes (3 of them experienced coverage, then no coverage, then coverage; 5 of them had no coverage, then coverage, then no coverage). Overall, our sample shows little change in D&O insurance status within firms, as 88.7 percent of firms do not experience change in their D&O insurance status during our sample period.

Table 2 illustrates the trend in the D&O coverage amount and D&O premium, both of which are adjusted for inflation using the GDP deflator. An upward trend is evident for the mean coverage amount. The mean coverage amount is KRW 12,672,581,000, or approximately US$12.07 million.[14] This coverage amount is about one-third of the mean coverage amount for firms surveyed in the United States and about twice the

TABLE 2
Trend of D&O Insurance Information

Year		Insurance Coverage Amount	Coverage Amount/Lagged Asset Size (%)	Insurance Premium	Premium/Lagged Asset Size (%)	Coverage Amount/ Insurance Premium
2002	Mean	8,462,983	1.114	185,859	0.019	123.62
	Median	5,364,807	0.778	105,384	0.013	45.68
2003	Mean	8,392,890	1.126	197,670	0.019	133.05
	Median	5,192,108	0.688	84,112	0.012	39.39
2004	Mean	10,368,033	1.442	189,282	0.020	131.62
	Median	5,030,181	0.753	76,459	0.012	63.29
2005	Mean	11,721,008	1.074	187,844	0.015	115.92
	Median	5,000,000	0.629	75,830	0.010	73.60
2006	Mean	14,717,025	1.528	201,039	0.015	147.61
	Median	5,005,005	0.819	64,833	0.008	87.31
2007	Mean	15,213,008	1.860	173,123	0.011	203.77
	Median	7,360,157	0.838	46,761	0.007	121.95
2008	Mean	15,417,395	1.465	153,098	0.010	241.11
	Median	9,532,889	0.725	40,295	0.005	144.62
Total	Mean	12,672,581	1.416	181,879	0.015	164.39
	Median	5,030,181	0.748	62,897	0.009	83.05

Note: This table shows the trend of variables related to D&O insurance within our sample period of 2002–2008. Variables on D&O insurance are collected from each company's annual reports on Data Analysis, Retrieval, and Transfer System in the Financial Supervisory Service (http://dart.fss.or.kr). D&O insurance coverage amount and D&O insurance premium are in thousand Korean won. All numbers are adjusted for inflation using the GDP deflator of which 2005 is the base year.

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[14]We assume an exchange ratio of KRW 1,050 per U.S. dollar.

coverage amount for IPO firms in the United States.[15] If we normalize the coverage amount by the lagged asset size of the firm, we observe a slight upward trend for the mean ratio of the coverage amount to the lagged asset. We also observe a large clustering of the raw coverage amount (when unadjusted for inflation) at KRW 5 billion and 10 billion. The increasing trend in the coverage amount reflects the need for firms to have higher coverage in response to the changes in the litigation environment over time, especially after 2005 when the class action procedure became available for small shareholders of large companies.

As for the insurance premium, the mean (median) premium is KRW 181,879,000 (KRW 62,897,000), which is approximately US$173,218 (US$56,902). These are smaller than the corresponding figures in the United States and Canada. By comparison, Cao and Narayanamoorthy (2014) find that in the United States, the mean (median) premium is US$480,000 (US$390,000). In Canada, Chung and Wynn (2008) report a mean (median) premium of C$330,000 (C$80,000). We observe a downward trend in the median insurance premium over our sample period. Once we normalize the premium amount by the lagged asset size of the firm, the downward trend in this ratio is evident for both the mean and the median values of the ratio. Various sources of Korean financial press cite the following reasons for the decline in insurance premiums. In the earlier part of our sample period, the highly publicized governance problems of Korean firms in the aftermath of the Asian financial crisis influenced the high insurance premium priced by D&O insurers, most of whom were U.S. insurers. This concern gradually dissipated over time as governance issues improved for Korean firms. And as domestic insurers started providing D&O insurance, the increase in market competition in the D&O insurance market contributed to the decline in insurance premiums.

For our sample firms, D&O insurance provides coverage of 164.39 (median of 83.05) times the premium amount. This number is smaller than the corresponding figure in Canada, as Chung and Wynn (2008) report the mean (median) coverage-to-premium ratio as 657 (260).[16] The reciprocal of the coverage-to-premium ratio is the unit price of D&O insurance for its coverage, or "rate-on-line" in the language of insurance underwriters. In our sample of firms, the mean (median) rate-on-line is 0.6 (1.2) cents.

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[15]Cao and Narayanamoorthy (2014) find that according to the Tillinghast's D&O Insurance Surveys of 2001 and 2002, the mean (median) coverage amount is US$37.68 million (US$20.00 million) for their sample of 297 firm-year observations. For a sample of Canadian firms, the average (median) coverage amount is C$46.5 million (C$20.0 million), according to Lin, Officer, and Zou's (2011) study of 709 completed mergers and acquisitions, and C$54 million (C$25 million) in Chung and Wynn (2008), who examine 224 firms during the period of 1998 to 2004. Chalmers, Dann, and Harford (2002) report a mean (median) coverage amount of US$6.61 million (US$5.00 million) for their sample of 72 IPO firms issued between 1992 and 1996. Care must be taken in generalizing these amounts to all firms because as previously mentioned, studies that use the survey data incur a possible sample selection bias toward large firms.

[16]The coverage-to-premium ratio of our sample firms in Korea is slightly larger than the ratio of 129 for the first (smallest) quartile of firms sorted by firm size in the sample of Canadian firms in Chung and Wynn (2008).

By comparison, Cao and Narayanamoorthy (2014) report the mean (median) rate-on-line of 2 cents in their sample of U.S. firms, and Chalmers, Dann, and Harford (2002) show a mean (median) of 4.0 (3.8) cents for the sample of IPO firms in the United States, which reflects the higher litigation risks of young IPO firms. Therefore, D&O insurance in Korea exhibits a lower premium for its coverage amount than in the United States, but a larger one compared to Canada. This difference reflects the differences in the legal environment and the likelihood of litigation in different countries. Although United States and Canada are both under a common law jurisdiction, U.S. firms face greater likelihood of litigation than Canadian firms. Insofar as the rate-on-line proxies for litigation risk, as argued by Cao and Narayanamoorthy, our results imply that the average litigation risk in Korea is between that of the United States and Canada.

We also show the D&O insurance information categorized by industry in Table 3.[17] Companies in the same industry have similar business risks, and thus, the risk of litigation and the need for D&O insurance can reveal industrywide variation. Numbers in Table 3 show that firms operating in industries of professional, scientific, and technical activities are the most likely to carry D&O insurance, whereas firms in the manufacturing industry are the least likely to have D&O insurance. Given that the manufacturing industry is the largest industry, once we examine the subcategory of manufacturing industry, we find that there is a wide variation within the manufacturing industry. For example, the manufacturing of medical, precision, and optical instruments are the most likely to have insurance (67 percent), whereas the manufacturing of rubber and plastic products is at the other extreme (16 percent). These results are consistent with the conjecture that firms in risky industries are more likely to carry D&O insurance. Numbers in Table 3 also show that firms operating in industries of professional, scientific, and technical activities also incur a large insurance premium relative to firm asset size.

Table 4 shows the descriptive statistics of the variables used in our sample. Definitions of all the variables are provided in the Appendix. The univariate analysis provides us with some simple insight regarding the differences between firms that are covered by D&O insurance and those that are not covered by the insurance. The mean difference test between the two groups of firms is based on t-statistics, and the median difference test is based on Wilcoxon statistics. With respect to the association between D&O insurance coverage and the firm's riskiness, the descriptive statistics portray conflicting results. On the one hand, firms that are insured by D&O insurance show greater R&D expenditure, which implies greater firm risk. But on the other hand, firms covered by D&O insurance are more likely to have lower stock return volatility than firms that are not covered by D&O insurance. As for the other variables, firms that are covered by D&O insurance are likely to be larger firms and firms with higher market valuation as measured by Tobin's Q, higher leverage, and higher profitability measured by ROA. While we defer the theoretical prediction and empirical relationship between these variables and the D&O insurance decision to the next

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[17]The agriculture, forestry, and fishing industry is not shown as none of the firms in that industry carried D&O insurance during our sample period.

