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ABSTRACT

Using data on directors' and officers' insurance policies gathered from a sample of Canadian firms, this article examines the determinants of firms' demand for D&O insurance. Firms with greater litigation risk are more likely to purchase insurance and carry higher limits and deductibles. The data do not support the hypothesis that director cash compensation substitutes for D&O insurance. Consistent with the hypotheses of Mayers and Smith (1982, 1987), firms with greater distress probability and utilities are more likely to purchase insurance and carry higher limits. However, firms with greater inside shareownership are less likely to purchase insurance and carry lower limits. Firms with greater inside voting control are more likely to purchase insurance and carry higher limits.

INTRODUCTION

Directors' and officers' (D&O) insurance is a unique type of corporate-owned insurance. The D&O policy is purchased and owned by the firm but covers the firm's directors and officers. Should a director or officer have to settle or defend a lawsuit related to his or her service to the firm, the D&O policy will reimburse the associated expenses (subject to the policy limit and deductible), provided that the director or officer had acted honestly and in good faith. The typical D&O policy combines two types of insurance coverage: corporate coverage—which reimburses the firm when it indemnifies a director or officer for the costs of a suit—and per-

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sonal coverage—which provides direct payment to a director or officer when the firm is not able to indemnify him by reason of law or because of financial distress.

Three sources of demand for D&O insurance are hypothesized: (1) demand for D&O personal coverage arising from writing an efficient contract with a risk-averse outside director; (2) demand for D&O corporate coverage arising from an efficient corporate insurance decision; and (3) the demand for D&O insurance arising from managerial entrenchment.¹ The separate personal coverage and corporate coverage portions of the D&O policy imply two sources of efficient demand for D&O coverage. First, a firm's demand for D&O personal coverage arises because its outside directors are risk averse. Because of the chance that the firm could not indemnify them in the event of a suit (Parry and Parry, 1991), risk-averse outside directors require D&O personal coverage or extra compensation as a condition of service. An efficient outside director compensation contract includes D&O personal coverage when other forms of director pay are lower, when litigation risk is higher, when distress probability is higher, or when the firm has greater growth opportunities. Second, a firm purchases D&O corporate coverage to insure its indemnity obligation for the same reasons it would purchase insurance to cover any other corporate liability (Mayers and Smith, 1982, 1987, 1990). It is efficient for a risk-neutral firm to forego self-insurance and purchase corporate insurance when it has greater expected distress costs, has greater need for real-service efficiencies, has greater growth opportunities, is rate-regulated, or has greater inside ownership.

However, managerial entrenchment prevents firms from writing efficient contracts: the entrenched managers contract to maximize their own rents, not those of the outside shareholders (Jensen, 1993; Shleifer and Vishny, 1995). A number of studies have documented that CEO compensation is higher at firms with more entrenched managers (e.g., Lambert, Larcker, and Weigelt, 1993; Core, 1996; Core, Holthausen, and Larcker, 1996). When managers are more entrenched, firms are expected to purchase more D&O insurance.

The data on D&O insurance come from a sample of Canadian publicly-owned firms, which are required to disclose the details of their D&O insurance policies in their proxy statements. Securities regulation, disclosure requirements, and the legal system in the United States and Canada are very similar. However, this Canadian sample has two important differences from a comparable U.S. sample. First, only two-thirds of this sample carries D&O coverage (compared to over 90 percent of U.S. public companies), so that it is meaningful to test for differences between firms with coverage and without coverage. Second, one-third of this sample has multiple classes of voting stock (compared to less than 5 percent of U.S. companies). As a result, it is possible to measure separately the entrenchment

¹ For the purposes of this article, "efficient" describes a contract or other decision that maximizes the firm's value to outside shareholders. In order for a contract to be efficient, it must be written by the shareholders acting as Stackelburg leader. When the manager (or other contracting party) acts as Stackelburg leader in writing a contract with the shareholders, this contract is by definition not efficient because all the rents go to the manager and not to the shareholders.

effects of insider control of share votes and the incentive alignment effects of insider ownership of share value.

Understanding demand for D&O insurance is important for three reasons. First, this article tests the Mayers and Smith (1982, 1987) hypotheses on the corporate demand for insurance using a cross-section of publicly-held firms in a variety of industries. Second, given the growing debate about the appropriate level of risk in board compensation (e.g., Jensen, 1993; Carey, 1995; Krivicky, Giardina, and Hatch, 1995) and given the limited academic research on director compensation, it is important to understand whether outside director pay is efficient from the perspective of outside shareholders. Third, given that demand for D&O insurance is in part derived from outside directors' perceptions of litigation risk, how demand for D&O insurance changes as litigation risk changes provides indirect evidence of the extent to which sophisticated individuals understand the risk associated with low-probability-high-loss events.²

In the next section, hypotheses are developed that relate a firm's characteristics to its decision to purchase D&O insurance and the amount of limit and deductible purchased. The following sections describe the data used to test these hypotheses, present the results of the empirical tests, and, finally, provide a brief conclusion.