TABLE 3
D&O Insurance Information by Industry

Industry	Number (Proportion) of Firm-Year Obs. With Insurance		Insurance Coverage Amount	Coverage Amount/ Lagged Asset Size (%)	Insurance Premium	Premium/ Lagged Asset Size (%)	Coverage Amount/ Insurance Premium
Manufacturing	552	Mean	13,204,268	1.432	190,530	0.013	165.37
	(28.29%)	Median	5,030,181	0.805	53,265	0.009	92.02
Construction	74	Mean	12,127,442	0.649	150,620	0.008	163.15
	(36.63%)	Median	9,532,889	0.523	79,827	0.006	65.78
Wholesale and retail trade	88	Mean	8,924,545	2.235	122,090	0.028	223.26
	(38.94%)	Median	5,005,005	0.970	62,031	0.015	73.10
Transportation	26	Mean	10,382,821	0.830	151,091	0.011	106.71
	(37.14%)	Median	8,427,898	0.542	89,431	0.006	53.53
Information and communications	25	Mean	28,694,923	1.525	343,440	0.016	116.83
	(54.35%)	Median	31,152,648	0.316	396,459	0.004	84.44
Professional, scientific, and technical activities	49	Mean	7,277,709	1.177	172,905	0.025	104.51
	(74.24%)	Median	5,005,005	0.905	106,957	0.021	36.10
Total	814	Mean	12,672,581	1.416	181,879	0.015	164.39
	(31.66%)	Median	5,030,181	0.748	62,897	0.009	83.05

Note: This table shows the variables related to D&O insurance for each industry within our sample period of 2002–2008. D&O insurance coverage amount and D&O insurance premium are in thousand Korean won. All numbers are adjusted for inflation using the GDP deflator of which 2005 is the base year. Agriculture, forestry, and fishing industry is not shown since none of the firms in that industry carried D&O insurance during our sample period.

TABLE 4
Summary Statistics

Variable	Firms With D&O Insurance			Firm Without D&O Insurance			All Firms			Difference in Mean	Difference in Median
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.		
Firm size	20.504	20.451	1.473	18.787	18.754	1.069	19.344	19.137	1.457	***	***
Tobin's Q	1.115	0.971	0.531	0.895	0.805	0.421	0.965	0.844	0.470	***	***
Leverage	0.497	0.516	0.197	0.449	0.442	0.213	0.464	0.463	0.209	***	***
Cash holdings	0.129	0.079	0.160	0.139	0.083	0.165	0.135	0.081	0.163		*
ROA	0.062	0.059	0.065	0.044	0.045	0.075	0.050	0.049	0.072	***	***
Stock return volatility	0.499	0.474	0.165	0.536	0.494	0.205	0.524	0.484	0.194	***	***
R&D	0.008	0.002	0.014	0.005	0.000	0.011	0.006	0.001	0.012	***	***
Stock turnover	0.011	0.007	0.015	0.019	0.008	0.030	0.017	0.007	0.027	***	***
Stock return	14.000	-0.094	64.619	7.771	-6.744	66.785	9.744	-4.774	66.158	**	***
Sales growth	0.046	0.066	0.312	0.053	0.056	0.312	0.051	0.060	0.312		*
Ratio of outside directors	0.380	0.333	0.138	0.298	0.286	0.098	0.324	0.286	0.119	***	***
Controlling shareholder ownership	14.494	8.190	16.892	24.672	24.660	18.462	21.449	20.600	18.590	***	***
Ownership disparity	23.289	21.020	20.700	16.558	8.360	19.461	18.689	11.100	20.103	***	***
Foreign shareholder ownership	18.457	11.775	19.229	7.052	0.630	12.581	10.663	2.040	15.915	***	***
Chaebol dummy	0.547	1.000	0.498	0.090	0.000	0.286	0.235	0.000	0.424	***	***
Cross-listing dummy	0.052	0.000	0.221	0.003	0.000	0.053	0.018	0.000	0.134	***	***
Big audit firm dummy	0.779	1.000	0.415	0.454	0.000	0.498	0.557	1.000	0.497	***	***
Class action act dummy	0.452	0.000	0.498	0.300	0.000	0.458	0.348	0.000	0.476	***	***

Note: This table shows the descriptive statistics of firm characteristics for the group of firms that have D&O insurance coverage versus the group of firms that do not have D&O insurance coverage. The mean difference test between the two groups is based on t-statistics. The median difference test between the groups is based on Wilcoxon statistics. Definitions of the variables are provided in the Appendix. ***, **, * denote a significant difference between the two groups of firms at the 1 percent, 5 percent, and 10 percent levels, respectively.

section, the results of the univariate tests are (with the exception of the stock return volatility variable) generally consistent with the findings in the previous literature. There are also some differences between insured firms and noninsured firms with respect to the firm governance characteristics. For example, insured firms have a greater proportion of outside directors, less controlling shareholder ownership, greater ownership disparity, and greater foreign shareholder ownership. Chaebol firms, cross-listed firms, and firms audited by auditors affiliated with the five largest auditing firms in the United States are also more likely to carry D&O insurance.[18] Overall, as firms that are covered by D&O insurance and those that are not covered by insurance show heterogeneous characteristics with respect to several dimensions, we account for these firm-specific factors in our analyses of the association between D&O insurance coverage and firm value.

DETERMINANTS OF D&O INSURANCE

The main research objective of this study is to examine how D&O insurance coverage affects firm value. However, as seen from the descriptive statistics, we observe different firm characteristics between firms that are insured by D&O insurance and those that are not insured. In order to account for the potential endogeneity of D&O insurance coverage, we first examine the factors that affect the purchase of D&O insurance through a probit regression of D&O insurance purchase.[19] This analysis also serves the purpose of discovering what factors determine the company's decision to purchase D&O insurance in a country in which the D&O insurance market history is at a relatively young stage and in which the legal origin is based on civil law.

In the multivariate analysis of the determinants of D&O insurance coverage, the dependent variable is an indicator variable with a value of one if the firm reported that it carried D&O insurance in its annual report, and zero otherwise. This specification is possible due to the mandatory disclosure requirement of D&O insurance coverage in Korea during our sample period of 2002–2008. As for the explanatory variables of D&O insurance, many of them are adopted from the studies of Core (1997), O'Sullivan (1997), Zou et al. (2008), and Boyer and Tennyson (2015).[20] Many explanatory variables have confounding effects on the decision to purchase D&O insurance. Moreover, previous studies present mixed results with respect to these variables due to different sample periods and different sample pools. In addition to the control variables used in previous studies, we consider the factors that are unique to the business and litigation environment in Korea. Equation (1) indicates the specification

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[18]Chaebol firms are firms that belong to large Korean business groups. The five largest auditing firms in the United States. during our sample period were PwC (Pricewaterhouse Coopers), Deloitte Touche Tohmatsu Limited, KPMG, Ernst & Young, and Arthur Andersen.

[19]Earlier studies, such as Core (1997) and O'Sullivan (1997), use a logit regression, whereas more recent studies, such as Chung and Wynn (2008) and Zou et al. (2008), use probit regression. We follow the latter approach.

[20]We also refer to studies that examine the determinants of D&O insurance coverage en route to answering their main research question. Such studies include Chung and Wynn (2008) and Cao and Narayanamoorthy (2014).

of the multivariate regression for the determinants of D&O insurance, which can be categorized into variables that affect the future likelihood of litigation, variables that capture the firm's governance structure, and variables unique to the Korean business environment. All the firm-specific regressors are lagged 1 fiscal year before the observation of D&O insurance coverage. The list of variables is shown in Table 5.

$$
\begin{aligned}
\text{D\&O insurance}_{i,t} = {} & \beta_0 + \sum_k \beta_k \cdot \left(\text{litigation control}_k\right)_{i,t-1} + \sum_l \beta_l \\
& \cdot \left(\text{governance control}_l\right)_{i,t-1} + \sum_m \beta_m \\
& \cdot \left(\text{Korean business environment control}_m\right)_{i,t-1} \\
& + \Sigma \text{ industry dummies} + \Sigma \text{ year dummies} + \varepsilon_{i,t}. \quad (1)
\end{aligned}
$$

We estimate Equation (1) using pooled probit regression. We include industry dummies to control for the industry effect as evidenced in Table 3 and include year dummies to remove the time effect (the observations of different firms in the same year are correlated). In order to account for the possible firm effect (the observations of the same firm in different years are correlated) left in the data, we use the Huber–White robust standard errors clustered by firms. Petersen (2009) shows that such standard errors clustered by firms produce unbiased estimates. We do not include firm dummies directly because, as shown in the previous section, 88.7 percent of our sample firms do not change their D&O insurance status during our sample period. In this case, using firm fixed effect would result in these firms with no change in D&O insurance status being dropped from the estimation.[21] Our method of modeling panel data by including time dummies and using standard errors clustered by firms is also found in studies, such as Lamont and Polk (2001), Gross and Souleles (2002), Anderson and Reeb (2004), Sapienza (2004), Faulkender and Petersen (2006), Galema, Plantinga, and Scholtens (2008), Foucault and Fresard (2012), and Subrahmanyam, Tang, and Wang (2014).[22]

In Equation (1), one of the categories among the determinants of D&O insurance purchases includes variables that influence the likelihood of future litigation.[23] Examples of such factors include stock return performance, stock return volatility, stock turnover, growth opportunity, firm size, leverage, cash holdings, and industry

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[21]We thank an anonymous referee for pointing this out. As alternative models to control for firm fixed effects, we estimate the Equation (1) using OLS with firm fixed effects, probit model with random effects, and annual probit regressions. The results are qualitatively similar to those of Table 5.

[22]Clustering by time and firm (two-way clustering) is an alternative method of the estimation for panel data (Gow, Ormazabal, and Taylor, 2010). However, standard errors using the two-way clustering are correct only asymptotically (Cameron, Gelbach, and Miller, 2008). We employ one-way (firm) clustering with time dummies because our sample is limited. Results are similar when we use two-way clustering.

[23]Cao and Narayanamoorthy (2014) use the D&O insurance premium as a proxy of litigation risk in examining the effect of litigation risk on management's decision to issue earnings forecasts.

TABLE 5
Determinants of D&O Insurance

Variable Group	Variable	Model 1			Model 2		
		Coefficient	Marginal Effect	z-Statistic	Coefficient	Marginal Effect	z-Statistic
Litigation control variables	Stock return	−0.001***	−0.000***	(−2.55)	−0.001***	−0.000***	(−2.95)
	Stock return volatility	−0.002	−0.001	(−0.01)	−0.015	−0.005	(−0.04)
	Stock turnover	−2.662	−0.891	(−1.02)	−1.568	−0.523	(−0.63)
	Firm size	0.579***	0.194***	(10.23)	0.420***	0.140***	(6.47)
	Leverage	0.413	0.138	(1.35)	0.365	0.122	(1.14)
	Cash holdings	0.503	0.168	(1.54)	0.345	0.115	(1.07)
	Sales growth	−0.351***	−0.118***	(−2.68)	−0.318**	−0.106**	(−2.50)
Governance control variables	Ratio of outside directors	1.402***	0.469***	(2.87)	1.197***	0.399***	(2.39)
	Controlling shareholder ownership	−0.012***	−0.004***	(−3.18)	−0.011***	−0.004**	(−2.22)
Korean business environment control variables	Ownership disparity				−0.002	−0.001	(−0.56)
	Chaebol dummy				0.622***	0.223***	(3.92)
	Foreign shareholder ownership				0.006	0.002	(1.32)
	Big audit firm dummy				0.236	0.078	(1.64)
	Cross-listing dummy				−0.719	−0.183	(−1.33)
	Class action act dummy				0.111**	0.037**	(2.02)
Constant		−12.159***		(−10.87)	−9.345***		(−7.51)
Number of observations		2571			2571		
Pseudo R^2		0.306			0.332		
χ^2		190.357			227.062		

Note: This table examines the determinants of carrying D&O insurance modeled by using a probit regression. The dependent variable is an indicator variable that equals one if the firm carries D&O insurance. Firm-specific regressors are lagged 1 year prior to the measurement of the dependent variable. Year dummies and industry dummies at the three-digit SIC code are included. Standard errors are Huber–White robust standard errors that correct for the clustering of observations at the firm level. χ^2 is the value of the likelihood ratio test for model fit. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

factors (Core, 1997; Chung and Wynn, 2008; Gong, Louis, and Sun, 2008; Zou et al., 2008; Cao and Narayanamoorthy, 2014; Boyer and Tennyson, 2015).[24]

Studies find that firms face greater litigation risk when they exhibit lower stock return performance, higher stock return volatility, and higher turnover in trading. The effect of firm size on D&O insurance coverage decision is ambiguous. On the one hand, larger firms can be targeted more often in shareholder lawsuits, leading to a greater demand for insurance. Chung and Wynn (2008) and Boyer and Tennyson (2015) report results that are consistent with this conjecture.[25] On the other hand, Mayers and Smith (1982), Core (1997), and Boyer and Stern (2012) note that although large firms tend to be equipped with in-house legal staff in order to defend against litigations, small firms are more likely to demand insurance coverage due to real-service efficiencies brought by the insurance, and because bankruptcy costs are proportionately higher. The effect of growth opportunity, measured by the lagged sales growth rate, is also multifaceted. On the one hand, firms with greater growth opportunities have more volatile and intangible growth options, which make them more susceptible to litigation. On the other hand, in cases where firms overinvest or make wrong investment, firms with *ex ante* less growth opportunities can be in greater danger of being sued.

Firms with greater probability of financial distress are likely to purchase D&O insurance because they have greater litigation risk; further, being covered by the insurance lowers their expected bankruptcy costs (Core, 1997; Zou et al., 2008). These effects are captured by financial leverage and cash holdings. However, these variables can also have confounding effects on the firm's decision to purchase D&O insurance. As for financial leverage, the typical argument is that more debt can lead to greater probability of financial distress, which can increase the demand for insurance. However, if external debtholders have an incentive to monitor the firm's management, such monitoring can act as a substitute for the monitoring services provided by D&O insurance. The effect of cash holdings is also twofold. On the one

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[24]Another variable that is associated with litigation risk and with D&O insurance coverage is the degree of earnings management. Specifically, Zou et al. (2008) find that Chinese firms that engage in more earnings manipulation are more likely to consider D&O insurance. However, their setting is unique in that earnings management problems preceded the D&O liability. In general, the causal relationship can go both ways. Chung and Wynn (2008) show that greater managerial liability coverage leads to more earnings management and that this relationship becomes stronger in a high-litigation regime. However, incorporating this bilateral relationship would require setting up another set of simultaneous equations of D&O insurance and earnings management, which is beyond the scope of this article. Therefore, we do not consider the earnings management variable in our regressions. Our use of the big audit firm indicator variable (to be explained later) captures the effect (although imperfectly, but less prone to reverse-causality problem) as Nah and Choi (2003) find a strong negative relationship between this variable and the discretionary accruals for firms in Korea.

[25]O'Sullivan (1997) also finds a positive relationship between firm size and the likelihood of carrying D&O insurance for their sample of firms in the United Kingdom. However, his interpretation of the positive relationship is that as firm size increases, the need for D&O insurance as a monitoring mechanism increases.

hand, firms that hold a large amount of cash and short-term securities are less exposed to the possibility of financial distress and bankruptcy, suggesting a negative relationship between cash holdings and the likelihood of D&O insurance purchase decision. However, according to Chung and Wynn (2008), firms with excess cash are more likely to purchase D&O insurance because rational mangers would choose the optimal amount of coverage based on the cost and benefit relation, given the insurance premium and the excess cash they have. According to this argument, there can be a positive relationship between cash holdings and the decision to purchase D&O insurance.