HYPOTHESIS DEVELOPMENT

Hypotheses are developed under the following assumptions. The D&O insurance market is perfectly competitive, all of the decision-makers are rational, and the firm (the inside officers, outside directors, and shareholders) and insurer have symmetric beliefs about the probability and distribution of D&O losses.³ In this insurance market, there is no adverse selection and no screening. Any firm may purchase D&O insurance and may choose the policy limit it desires. The firm is charged a premium equal to the product of the probability of loss and the conditional expected loss plus a loading for the insurer's variable profit and administrative costs.

Interviews with a Canadian D&O broker and a Canadian D&O underwriter confirmed that these assumptions are reasonable. For the last five years, the Canadian D&O market has been highly competitive. At least ten insurers underwrite primary coverage for Canadian-only risks, but a large Canadian firm can purchase D&O insurance from another 30 to 40 firms underwriting in the United States and worldwide. The broker and underwriter characterized the current market for D&O insurance in Canada as a buyer's market because of high capacity among both

² D&O claims are low-probability-high-loss events: for an average U.S. company, D&O claims occur with a 7 percent annual frequency and a conditional cost of \$4 million (Wyatt Company, 1993). As discussed below, Canadian claims are less frequent and less severe than U.S. claims.

³ See Cummins (1991) for a discussion of the assumptions underlying symmetric information insurance contracting. The detailed D&O application form is explicitly structured so that the insurer and firm have symmetric beliefs about the firm's litigation risk at the time the insurance is priced. If the firm withholds any information relevant to its litigation risk, the insurer can use this omission to deny coverage in the event of a claim (Doyle, 1991).

D&O underwriters and reinsurers. The underwriter observed that, although there might be a very small number of firms that insurers would refuse to underwrite because of extreme risk ("screening"), the vast majority of firms could obtain insurance at some price, no matter how risky they were.⁴ When asked why so many Canadian firms did not carry D&O insurance, the underwriter stated that firms did not carry insurance because they believed that they did not need it. He conjectured that some of these firms may not have revised their beliefs to reflect the substantial increase in D&O litigation risk in Canada over the past five years. Thus, the assumption that directors have unbiased beliefs about litigation risk may be too strong.⁵

The foregoing assumptions are used to develop hypotheses that predict variation in firms' D&O insurance contracts. The following three subsections consist of an analysis of the demand for D&O personal coverage as part of an efficient outside director contract; the demand for D&O corporate coverage as the result of an efficient corporate purchase decision; and the demand for D&O insurance arising from managerial entrenchment. This analysis leads to hypotheses that relate a firm's characteristics to its decision to purchase D&O insurance and the amount of limit purchased. The final subsection develops a hypothesis that relates a firm's characteristics to the amount of the corporate deductible.

Demand for Personal Coverage

The personal coverage portion of D&O insurance protects directors (and officers) from losses in suits that cannot be indemnified, provided that the director acted honestly and in good faith. D&O insurance is often a part of an outside director's compensation package, which may also contain one or more of the following: a fixed component (cash or benefits), stock or stock options, and corporate indemnity.⁶ An efficient outside director compensation plan minimizes the firm's cost of obtaining outside directors of the ability it needs. The director will not serve unless the package offered meets his or her reservation utility. The combination of the firm's desire to minimize the cost of hiring a director of the desired ability and the director's reservation utility requirement imposes a restriction on the contract design. For example, the firm chooses a level of D&O coverage, and the director's reservation utility implies the level of other pay necessary to compensate the director for his or her time and for any uninsured risks. Thus, other forms of director compensation are hypothesized to be substitutes for D&O insurance, for a decrease

⁴ To the extent that any of these firms are in the sample, they will reduce the power of the hypothesis tests by biasing the coefficients toward zero.

⁵ That Canadian directors may be misinformed about the magnitude of risk they face is consistent with the findings of a 1995 Louis Harris survey of 403 outside directors of publicly-held U.S. firms, in which less than half of the respondents report that they are "very informed" about the types of risks covered and not covered by their D&O insurance. Moreover, 5 percent of those surveyed were not sure whether they were covered by D&O insurance. In addition, a substantial empirical literature indicates that individuals underinsure themselves against low-probability-high-loss events (Kunreuther, Sanderson, and Vetschera, 1985).

⁶ All firms are assumed to provide the full indemnity allowed by law, because the proxy statements do not state whether the firms not purchasing D&O provide indemnity (firms with D&O coverage by definition provide indemnity).

in the level of D&O insurance results in an increase in the amount of other pay required by the director as compensation for the additional risk (the "risk premium").

When litigation risk is very low, it is efficient for the firm not to buy insurance. Not purchasing insurance is efficient because the costs of the insurer's cost-and-profit loading and of the time involved in negotiating with the insurer are greater than the small risk premium that the director would require. When litigation risk increases, the director's risk premium is hypothesized to increase faster than the insurance premium, because the director is risk averse and the insurer is risk neutral. Thus, although there is a net cost to purchasing D&O insurance for low levels of litigation risk, once litigation risk becomes sufficiently large, the net benefits of purchasing D&O insurance increase with increases in litigation risk.⁷ Shareholders balance the cost of increasing the D&O insurance premium against the benefit of decreasing the director's risk premium. Accordingly, increases in the firm's litigation risk are hypothesized to lead to increases in the probability of purchasing D&O insurance and increases in the personal coverage limit. Moreover, because firms with greater distress probability are less likely to meet their indemnity obligations, they are hypothesized to be more likely to purchase D&O insurance and a higher personal coverage limit.