We also control for various governance structures of the firm, including those that are specific to the business environment in Korea. The proportion of outside directors can affect the likelihood of carrying D&O insurance. On the one hand, fewer outside directors increase the chance for the board to make decisions at the expense of minority shareholders, which can lead to greater demand for D&O insurance due to the increased likelihood of litigation. On the other hand, if outside directors require D&O insurance as part of their compensation package, then firms that have greater proportion of outside board members can have greater likelihood of carrying D&O insurance. Studies, such as Core (1997), O'Sullivan (1997), Chalmers, Dann, and Harford (2002), Zou et al. (2008), and Boyer and Tennyson (2015) find evidence consistent with the latter argument. The ownership of the controlling shareholder can also affect the likelihood of carrying D&O insurance due to various reasons. Zou et al. (2008) argue that firms with greater power of controlling shareholders, especially in countries or firms with greater agency problems, are more likely to be challenged by other shareholders, which lead to greater demand for insurance. Mayers and Smith (1982) explain the positive relationship between the two variables based on the insiders' risk aversion. On the other hand, Core (1997) argues that the incentive alignment effect, which acts as a substitute for D&O insurance, can result in a negative relationship between the two variables. Empirically, Boyer and Tennyson (2015) report a positive relationship between the two variables whereas O'Sullivan (1997) and Chung and Wynn (2008) find a negative relationship. We measure the control shareholder ownership as the percentage of shares held by the controlling shareholders and his/her relatives.

We include the following control variables that are shown to influence the litigation environment specifically in Korea. Firms with more conflict of interests between the controlling shareholders and minority shareholders are more likely to be involved in shareholder lawsuits (Shleifer and Vishny, 1997). Specifically, studies, such as Claessens et al. (2000) and Carney and Child (2013) find a large divergence between cash flow rights and control rights for many East Asian companies, and Baek, Kang, and Park (2004) note that in Korea, owner-managers of large firms exercise substantial control over cross-ownership among affiliated firms. If owner-managers use equity ownership in affiliated firms in order to strengthen their control rights, we expect that these firms face greater likelihood of litigation due to the heightened agency problem. Following Claessens, Djankov, and Lang (2000), Joh (2003), and Black, Cheffins, and Klausner (2011), we measure the ownership disparity, sometimes referred to as "wedge" in the literature, as the ownership by all affiliated shareholders subtracted by the direct ownership of the controlling shareholder.

We also control for firms that belong to large Korean business groups, which are referred to as chaebols. Chaebol firms have an extensive cross-holding ownership structure, which can be conducive to shareholder expropriation.[26] Baek, Kang, and Park (2004) note that the cross-shareholding practices in chaebols can prevent outside shareholders from effectively monitoring the member firms. Bae, Kang, and Kim (2002) find evidence of tunneling for chaebol firms by showing that when a chaebol-affiliated firm makes an acquisition, its market value decreases whereas other firms in the same chaebol group experience increase in value. This evidence suggests that chaebol firms, which carry many governance problems, are more susceptible to litigation in Korea. On the other hand, another characteristic of chaebol firms is that due to their internal capital markets and cross-debt guarantees among member firms, they are subject to fewer financing constraints than other firms (Shin and Park, 1999; Baek, Kang, and Park, 2004). This feature can have an effect on lessening the probability of financial distress. To control for this special form of business, we use the chaebol indicator variable, which takes a value of one if the firm belongs to one of the chaebol firms as listed in the Korea Free Trade Commission's *Annual Statistics*.

The effect of foreign shareholder ownership can also affect the litigation environment for firms in Korea. On the one hand, firms with greater foreign shareholder ownership can face higher probability of litigation because foreign investors are, in general, more sophisticated and are more accustomed to engendering lawsuits. On the other hand, studies such as Baek, Kang, and Lee (2006) reveal that foreign investors have a strong incentive to monitor managers and discourage them from engaging in tunneling, therefore reducing the litigation risk.

Studies on Korean firms, such as Nah and Choi (2003) and Kwon and Ki (2011), find that firms that are audited by auditing firms affiliated with the five largest auditing firms in the United States face less likelihood of accounting-related accusations, and further argue that these auditing firms provide higher audit quality. This argument is based on DeAngelo (1981), who indicates that the larger audit firms in the United States provide higher audit quality because auditors with a greater number of clients have "more to lose" by failing to report a discovered breach. We, therefore, proxy for audit quality by using a big audit firm variable, which indicates if a firm was audited by an auditor that is affiliated with one of the five largest audit firms in the United States.

We also include an indicator variable for Korean companies cross-listed on the London, New York, or Luxembourg exchanges, which are the three main stock exchanges for cross-listing of Korean firms (Kim, 2003).[27] The effects of cross-listing on the decision to purchase D&O insurance can be approached from different

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[26]Because direct interlocking ownership (e.g., firm A owns firm B, and firm B owns firm A) is illegal, chaebol firms use complex pyramidal or multilayered patterns of interlocking ownership (Joh, 2003).

[27]An alternative specification is to use U.S. cross-listed firm dummy, in view of the additional risk of litigation in the United States. However, all U.S. cross-listed firms (23 observations) carried D&O insurance (i.e., U.S. cross-listed firm dummy predicts D&O insurance perfectly), rendering the probit model estimation problematic with respect to this variable.

perspectives. Studies that document the bonding hypothesis of cross-listing (e.g., Doidge, Karolyi, and Stulz, 2004; Lel and Miller, 2008) imply that cross-listed firms are better governed firms than those that do not cross-list. According to this argument, there may be less need for D&O insurance for cross-listed firms because they are better governed firms. Alternatively, the litigation environment in the country whose stock is cross-listed can have an effect on the firm's insurance purchase decision. Lang, Raedy, and Yetman (2003) note the perceived litigation risk as an influential factor in firms' decision to cross-list, and studies, such as Chung and Wynn (2008), Gong, Louis, and Sun (2008), and Cao and Narayanamoorthy (2014) find evidence that supports this argument.

The last control variable that is specific to the litigation environment in Korea is the shareholder class action act dummy. In 2004, Korea enacted the Securities Class Action Act of 2004, under which the class action procedure became available for small shareholders of large companies (defined as asset size greater than KRW 2 trillion) beginning in 2005 and for all public companies from 2007. Therefore, to control for the higher likelihood of litigation environment for these firms, we include a dummy variable that equals one if the firm's asset size is greater than KRW 2 trillion for the years between 2005 and 2007, and for all firms after 2007. And as firms in certain industries are more prone to be targets of litigation than firms in other industries, we include industry dummy variables based on three-digit SIC codes.

Table 5 presents the results of the probit regression of the D&O insurance coverage as shown by Equation (1). In Model 1, we use variables following the previous literature on the determinants of purchasing D&O insurance. In Model 2, we include the variables that are specific to the corporate governance and litigation environment in Korea. As mentioned before, all firm-specific independent variables are lagged 1 year prior to the measurement of the dependent variable.[28] We report both the coefficients and the marginal effects, which measure the change in the probability of the firm carrying D&O insurance for a unit change in the relevant variable from its mean value and all other variables remain at their mean values.

The result indicates that firms with lower performance, as measured by the previous year's market adjusted stock return, are more likely to purchase D&O insurance. This result is consistent with that of previous studies and suggests that firms with bad performance are typically faced with a greater likelihood of litigation; thus, they are more likely to purchase D&O insurance. The coefficient of the stock return volatility is negative but insignificant. This result is different from the findings of previous studies, which reveal that firms with greater stock return volatility are more likely to carry D&O insurance because they have a greater likelihood of being the target of shareholder litigation. Our evidence suggests that insofar as stock return volatility proxies for the firm's risk-taking behavior (Rajgopal and Shevlin, 2002; Coles, Daniel, and Naveen, 2006; Low 2009; Cassell et al., 2012; Hirshleifer, Low, and Teoh, 2012; Kini and Williams, 2012; Bova et al., 2014), firms that take on higher risk are not necessarily more likely to purchase D&O insurance.

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[28]For robustness, we use independent variables with 2-year lags of the dependent variables. We find that our main results remain qualitatively the same.

Firm size is positively related to the likelihood of carrying D&O insurance. In our sample, the firm size variable is measured as the log of asset size, the average of which is 19.344. The marginal effect of this variable implies that when asset size increases from $e^{19.344} \times 1,000 =$ KRW 252 trillion to $e^{20.344} \times 1,000 =$ KRW 684 trillion (172 percent increase in firm asset), the probability of carrying D&O insurance increases by 19.4 percent, according to Model 1. The positive relationship between firm size and the likelihood of carrying D&O insurance is consistent with the findings of O'Sullivan (1997), Chung and Wynn (2008), and Boyer and Tennyson (2015), but is different from that of Boyer and Stern (2012). The explanation provided by Boyer and Stern (2012) was that large firms carry alternatives to D&O insurance, such as having an in-house team of lawyers. We find that the conventional argument that larger firms have greater demand for insurance because they can be targeted more often in shareholder lawsuits holds in our sample of Korean firms. The coefficient of the leverage variable is positive but statistically insignificant, which is consistent with the confounding effects of debt (increasing both the bankruptcy risk and the debtholders' monitoring effect) as noted by Boyer and Stern (2012). The coefficient of the lagged change in sales is negative, which suggests that firms with lower growth are more susceptible to the potential litigation caused by the overinvestment problem as shown by McTier and Wald (2011).

As for the variables that measure the firm's governance structure, firms are more likely to be insured if they have a greater proportion of outside directors, if the controlling shareholder ownership is low, and for chaebol firms. The positive relationship between the ratio of outside directors and D&O insurance purchase decision is consistent with the risk-averse attitude of the outside directors (Core, 1997; O'Sullivan, 1997; Zou et al., 2008; Boyer and Tennyson, 2015). The negative coefficient of the controlling shareholder ownership variable is consistent with the findings of Core (1997), O'Sullivan (1997), and Chung and Wynn (2008), suggesting that there is an incentive alignment effect of insider stock ownership that can act as a substitute for D&O insurance. The positive coefficient of the chaebol indicator variable implies that the demand for D&O insurance created by the chaebol's governance problem, which makes them susceptible to litigation, outweighs the effect of chaebols having a lower likelihood of financial distress. The coefficient of the cross-listing dummy variable is negative but statistically insignificant. We note that in the univariate test shown in Table 4, firms that carry D&O insurance are more likely to cross-list their shares compared to noninsured firms. However, once we control for other determinants of D&O insurance coverage, the marginal impact of cross-listing on the firm's likelihood of having D&O insurance is statistically insignificant. Lastly, the coefficient of the shareholder class action act indicator variable is positive and significant. This result confirms that the Securities Class Action Act of 2004 caused firms to perceive greater likelihood of litigation.

Overall, we find that some previously documented variables that determine the D&O insurance purchase decision in a common law jurisdiction also apply to Korea in the same manner. Such variables are firm size, firm performance, growth rate, and the proportion of outside directors. On the other hand, we find that some variables, such as stock return volatility, and stock turnover, that have been documented to affect the D&O insurance coverage decision in other countries do not affect the D&O insurance

purchase decision in Korea. As for factors that are specific to the business environment in Korea, we find that chaebol firms are more likely to purchase D&O insurance and that more firms had D&O insurance coverage after the Securities Class Action Act. Finally, the coefficient of the controlling shareholder ownership suggests that the incentive alignment effect outweighs the entrenchment effect in Korea.

D&O INSURANCE AND FIRM VALUE

Thus far, we have examined the factors that determine the firm's decision to carry D&O insurance. In this section, we empirically test the effect of D&O insurance coverage on firm value. We measure firm value using Tobin's Q, which follows previous studies, such as Morck, Shleifer, and Vishny (1988), Servaes (1996), Yermack (1996), and Jin and Jorion (2006). If the stock market is efficient, any effects of D&O insurance should be impounded in the 1-year future Tobin's Q. The regression model is shown in Equation (2). All the right-hand-side variables except for the year dummies are lagged by 1 year.

$$\text{Tobin's } Q_{i,t} = \beta_0 + \beta_1 \cdot \text{D\&O insurance}_{i,t} + \beta_2 \cdot \text{firmsize}_{i,t-1} + \beta_3 \cdot \text{leverage}_{i,t-1}$$
$$+\beta_4 \cdot \text{ROA}_{i,t-1} + \beta_5 \cdot \text{R\&D}_{i,t-1} + \beta_6 \cdot \text{sales growth}_{i,t-1} + \sum_t \beta_t \cdot \text{year}_t + \varepsilon_{i,t}. \tag{2}$$

Control variables of the regression model are adopted from the previous literature Securities Class Action Act examines the determinants of firm value using Tobin's Q (e.g., Morck, Shleifer, and Vishny, 1988; Claessens et al., 2002; Lins, 2003; Hirshleifer, Low, and Teoh, 2012). As for firm size, Claessens et al. (2002) and Lins (2003) document that large firms in East Asian countries engage in excessive diversification, which leads to lower firm value. Leverage captures the capital structure effect and the financial risk of the firm. ROA controls for the profitability of the firm, and R&D accounts for the effects of the intangible assets on market valuation. Sales growth captures the growth prospects and the investment opportunity of the company as noted in studies, such as Claessens et al. (2002) and La Porta et al. (2002). In most of the model specifications, we include the interaction variable between D&O insurance choice and lagged sales growth. This interaction variable allows us to examine whether the change in the firm value due to D&O insurance is more pronounced for firms with greater investment opportunities.

To infer how D&O insurance coverage affects firm value, we must consider the possibility that firms may be selected into D&O insurance coverage on certain characteristics. To address this endogeneity of D&O insurance, we consider the joint determination of D&O insurance coverage and firm value through the use of two econometric approaches: treatment effect model and the dynamic panel data model. Treatment effect model accounts for the endogeneity of D&O insurance through the two-step estimation procedure as described in Heckman (1978) and Maddala (1983). The dynamic panel data model includes the lagged dependent variable as an additional explanatory variable. We adopt Blundell and Bond's (1998) generalized method of moments (GMM) to provide consistent estimators when the lagged dependent variable is correlated with the unobserved firm-fixed effects impounded

in the panel data set. This method has an added benefit of allowing right-hand-side variables to be predetermined, but has to be weighed against the cost of having too many instruments in the model (Huang and Ritter, 2009).[29]

Treatment Effect Model

Employing the treatment effect model in a panel data set follows studies such as Ranciere, Tornell, and Westermann (2006), Villalonga and Amit (2006), Chung and Wynn (2008), Givoly, Hayn, and Katz (2010), and Fung, Wen, and Zhang (2012). Our treatment effect model is constructed with two equations. The Tobin's Q regression as shown in Equation (2) is the "outcome" equation, and the probit model of Equation (1) (the full model as shown in Model 2 of Table 5) is the "treatment" equation representing the likelihood of being covered by the D&O insurance.[30] In the treatment equation, the D&O insurance dummy variable depends on the realization of an unobserved latent variable. The latent variable is assumed to depend on a set of determinants that we used in Equation (1) and a random component. Under the assumption that the random component follows a standard normal distribution, the treatment equation can be estimated using a probit regression of Equation (1). In the outcome equation of Tobin's Q, the inverse Mills ratio is the self-selection parameter

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[29]Predetermined variables are regressors that are independent of current disturbances but can be affected by past disturbances. That is, the error term can have some feedback on the subsequent realizations of these variables.