Outside directors perform two duties for shareholders: they approve investments in new projects (proposed by the firm's inside officers); and they motivate, monitor, and evaluate the insiders' performance in managing existing projects (Fama and Jensen, 1983). D&O insurance affects directors' relative motivation to fulfill these two duties. As the firm moves closer to full insurance, the directors become effectively less risk averse and less likely to reject attractive new risky projects. On the other hand, the directors will reduce their (unobservable) effort in monitoring insiders because there is a lower probability that shareholders can successfully discipline them with a lawsuit.⁸ Shareholders at firms with large growth opportunities are hypothesized to be more likely to purchase insurance and to carry higher limits, because the value of adopting positive-net present value projects more than offsets the costs of any reduced monitoring by directors. Moreover, because more of their value consists of volatile and intangible growth options, firms with greater growth opportunities have higher litigation risk, so that the arguments linking litigation risk to D&O insurance reinforce this argument. Conversely, a firm with limited growth opportunities is hypothesized to be less likely to purchase D&O insurance, because it wishes to impose risk on its directors to increase their

⁷ This hypothesis simplifies the subsequent empirical analysis considerably, because the net benefits of D&O purchase are increasing in litigation risk, and it is not necessary to observe the (unobservable) marginal cost of the insurance premium. The firm's hypothesized demand for D&O insurance induced by the director's risk aversion is similar to the demand for insurance by a risk-averse consumer when there is a positive loading, a large potential loss, and a small probability of loss: the consumer underinsures but increases the amount of insurance as the loss probability grows larger.

⁸ This observation follows from the fact that D&O insurance will pay claims unless there is incontrovertible evidence that the director acted improperly (Alexander, 1991).

efforts in monitoring insiders and to deter them from approving negative-net present value projects or value-destroying acquisitions.⁹

Demand for Corporate Coverage

The factors influencing the firm's decision to buy the corporate coverage portion of D&O insurance are the same as those influencing any of the firm's other corporate insurance decisions. Mayers and Smith (1982, 1987, 1990) observe that, when there are no contracting costs, self-insurance is always optimal, but firms with higher contracting costs are more likely to purchase corporate insurance.¹⁰ Thus, firms with higher distress probability are more likely to purchase D&O corporate coverage, because the insurance lowers the expected costs of bankruptcy. Smaller firms are more likely to purchase D&O insurance because of real-service efficiencies and because bankruptcy costs are proportionately higher for smaller firms. Just as firms with greater growth opportunities are more likely to purchase personal coverage, these firms are also more likely to purchase corporate coverage in order to avoid underinvestment problems. By purchasing D&O insurance and including the premium in its rates, a rate-regulated utility is able to include the expected value of future losses in its rates, while passing the cost of the insurance loading through to its customers (Mayers and Smith, 1982). Thus, a rate-regulated utility is expected to purchase more D&O insurance, because its shareholders benefit from the insurance while bearing none of the cost. While the incentive alignment effects discussed below suggest that firms with greater inside ownership purchase less insurance, Mayers and Smith hypothesize that firms with greater inside ownership will purchase more insurance because of the insiders' risk aversion.

Demand Resulting from Managerial Entrenchment

As is the case with many forms of compensation, managers are under no obligation to seek shareholder approval for the purchase of D&O insurance. If their compensation is not adjusted downward to reflect the insurance purchase, the inside officers enjoy all of the value of the insurance while paying only part of its cost. Ownership of the firm's shares by its managers has countervailing effects: an incentive alignment effect that increases with the percentage of share value owned by the managers (Jensen and Meckling, 1976) and an entrenchment effect that increases with the percentage of share votes controlled by the managers (Morck, Shleifer, and Vishny, 1988). As insiders' voting control over the firm increases, insiders are more able to ignore the preferences of outside shareholders, and the firm is more likely to have insurance. Conversely, as insiders' ownership of the

⁹ This argument parallels Jensen's (1993) argument that firms with high levels of free cash flow (i.e., low growth opportunities) should impose extra risk on their directors and managers (through required stock ownership) in order to prevent negative-net present value investments.

¹⁰ No separate prediction is made about the firm's expected marginal tax rate (MTR) as a determinant of the purchase of corporate coverage, because the MTR is difficult to observe. Also, any tax effects are at most second-order in magnitude, because D&O claims are infrequent and do not cover a depreciable asset (Main, 1983).

firm grows, their incentives become more aligned with those of the outside shareholders, litigation risk goes down, and the quality of outside directors required for monitoring is decreased, all of which lead to lower demand for D&O insurance. Moreover, insiders bear more of the cost of the insurance as their ownership grows while the benefits remain fixed. These arguments suggest that as the insiders' ownership percentage of the firm increases, the firm is less likely to carry D&O insurance.

Summary of Predictions for Demand for D&O Insurance

The three sources of demand for D&O insurance discussed above suggest several hypotheses relating firm characteristics to demand for D&O insurance, which are summarized below.