[30]The structure of the model is as follows.

Outcome model:

$$\text{Tobin's } Q_{i,t} = \beta_0 + \beta_1 \cdot \text{D\&O insurance}_{i,t} + \beta_2 \cdot \text{firmsize}_{i,t-1} + \beta_3 \cdot \text{leverage}_{i,t-1}$$
$$+ \beta_4 \cdot \text{ROA}_{i,t-1} + \beta_5 \cdot \text{R\&D}_{i,t-1} + \beta_6 \cdot \text{sales growth}_{i,t-1} + \sum_t \beta_t \cdot \text{year}_t + \varepsilon_{i,t}.$$

Treatment model:

$$\text{D\&O insurance}_{i,t} = \beta_0 + \sum_k \beta_k \cdot (\text{litigation control}_k)_{i,t-1} + \sum_l \beta_l \cdot (\text{governance control}_l)_{i,t-1}$$
$$+ \sum_m \beta_m \cdot (\text{Korean business environment control}_m)_{i,t-1} + \sum \text{industry dummies}$$
$$+ \sum \text{year dummies} + u_{i,t}.$$

The choice of exogenous variables in the treatment equation are litigation risk proxies and governance proxies, such as the ratio of outside directors, controlling shareholder ownership, ownership disparity, chaebol dummy, foreign shareholder ownership, cross-listing dummy, and the class action act dummy variable. These instruments have a direct theoretical association with the first-stage regression of D&O insurance coverage decision, as explained in the previous section. On the other hand, these variables are thought to be uncorrelated with the errors in the outcome equation after conditioning on the remaining exogenous variables of the outcome model; thus, they are likely to affect firm value through its effect on the predicted likelihood of having D&O insurance coverage.

obtained in the treatment equation estimation and is used to correct for potential self-selection bias. The coefficient of the inverse Mills ratio tells us the sign of the correlation between the error terms in the probit regression of D&O insurance coverage decision and the error terms in the regression of firm value.[31] The standard errors in the Tobin's Q equation are adjusted for sampling errors as described in Greene (1981) and Maddala (1983).[32]

Table 6 shows the results of the firm value regression using the treatment effect model. Panel A presents the results for the pooled sample. Results in Panel A show that the coefficients of the D&O insurance variable are positive and significant at the 1 percent level for both Models 1 and 2. This implies that D&O insurance results in firm value increase. Furthermore, in Model 2, the interaction term between the D&O insurance variable and the sales growth rate is positive and significant. This result shows that the value increase due to D&O insurance is more pronounced when the firm's growth opportunity is high.[33] Without D&O insurance, directors and officers can become overly averse to taking risks due to fears of litigation. Since D&O insurance insulates their liabilities from litigation, D&O insurance can mitigate the problem of excessive risk averseness in corporate investment. Our evidence suggests that D&O insurance can reduce underinvestment problem of firms with greater growth opportunity, instead of causing overinvestment problem in companies with limited investment opportunities.

The coefficient of the inverse Mills ratio is negative and statistically significant. Whereas the descriptive statistics in Table 4 show that the current-period Tobin's Q and the actual likelihood of having insurance are positively related, the negative coefficient of the inverse Mills ratio implies that there is a negative relationship between the unobserved factors that make the firm more likely to purchase insurance (in the "treatment" regression of D&O insurance) and the current period Tobin's Q (in the "outcome" equation). That is, the unobserved factors that make the firm more likely to purchase insurance are associated with *lower* Tobin's Q. A plausible argument is that there can be some unobserved litigation factors that make the firm more likely to purchase D&O insurance and that are also detrimental to future firm values. We find that after controlling for self-selection, the coefficient of the D&O insurance variable is positive and significant.

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[31]Specifically, the inverse Mills ratio is defined as the probability density function divided by the cumulative density function of the estimated likelihood of purchasing D&O insurance for each insurer and time period.

[32]To implement the treatment effect model, we use the STATA commands *treatreg* (for equations without the interaction variable) and *itreatreg* (for equations with the interaction variable). These commands provide two-step consistent estimates of the parameters, standard errors and covariance matrix of the model.

[33]We also examine subgroups of high-growth firms and low-growth firms by splitting the firms based on the industry median values of sales growth rate. We still find that the coefficients of the D&O insurance variable are positive and statistically significant for both groups, and that the size of the coefficient is larger for the high-growth firms. Results are available upon request.

TABLE 6
D&O Insurance and Firm Value: Treatment Effect Model

Panel A: Pooled Regression

Variable	Model 1	Model 2
D&O insurance	1.039***	1.038***
	(12.26)	(12.25)
D&O insurance × Sales growth		0.226**
		(3.30)
Firm size	−0.187***	−0.188***
	(−10.84)	(−10.90)
Leverage	0.496***	0.491***
	(8.51)	(8.42)
ROA	0.580***	0.570***
	(3.82)	(3.76)
R&D	9.547***	9.507***
	(11.94)	(11.91)
Sales growth	0.027	−0.038
	(0.68)	(−0.85)
Inverse Mills	−0.548***	−0.552***
	(−11.23)	(−11.30)
Number of observations	2,571	2,571
χ^2	903.87	915.31

Panel B: Annual Regression

	2002	2003	2004	2005	2006	2007	2008
D&O insurance	0.108	0.507***	0.949***	1.618***	0.736***	1.155***	0.639***
	(0.99)	(4.12)	(4.45)	(4.97)	(3.91)	(5.18)	(5.09)
D&O insurance × Sales growth	0.281*	−0.037	0.253*	0.033	0.496**	0.470**	0.238***
	(1.69)	(−0.17)	(1.93)	(0.08)	(2.54)	(2.07)	(2.76)

Continued

TABLE 6
Continued

	Panel B: Annual Regression						
	2002	2003	2004	2005	2006	2007	2008
Firm size	−0.054**	−0.086***	−0.156***	−0.357***	−0.138***	−0.190***	−0.094***
	(−2.32)	(−3.37)	(−3.89)	(−5.25)	(−3.33)	(−3.95)	(−3.58)
Leverage	0.627***	0.462***	0.554***	0.023	0.781***	0.917***	0.504***
	(7.99)	(4.90)	(4.00)	(0.09)	(5.37)	(5.20)	(4.95)
ROA	−0.094	0.761***	0.740**	0.478	1.614***	0.282	1.406***
	(−0.37)	(3.02)	(2.17)	(0.72)	(4.27)	(0.69)	(5.57)
R&D	6.669***	8.444***	6.760***	15.767***	13.778***	7.300***	5.699***
	(3.72)	(4.33)	(3.00)	(5.12)	(6.96)	(3.77)	(4.86)
Sales growth	−0.045	0.158**	−0.020	0.126	−0.572***	0.225*	−0.136*
	(−0.58)	(2.54)	(−0.21)	(0.54)	(−5.87)	(1.82)	(−1.71)
Inverse Mills	−0.057	−0.319***	−0.534***	−0.808***	−0.395***	−0.647***	−0.372***
	(−0.87)	(−4.49)	(−4.41)	(−4.39)	(−3.58)	(−5.03)	(−5.11)
Constant	1.291***	1.979***	3.168***	7.362***	3.387***	3.907***	2.440***
	(2.78)	(3.95)	(4.01)	(5.33)	(4.24)	(4.38)	(4.93)
Number of observations	310	329	351	374	388	409	410
χ^2	175.246	137.973	121.511	107.268	210.357	143.601	176.626

Note: This table reports the results for the second-stage regression of the treatment effect model of Tobin's Q, on D&O insurance and other control variables. Panel A presents the results for the pooled sample and Panel B reports the results for the annual regression. The inverse Mills ratio is calculated from the probit model on the likelihood of having D&O insurance coverage, and represents whether the error terms in the first-stage probit regression of D&O insurance coverage decision and the second-stage regression of Tobin's Q are correlated. Definitions of all variables are provided in the Appendix. z-Statistics are in parentheses. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

The results for the control variables are consistent with our expectation. The negative coefficients of the firm size are consistent with Claessens et al. (2002) and Lins (2003), who find that large firms in East Asian countries suffer lower value from extensive diversification. The positive coefficients of leverage are suggestive of (1) the tax benefit of debt and/or (2) monitoring effect of creditors (McConnell and Servaes, 1995; Harvey, Lins, and Roper, 2004). The coefficients of ROA are positive and significant in the pooled model and for most of the years in the annual regression. This is consistent with the stylized fact that profitable firms have greater firm value. The coefficients of R&D expenditure are positive, which suggests that firms with greater intangible assets have higher Tobin's Q. This again is consistent with the findings in the literature, such as Morck, Shleifer, and Vishny (1988).

In applying the treatment effect model to a pooled panel data set, it is possible that the autocorrelated observations from the same firm can distort the significance levels of the estimated coefficients. To address this potential problem, we report the results of annual regression in Panel B. Annual regression shows a similar result in that firms with D&O insurance have greater firm value and the value increase is more pronounced for firms with higher growth rate. In both models of Panel A and B, values of χ^2 have p-values that are less than 1 percent, which show that the overall fit of the model is statistically significant.

Dynamic Panel Data Model

If the effect of any unobserved shock on firm value measured by Tobin's Q is persistent, we need to incorporate the time-series process of Tobin's Q into our model. In order to search whether there is any time-series pattern in the data, we sort all the firms in our sample based on lagged Tobin's Q and categorize them in quartiles based on lagged Tobin's Q. We then track the Tobin's Q of insured firms against that of noninsured firms for the next four years. Figure 1 shows the result of the trend of the mean and the median of Tobin's Q in each group of firms. In the figure, NISi refers to the average Tobin's Q of noninsured firms in the ith quartile of lagged Tobin's Q. ISi refers to the average Tobin's Q of insured firms in the ith quartile of lagged Tobin's Q.

Figure 1 shows a slight mean-reverting trend of Tobin's Q, as Tobin's Q in the highest quartiles is decreasing whereas Tobin's Q in the lower quartiles is increasing over time. The gap between the highest and the lowest quartiles of Tobin's Q is narrowing over the next 4 years.[34] This result confirms the study of Alti (2003), who formally models a mean-reverting behavior of firm value. The time-series pattern in

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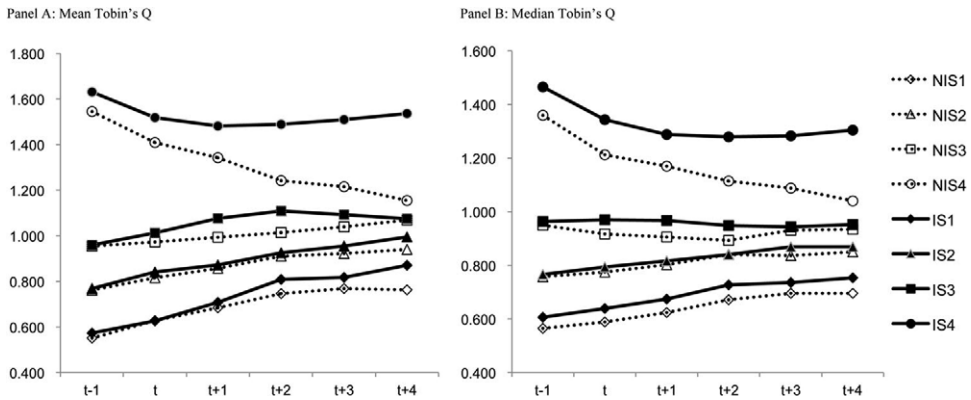[34] As a complementary test, we estimate the following first-order autoregressive model for our sample:

$$(\text{Tobin's } Q_{i,t+1}) - (\text{Tobin's } Q_{i,t}) = a + b \cdot [(\text{Tobin's } Q_{i,t}) - (\text{Tobin's } Q_{i,t-1})] + \varepsilon_{i,t}.$$

We find that the mean coefficient is negative (-0.35), which indicates the mean-reverting pattern of Tobin's Q.

FIGURE 1

Changes in Firm Value Between Insured Firms and Noninsured Firms

Note: This figure depicts the trend in future Tobin's Q for our sample of firms with D&O insurance coverage versus a sample of firms with no insurance. All firms in the sample are sorted based on the lagged Tobin's Q (at year $t-1$) and categorized into quartiles based on lagged Tobin's Q. The average Tobin's Q are tracked for the firms in each quartile until year $t+4$. NISi refers to the average Tobin's Q of noninsured firms in the ith quartile of lagged Tobin's Q. ISi refers to the average Tobin's Q of insured firms in the ith quartile of lagged Tobin's Q. Tobin's Q is measured as the market value of equity and book value of debt over total assets.

Tobin's Q suggests the inclusion of the lagged-dependent variable as another explanatory variable in Equation (2).[35] Figure 1 also shows that especially for firms in the highest quartile of Tobin's Q, which are firms with the greatest initial market valuations, firms with D&O insurance outperform matched uninsured firms over the next 4 years.[36] This suggests a possible effect of D&O insurance on increasing the firm value.

When panel data with firm fixed effects has a dynamic property, a pooled OLS without considering firm fixed effects and demeaning transformation method make the estimated coefficient on the lagged dependent variable biased (Hsiao, 2003; Nickell, 1981). To avoid such bias, we estimate this dynamic panel data model by using Blundell and Bond's (1998) GMM as described in Flannery and Hankins (2013). In the estimation process of a two-equation system of regression in levels and in first

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[35]Another benefit of including lagged dependent variable is in addressing the problems of omitted correlated variables and reverse causality. As the effects of omitted correlated variables and reverse causality can be captured by the lagged value of dependent variable, the lagged dependent variable will restrain the impact of other regressors and bias against finding significant effect of these other regressors.

[36]The initial starting point of Tobin's Q is higher for the set of insured firms than uninsured firms because as shown in the descriptive statistics, insured firms, on average, have higher Tobin's Q than uninsured firms.

differences, this method uses the lagged dependent variables' levels as instruments for the first differenced equation, provided that the residuals do not have second-order serial correlation, and uses the lagged first differences as instruments for the level equation.[37]

In the GMM estimation, the variables that we specify to be endogenous are not only the dependent variable, but also the D&O insurance dummy and its interaction variable. This is done in order to consider the reciprocal interaction between Tobin's Q and the decision to purchase the insurance. Another advantage of using GMM estimation is that we can allow for the possibility that other variables in the model may not be fully exogenous. Therefore, we set the year dummies as exogenous variables and state all other explanatory variables as predetermined, and not fully exogenous. Following Flannery and Hankins (2013), we limit the maximum number of lags to two for their use as instruments.[38] We use the Windmeijer (2005) bias-corrected robust estimators which are robust to errors in the two-step GMM estimation. The legitimacy of our model specification is tested using the Hansen J-statistic, which is the minimized value of the two-step GMM criterion function and determines the validity of the overidentifying restrictions in a GMM model. As the p-values for the Hansen's J-statistics are 0.203 and 0.347 for each model, our model seems to be correctly specified. The test of serial correlation of residuals (AR[2]) shows that residuals do not have second-order serial correlation, suggesting that the lagged values are appropriate instruments for the difference equation (Arellano and Bond, 1991).

Results in Table 7 show that again, firms that are covered by D&O insurance have higher future firm value. Further, the interaction term between D&O insurance variable and sales growth is positive and statistically significant. Results in Table 7 are consistent with the results in Table 6 in that D&O insurance benefits the firm by increasing firm value and that this increase is more pronounced for firms with high growth opportunities.[39] Results of the coefficients for other variables are similar to, but somewhat weaker in statistical significance compared to, those in Panel A. For example, the leverage variable and the ROA variable lose their statistical significance in explaining future firm value. Smaller firms and firms with greater R&D expenditure have greater future firm value, which is consistent with the results in Table 6.