Variable	Sources of Demand for D&O Insurance			Hypothesized Net Effect on Demand for D&O
	Efficient Contracting with Directors	Efficient Corporate Insurance	Managerial Entrenchment	
Other Director Pay	-			-
Litigation Risk	+			+
Distress Probability	+	+		+
Growth Opportunities	+	+		+
Firm Size	+	-		?
Regulated Utility		+		+
Insiders' Share Ownership		+	-	?
Insider's Voting Control			+	+

Firms that have higher other director pay are hypothesized to be less likely to purchase D&O and carry lower limits, while firms with greater litigation risk, greater distress probability, greater growth opportunities, greater inside voting control, and utilities are hypothesized to be more likely to purchase D&O and carry higher limits. Because different sources of demand imply contradictory hypotheses on the role of size and inside ownership, the effects of these two variables are expected to be ambiguous.

Corporate Deductible

The corporate deductible serves to eliminate costly processing of small claims. Since these small claims are larger or are more frequent for firms with higher litigation risk, insurers set higher deductibles for riskier firms.¹¹ The underwriter I interviewed stated that, while firms had substantial discretion in their choice of limits, they had very limited ability to negotiate lower corporate deductibles. Furthermore, the size of the corporate deductible does not affect a director's risk premium, because the personal coverage portion of the insurance would cover the director if the firm were unable to meet its obligation to indemnify the director

¹¹ Firms also prefer a nonzero deductible, because they can process small claims at least as efficiently as the insurer and avoid the large loading the insurer would charge for processing small claims.

because of financial distress (Knepper and Bailey, 1993). Accordingly, the utility of outside directors and insiders is not affected by the size of the corporate deductible, but the firm and the insurer prefer a higher deductible when litigation risk is higher. Thus, the final hypothesis is that firms with higher litigation risk carry higher corporate deductibles and that litigation risk is the sole determinant of the size of the corporate deductible.

DATA

Sample and Data Sources

A sample of Canadian firms was chosen because they are required under Form 30 of the Ontario Securities Commission to disclose the details of their D&O insurance policies in their proxy statements (Alboini, 1993). The sample consists of a cross-section of 222 firms with fiscal years ending between June 1, 1993 and May 31, 1994. From an initial sample of 246 firms, 23 firms are excluded whose parents provided D&O insurance (because the decision to purchase D&O is made by the parent), and one firm is excluded that stated the intention to purchase D&O insurance but did not carry it.¹² Of the final sample of 222 firms, 139 (63 percent) carry D&O insurance.

The data used in this article were gathered from three sources: the company's annual report and proxy; the 1994 Canadian, annual, and full coverage *Compustat* tapes; and a daily stock price series and information on stock splits, dividends, and ex-dividend dates provided by the Toronto Stock Exchange. All independent variables are measured at the end of the fiscal year prior to the proxy disclosure of D&O insurance, under the assumption that the insurance was purchased at the beginning of the most recent fiscal year.¹³ All dollar amounts reported in this article are denominated in Canadian dollars.¹⁴ For those companies that report in U.S. dollars, amounts have been converted into Canadian dollars using a monthly series of the spot exchange rate (obtained from the *Datastream* service). Flow amounts such as income or director compensation (or amounts such as D&O limits and deductibles for which the purchase date was unknown) were converted at the 12-month average rate. Static amounts such as assets were converted at the month-end closing exchange rate.

Variable Measurement

This subsection first describes the measurement of the dependent (D&O insurance) variables. Second, the independent variables related to litigation risk are defined.

¹² The initial sample of 246 firms was obtained as follows. In March 1994, a request for annual reports and proxies was mailed to each of the 375 publicly-traded Canadian companies listed on *Compact Disclosure Worldscope*. A follow-up request was mailed in July 1994. Included in the sample are all companies for which a recent proxy (a proxy related to a fiscal year ending between June 1, 1993, and May 31, 1994) had been obtained by August 20, 1994.

¹³ Under the assumption that director compensation is determined at the beginning of each year, director compensation is measured during the fiscal year of D&O purchase.

¹⁴ To convert Canadian dollars into U.S. dollars, multiply the Canadian dollar figure by 0.8.

Next, the remaining independent variables are defined. Finally, the regression analysis used to create a measure of excess director compensation is described.

D&O insurance. The typical D&O policy in this sample contains no personal coverage deductible, a substantial corporate coverage deductible (CORP_DED), and identical corporate coverage and personal coverage limits (PERS_LIM).¹⁵ The personal coverage limit is used as the dependent variable in the subsequent empirical tests of the amount of insurance purchased.¹⁶ Data on whether D&O insurance was purchased (D&O_PURCH), personal coverage limits (PERS_LIM), and corporate coverage deductible (CORP_DED) were collected from the proxy statements. All 139 firms with D&O insurance provided information on the personal coverage limit, but only 125 of the firms disclosed data on the amount of the corporate deductible. The empirical distributions of the PERS_LIM and CORP_DED variables are highly skewed. In order to mitigate potential heteroscedasticity and the influence of a few extreme observations, the logarithms of these variables (lnLIMIT and lnDED) are modeled in the empirical tests below. Table 1 contains definitions and descriptive statistics for the D&O insurance variables.

Litigation risk. Firms with greater litigation risk are hypothesized to have greater demand for D&O coverage. Ten variables are employed as proxies for litigation risk, which previous research has found to be associated with D&O claims (Wyatt Company, 1993; Francis, Philbrick, and Schipper, 1993; Skinner, 1994; Core, 1996). The annualized volatility of the daily continuously compounded return for the year ending prior to the D&O purchase (STK_VOL) is expected to increase litigation risk by making stock price declines more likely. Because D&O claims often arise because of poor financial performance, litigation risk is expected to be negatively related to the firm's average return on assets (ROA) for the prior three years. Companies with disclosed pending or prior litigation (LIT_DISC) are expected to have higher litigation risk either because this litigation may lead to a D&O claim or because of a negative reputational effect.¹⁷ Because of differences in the Canadian legal system, Canadian D&O claims are expected to be less frequent and less costly than U.S. claims.¹⁸ Firms with a greater portion of their assets in the United States (US_ASSET%) or a U.S. exchange listing (US_EXCH)

¹⁵ The personal deductible is zero for 92 percent of the sample firms with insurance, and the highest personal deductible is C\$10,000.

¹⁶ While the arguments of Mayers and Smith (1982, 1987) discussed above suggest that it would be optimal for firms that were large, healthy, mature, and unregulated to purchase the personal coverage portion only and to self-insure their liability to provide indemnity, the data do not support this hypothesis. Of the 139 sample firms with D&O insurance, 136 have identical personal and corporate coverage limits, two firms self-insure their corporate indemnity agreements, and one firm has a corporate limit that is about 10 percent lower than the personal limit.

¹⁷ Romano (1991) finds that firms which have previously settled a shareholder suit are significantly more likely to be sued again by shareholders, a finding which she interprets as a negative reputational effect.

¹⁸ Canadian tort cases are typically settled by a judge alone; the contingent fee system is not widely used in Canada; in Canada the loser pays part of the winner's legal expenses; punitive damages are rarely granted by Canadian courts; and in Canada it is much more difficult to obtain class status (Trebilcock, 1987; Clarkson and Simunic, 1994).

Table 1
Definitions and Descriptive Statistics for
Directors' and Officers' Insurance Variables

Variable	Definition	N	Mean	Standard Deviation	Minimum	First Quartile	Median	Third Quartile	Maximum
D&O_PURCH	Dummy = 1 If Firm Has D&O Insurance	222	0.626	0.485	0.000	0.000	1.000	1.000	1.000
PERS_LIM	Limit on the Personal Coverage Portion of D&O Insurance (C\$m)	139	25.576	24.886	1.000	10.000	20.000	31.520	161.675
lnLIMIT	ln(PERS_LIM)	139	2.913	0.806	0.000	2.303	2.996	3.451	5.086
CORP_DED	Deductible on the Corporate Coverage Portion of D&O Insurance (C\$m)	125	0.477	1.307	0.010	0.100	0.250	0.500	12.934
lnDED	ln(CORP_DED)	125	-1.638	1.204	-4.605	-2.303	-1.386	-0.693	2.560

are expected to have greater litigation risk. Because D&O claims often arise because of mergers, acquisitions, and divestitures, litigation risk is expected to be positively related to whether the firm merged with or acquired another company in the prior year (ACQUIROR) and to whether the firm divested a business or sold or disposed of substantial assets in the prior year (DIVESTOR).¹⁹

Firms with greater distress probability are expected to be more likely to purchase D&O insurance because they have higher litigation risk, a greater probability of not meeting their indemnity requirements, and greater expected bankruptcy costs. Distress probability (DISTRESS) is defined as

$$\frac{-\log(\text{market value of total assets} / \text{total liabilities})}{10 \times \text{the standard deviation of the firm's return on assets for the prior three years.}}$$

This ratio is positively correlated with the exercise probability of a put option on the firm's assets with a strike price equal to the book value of the firm's liabilities (Cheung, 1991). The variable captures the fact that a combination of both financial leverage and volatile cash flows is required for bankruptcy to be likely. This variable is designed so that industries that are more highly leveraged in equilibrium (e.g., banks and utilities) are not mechanically assumed to have higher distress probability.

Larger firms are expected to have higher litigation risk. Size is measured with both the logarithm of total assets, $\ln\text{ASSETS}$ (to capture litigation risk associated with the scope of the firm's operations), and the logarithm of the market value of the firm's common stock, $\ln\text{MVEQ}$ (to capture litigation risk associated with the net benefits of a stockholder suit). However, while size increases litigation risk and increases demand for personal coverage, larger firms are expected to have less demand for corporate coverage, so that the net effect of size on D&O purchase is expected to be ambiguous.

Growth opportunities. The ratio of the market value of the firm's equity plus the book value of the firm's liabilities divided by the book value of the firm's assets (VALUE/A) is used as a proxy for growth opportunities. Firms with greater VALUE/A have more of their value in the form of growth opportunities as opposed to assets-in-place. Smith and Watts (1992) and Gaver and Gaver (1993) use variations of this measure to capture Myers' (1977) notion of growth opportunities versus asset-in-place. VALUE/A is hypothesized to be positively associated with D&O insurance.