Overall, our results of using the treatment effect model and the dynamic panel data model both indicate that D&O insurance has a value-enhancing effect. In contrast to some recent literature that argues for an opportunistic behavior incurred by having coverage of D&O insurance, results of this study show that D&O insurance does not harm firm value. Rather, results suggest that D&O insurance can help firms to better

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[37]We implement the procedure using the STATA command *xtdpdsys*.

[38]Due to the use of lagged variables in the GMM estimation, the years used in our estimates are automatically truncated.

[39]When we examine subgroups of high-growth firms and low-growth firms, results are similar to the subgroup analysis using the treatment effect model mentioned in footnote 34, but with lower statistical significance. Results are available upon request.

TABLE 7
D&O Insurance and Firm Value: Dynamic Panel Data Model

Variable	Model 1	Model 2
D&O insurance	0.183*	0.184**
	(1.89)	(2.10)
D&O insurance $\times$ Sales growth		0.296**
		(1.96)
Lagged Tobin's Q	0.266***	0.262***
	(3.95)	(3.84)
Firm size	-0.128**	-0.115**
	(-2.21)	(-2.17)
Leverage	0.258	0.245
	(1.09)	(1.04)
ROA	-0.137	-0.211
	(-0.36)	(-0.59)
R&D	7.503***	7.744***
	(2.72)	(2.81)
Sales growth	0.008	-0.058
	(0.11)	(-0.69)
Number of observations	2571	2571
χ^2	297.99	344.793
p-value of AR(1)	0.002	0.003
p-value of AR(2)	0.518	0.399
p-value of Hansen J-test	0.203	0.347

Note: This table reports the results for the multivariate regression of Tobin's Q using Blundell and Bond's (1998) generalized method of moments (GMM). The exogenous variables are the year dummies. The endogenous variables are the lagged dependent variable, the D&O insurance dummy, and its interaction variable. All other explanatory variables are set as predetermined variables. The maximum number of lags in the system is set to two. Estimates are Windmeijer (2005) bias-corrected robust estimators. Hansen J-statistic is the minimized value of the two-step GMM criterion function and determines the validity of the overidentifying restrictions in a GMM model. Definitions of all variables are provided in the Appendix. The z-statistics are in parentheses. ***, **, * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

transform growth opportunities into higher firm value in the future. Our result also corroborates the finding of Bhagat, Brickley, and Coles (1987), who use an event study of a relatively small number of 25 firms and find that the decision to purchase D&O insurance has a positive impact on stock return. They conjecture that the positive effect is due to the monitoring role of D&O insurers. Our result showing that the value increase is more pronounced for firms with greater investment opportunity hints at the possibility that the greater risk-taking activity of firms that are covered by D&O insurance can be an additional channel that can create value for the firm. More detailed and comprehensive analysis of this conjecture is left for future research.

CONCLUDING REMARKS

D&O insurance protects directors and officers from the liability resulting from their corporate decisions and can thus affect corporate decision making. To the best of our knowledge, this is the first article to directly examine the value implication of D&O insurance using a large sample of firms. The view of many previous studies of D&O insurance is mixed. Some studies argue for the benefits of D&O insurance, such as the monitoring role during the underwriting process (Bhagat, Brickley, and Coles, 1987; Holderness, 1990; O'Sullivan, 1997; Core, 2000), helping attract competent and talented directors and officers (Mayers and Smith, 1982), and lowering the firm's likelihood of bankruptcy (Core, 1997; Zou and Adams, 2008). Other studies argue that D&O insurance leads to managerial opportunism and reduces the incentives to act in the best interest of the shareholders. (Core, 2000; Chalmers, Dann, and Harford, 2002) We use the Korean D&O insurance market to directly examine the relationship between D&O insurance coverage and firm value. The Korean market serves as an ideal setting for the study of D&O insurance because firms in Korea disclose their insurance coverage during our sample period of 2002–2008, and there is not an over-proportion of firms that carry insurance. This is in contrast to the D&O insurance market in the United States, in which the data are unavailable in the public domain and almost all firms carry D&O insurance.

We find that firms that carry D&O insurance have greater firm value and that the increase in firm value due to D&O insurance is more pronounced for high-growth firms. This result hints at the possibility that especially for high-growth firms, D&O insurance can help directors and officers become less risk averse and less likely to reject risky but value-adding projects. The results of this study have implications similar to studies that examine the effect of overconfident managers (Malmendier and Tate, 2005a, 2005b, 2008; Goel and Thakor, 2008; Gervais, Heaton, and Odean, 2011; Hirshleifer, Low, and Teoh, 2012). While overconfidence can lead to various agency problems that can hurt the firm (e.g., Malmendier and Tate, 2008, find that the market reacts more negatively to acquisitions made by overconfident CEOs), overconfidence can benefit shareholders if it leads to accepting good but risky projects. For example, Goel and Thakor (2008) and Gervais, Heaton, and Odean (2011) model the role of overconfidence in encouraging managers to take sufficient risk. Hirshleifer, Low, and Teoh (2012) empirically show that overconfident CEOs are more likely to invest in riskier projects and make greater R&D investments. We argue that a similar effect is shown for D&O insurance. While previous studies that examine the effect of D&O insurance coverage on corporate events, such as IPO (Chalmers, Dann, and Harford, 2002) and M&A (Lin, Officer, and Zou, 2011) argue that D&O insurance can be used to shield managers from their opportunistic behavior, we find that during noneventful periods as in Bhagat, Brickley, Coles (1987) and in a relatively low litigation environment of civil law jurisdiction, D&O insurance leads to greater firm value. Accordingly, we argue that D&O insurance should be viewed in a different manner from mechanisms that lead to entrenched or poorly governed managers, which studies universally find to have a negative impact on the firm's value.

APPENDIX

TABLE A1
Definition of Variables

Insurance dummy	One for firms with D&O insurance coverage, zero otherwise
D&O coverage	Annual D&O insurance coverage amount (in thousand Korean won)
D&O premium	Annual D&O insurance premium (in thousand Korean won)
R&D	R&D expenditure during the fiscal year over lagged total assets
Stock return	Buy-and-hold return (adjusted for Korea Stock Exchange KOSPI index) over the fiscal year (in percentage)
Stock return volatility	Annualized standard deviation of daily log stock returns during the fiscal year (excludes firms with fewer than 150 trading days during the fiscal year)
Stock turnover	Monthly average of daily trading volume during the fiscal year divided by the monthly average of daily number of shares outstanding during the fiscal year
Firm size	Natural logarithm of a firm's total assets (in thousand Korean won)
Sales growth	Log difference between the current fiscal year's sales and the prior fiscal year's sales
Leverage	Debt (current liabilities plus long-term debt) divided by total assets
Cash holdings	Cash and equivalents and short-term securities divided by net assets (total assets minus cash and equivalents and short-term securities)
Tobin's Q	Market value of equity and book value of debt divided by total assets
ROA	Operating income divided by lagged total assets
Ratio of outside directors	Number of outside directors divided by total number of directors
Controlling shareholder ownership	Percentage of shares held by the controlling shareholders and her/his relatives
Ownership disparity	(Ownership by all affiliated shareholders) – (Ownership by the controlling shareholder)
Chaebol dummy	One if the firm belongs to one of the chaebol firms as listed in the Korea Free Trade Commission's *Annual Statistics*, zero otherwise
Foreign shareholder ownership	Percentage of shares held by foreign investors
Big audit firm dummy	One for firms audited by an auditor that is affiliated with one of the five largest audit firms in the United States, which are PwC (Pricewaterhouse Coopers), Deloitte Touche Tohmatsu Limited, KPMG, Ernst & Young, and Arthur Andersen
Cross-listing dummy	One if the company's shares are listed on the London, New York, or Luxembourg stock exchanges, zero otherwise
Class action act dummy	For firms with total assets over KRW 2 trillion: a value of one from year 2005, zero otherwise; for firms with total assets below KRW 2 trillion: a value of one from year 2007, zero otherwise

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