Rate-regulated utilities. The dummy variable UTILITY is set equal to one for rate-regulated utilities (SIC codes 4600–4699, 4800–4813, 4900–4952, and 4954–4999). UTILITY is hypothesized to be positively associated with D&O insurance.

¹⁹ Mergers and acquisitions were identified through *Compustat* footnote codes describing the effect of mergers and acquisitions on the financial statements and cash flow statement data on cash paid for acquisitions and were cross-checked against the firm's annual report. Divestitures and asset sales and dispositions were identified by reading the annual reports of firms that had special items and income from discontinued operations in excess of 3 percent of total assets.

Inside ownership. INS_VALUE% is the percentage of the firm's total value owned by inside directors.²⁰ Risk aversion effects suggest that the INS_VALUE% variable is positively related to the purchase of D&O corporate coverage, while the incentive alignment effects and reduction in agency problems associated with increases in INS_VALUE% suggest that it is negatively related to the purchase of D&O coverage, so that the net effect of INS_VALUE% on D&O purchase is expected to be ambiguous.

Inside voting control. INS_VOTE% is the percentage of share votes controlled by inside directors. This variable is empirically distinct from INS_VALUE% because this Canadian sample contains a substantial proportion of firms (32 percent) with multiple classes of stock.²¹ Increases in the INS_VOTE% variable are expected to result in increases in managerial entrenchment, and INS_VOTE% is hypothesized to be positively associated with D&O insurance.

Control variable. The percentage voting control by a firm's corporate parent (PAR_VOTE%) is included as a control variable. Increases in this variable are expected to decrease the likelihood and amount of D&O coverage under the assumption that the financial resources of a corporate parent provide implicit indemnity to subsidiary directors. In addition, this variable is likely to be negatively related to the probability of D&O insurance purchase for the mechanical reason that all companies whose parents provided D&O insurance have been selected out of the sample.

Director compensation. The standardized residual from a regression of director cash compensation on its hypothesized economic determinants (EXCESS_PAY) is used as a measure of excess director compensation. EXCESS_PAY is hypothesized to be a substitute for D&O insurance, and thus to be negatively associated with D&O insurance.²² This residual is created using the regression Model 1 summarized in Table 2, which assumes that director cash compensation may be approximated by a linear function of the complexity of the outside directors' duties and the firm's demand for high-quality outside directors (lnASSETS, lnMVEQ, and VALUE/A); firm risk (STK_VOL and US_EXCH); shareownership (INS_VALUE% and PAR_VOTE%); and a dummy variable equal

²⁰ Canadian firms are required to disclose stock ownership only for those inside officers who are also directors; U.S. firms are required to disclose holdings by both inside officers who are directors and inside officers who are not directors.

²¹ Canada has no analogue to U.S. securities regulations, such as the NYSE rules which substantially restrict multiple classes of voting stock (Montgomery and Leighton, 1993). Some sample companies have common stock with no voting rights; others have a class of stock with 100 times the votes of the other class.

²² As discussed above, efficient contracting implies that the director's reservation utility constraint holds with equality, thereby imposing a restriction on the relationship between the value of D&O insurance and the value of other pay. Accordingly, although the choice of D&O insurance and other director pay depends on the same exogenous variables, this restriction implies that the residual from a properly specified model of board pay is opposite in sign and equal to the value of over- or underinsurance.

to one if directors receive stock options or stock grants (DIRSTOCK).²³ Twelve dummy variables in the regression control for industry differences. Because I wish to create residuals that reflect unusually high or low director pay, I mitigate the effects of leveraged outliers in the regression by weighting the individual observations using the bounded influence technique suggested by Welsch (1980).

Table 2
Weighted Least Squares Estimates of Director Cash Compensation

Variable	Expected Sign	Model 1		Model 2	
		Coefficient	t-Statistic ^a	Coefficient	t-Statistic ^a
lnASSETS	+	1,750	2.88	1,620	2.69
lnMVEQ	+	1,761	2.99	1,856	3.18
VALUE/A	+	-1,407	-1.86	-1,438	-1.91
STK_VOL	+	-1,981	-1.10	-1,982	-1.16
US_EXCH	+	2,200	1.70	2,148	1.66
INS_VALUE%	-	-4,331	-1.45	-3,498	-1.14
PAR_VOTE%	?	1,102	0.54	1,692	0.81
DIRSTOCK	-	-713	-0.55	-588	-0.46
D&O_PURCH	-			604	1.42
N		222		222	
Number of Regressors ^b		21		22	
Adjusted R ²		45.1%		45.2%	
Model p-Value		0.0001		0.0001	

Note: Dependent variable is director cash compensation (in Canadian dollars), estimated by the sum of the board annual retainer, the average annual retainer paid to a committee chair, eight times the per-meeting board fee, and three times the per-meeting committee fee. Independent variables are defined in Table 3. Coefficient estimates are obtained from weighted least squares estimation, where the observations have been weighted using the method of Welsch (1980). This two-step procedure gives DFFITSs with absolute value greater than 0.63 a weight equal to $.63/abs(DFFITS)$, and all other observations receive a weight of 1. A DFFITS is a standardized measure of the influence of an observation, and is considered small when its absolute value is near zero. An observation with a studentized residual of 1.96 would have an expected $|DFFITS|$ of 0.63 in these regression models (Belsley, Kuh, and Welsch, 1980).

^a T-statistic based on White (1980) standard error.

^b Number of regressors includes variables shown, 12 industry dummy variables, and a constant.

²³ While director total compensation might include benefits such as retirement or medical plans, these board compensation components are not included in the analysis because their use by the sample firms is negligible.

The EXCESS_PAY variable is likely to be a noisy proxy for excess director pay because of the following weaknesses in the specification of the regression model. The dependent variable is a noisy measure of director cash compensation and may overstate director compensation for smaller firms (which tend to have fewer board meetings) and understate director compensation for larger firms.²⁴ Also, this measure omits the unobservable, but potentially large, value of information directors gain from their board service (Manne, 1966). The DIRSTOCK variable is a noisy proxy for the value of the outside director's stock compensation. Noise in EXCESS_PAY only weakens the subsequent hypothesis test; but a correlated omitted variable would bias the test. For example, if the control variables in the director compensation regression did not adequately capture firms' demand for high-quality outside directors, then the EXCESS_PAY variable would partially capture firms' demand for high-quality directors, which may be positively associated with the D&O purchase and limit decision.

In Model 1, the signs of the coefficients are as expected, with the exception of those for the STK_VOL and VALUE/A variables. Director cash pay is higher at larger firms with a U.S. exchange listing. The negative, but insignificant, coefficient on insider ownership is consistent with the interpretation that firms with greater inside ownership require less monitoring and less qualified outside directors. The negative and significant coefficient on the proxy for growth opportunities (VALUE/A) is in contrast to the findings and theory of Smith and Watts (1992), who hypothesize that firms with greater growth opportunities require decision-makers with more valuable skills.

As a preliminary test of the hypothesized substitution of D&O insurance for cash compensation, D&O_PURCH (a dummy variable equal to one if the firm carries D&O insurance) is added to Model 2. The coefficient on this variable is positive, providing no support for the hypothesis that D&O insurance substitutes for cash director pay.

Missing Data Imputation and Descriptive Statistics

Little (1992) notes that complete case analysis (where observations with any missing values are discarded) is an excessive waste of information. This problem is particularly severe in this study where the sample size is small, and the number of explanatory variables is large, and even a small number of observations missing at random may cause a large number of incomplete cases.²⁵ Following Little, missing data are imputed through a conditional mean procedure, in which ordinary least squares regressions are used to impute missing values of the independent

²⁴ The actual amount of director cash compensation is not disclosed in the proxy statement, so it is estimated by the sum of the board annual retainer, the average annual retainer paid to a committee chair, eight times the per-meeting board fee, and three times the per-meeting committee fee.

²⁵ No data were missing for any of the ownership variables, nor were any data missing for the lnASSETS, lnMVEQ, or VALUE/A variables. Data on ROA and DISTRESS were missing for seven observations. Data on STK_VOL were missing for three firms not listed on the TSE. Thirteen observations of US_ASSET% were coded as missing, all of which firms had operations in the United States but did not disclose precisely what proportion of their assets these operations represented.

variables. No missing values of the dependent variables (lnLIMIT or lnDED) are imputed, nor are any of the dependent variables used to impute missing independent variables. Table 3 presents descriptive statistics for the independent variables defined above.

RESULTS

A logit model is used to test hypotheses about the D&O insurance purchase decision, and ordinary least squares regression models are used to test the hypotheses about the limit and corporate deductible.²⁶

D&O Purchase Decision and Limit

The logit model for the D&O purchase decision and the regression model for the logarithm of the personal limit are significant with p-values less than 0.01 (see Table 4). The logit model is very successful in predicting firms that carry D&O insurance (correct prediction rate of 76 percent), but it is unsuccessful in predicting firms that do not carry D&O insurance (correct prediction rate of 34 percent).²⁷ These results suggest that variables useful in predicting the decision not to purchase D&O insurance may be omitted from the model. In separate tests (not reported), and consistent with the assumptions underlying the hypotheses, the null hypotheses of no adverse selection and no screening are not rejected.²⁸ Although the difficulty of predicting the non-purchasers is consistent with the conjecture that firms not carrying the insurance have not adequately revised their beliefs to reflect the substantial increase in litigation risk in Canada in the last five years, it is not possible to create a proxy variable for insufficiently updated prior beliefs.

²⁶ Heckman (1979) models are also estimated. These models employ a first-stage probit model for D&O in order to correct for potential biases in the coefficient estimates for lnLIMIT and lnDED caused by the predictability of the D&O purchase decision. In both cases, these models indicate no selection bias. Accordingly, only the ordinary least squares parameter estimates are reported, which are more efficient than the Heckman estimates given no selection bias. A tobit specification is inappropriate because the limit and deductible cannot take on negative values (Maddala, 1983).

²⁷ A one-step quasi-jackknife procedure is used to assess the prediction rate of the logit model. This procedure removes the effect of the *j*th observation from the coefficient estimate and uses this revised coefficient estimate to predict the *j*th observation (SAS Institute, 1994).

²⁸ To test the null hypotheses of no adverse selection and no screening, a summary measure of litigation risk is created from the coefficients obtained from a reduced-form regression of the logarithm of the D&O premium on the agency problem proxies and litigation risk proxies (112 observations). Separate logit models are then fit, which include the litigation risk summary measure and a spline variable for the firms in the highest and lowest 5 percent of the distribution of the litigation risk proxy. A coefficient on the spline variable significantly less than zero would reject the null hypothesis of screening. A coefficient on the spline variable significantly greater than zero would reject the null hypothesis of no adverse selection. Neither of the coefficients of the spline variables are significant (p-value > 0.39). The power of these tests is low because they examine behavior in the tails of the distribution of a small sample (Kroner and West, 1995).

Table 3
Definitions and Descriptive Statistics for Independent Variables (N = 222)

Variable	Definition	Mean	Standard Deviation	Minimum	First Quartile	Median	Third Quartile	Maximum
EXCESS_PAY	Standardized Residual Director Cash Compensation from Regression Presented in Table 2	0.000	1.000	-2.483	-0.574	-0.018	0.415	5.066
STK_VOL	Annualized Standard Deviation of One Year of Daily Continuously Compounded Returns	0.401	0.286	0.092	0.220	0.303	0.499	2.087
ROA	Average Return on Assets for Prior Three Years	0.033	0.108	-0.546	0.008	0.052	0.083	0.279
LIT_DISC	Dummy Variable = 1 If Firm Disclosed Prior or Pending (in the Previous Year) Litigation in Either Its Annual Report or Proxy	0.477	0.501	0.000	0.000	0.000	1.000	1.000
US_ASSET%	Percent of Assets in United States	0.183	0.240	0.000	0.000	0.113	0.271	1.000
US_EXCH	Dummy Variable = 1 If Firm Is Listed on U.S. Exchange	0.297	0.458	0.000	0.000	0.000	1.000	1.000
ACQUIROR	Dummy Variable = 1 If Firm Made a Merger or Acquisition in the Prior Year	0.302	0.460	0.000	0.000	0.000	1.000	1.000

(Continued)

Table 3 (Continued)

Variable	Definition	Mean	Standard Deviation	Minimum	First Quartile	Median	Third Quartile	Maximum
DIVESTOR	Dummy Variable = 1 If Firm Divested a Business or Sold or Disposed of Assets in the Prior Year	0.090	0.287	0.000	0.000	0.000	0.000	1.000
DISTRESS	$-\ln(\text{Market Value of Assets} / \text{Total Liabilities}) / (10 \times \text{Standard Deviation of Prior Three Years' Return on Assets})$	-3.898	6.144	-64.426	-4.907	-1.866	-0.797	-0.010
lnASSETS	$\ln(\text{Total Assets in Millions of C\$})$	6.505	1.763	2.274	5.208	6.409	7.650	11.837
lnMVEQ	$\ln(\text{Market Value of Equity in Millions of C\$})$	5.690	1.566	0.888	4.787	5.673	6.817	9.450
VALUE/A	$(\text{Market Value of Firm's Equity} + \text{Book Value of Liabilities}) / \text{Book Value of Total Assets}$	1.411	0.943	0.568	0.993	1.119	1.409	7.270
UTILITY	Dummy Variable = 1 If Firm Is a Rate-Regulated Utility (SIC Codes 4600-4699, 4800-4813, 4900-4952, and 4954-4999)	0.063	0.244	0.000	0.000	0.000	0.000	1.000
INS_VALUE%	Percentage of Share Value Owned by Inside Directors	0.098	0.166	0.000	0.000	0.003	0.164	0.780
INS_VOTE%	Percentage of Share Votes Controlled by Inside Directors	0.165	0.262	0.000	0.000	0.003	0.217	1.000
PAR_VOTE%	Percentage of Share Votes Controlled by Corporate Parent	0.116	0.242	0.000	0.000	0.000	0.000	0.998

Table 4
Logit Estimates of the Probability of D&O Insurance
Ordinary Least Squares Estimates for lnLIMIT

Variable	Expected Sign	Logit Estimates for D&O PURCH		OLS Estimates for lnLIMIT	
		Coefficient	t-Statistic ^a	Coefficient	t-Statistic ^b
INTERCEPT		-0.127	-0.12	1.424	4.10
EXCESS_PAY	-	0.269	1.53	0.072	2.10
STK_VOL	+	-0.727	-0.88	-0.414	-1.97
ROA	-	1.064	0.63	0.174	0.31
LIT_DISC	+	0.665	1.96	0.231	2.16
US_ASSET%	+	1.384	1.75	0.154	0.47
US_EXCH	+	0.344	0.88	0.348	3.23
ACQUIROR	+	0.414	1.09	-0.016	-0.14
DIVESTOR	+	0.884	1.40	0.322	1.94
DISTRESS	+	0.048	1.65	0.014	3.96
lnASSETS	?	0.230	1.35	0.198	3.61
lnMVEQ	?	-0.249	-1.16	-0.001	-0.02
VALUE/A	+	0.324	1.38	0.079	1.58
UTILITY	+	1.339	1.61	0.355	1.96
INS_VALUE%	?	-5.246	-2.91	-1.550	-3.07
INS_VOTE%	+	2.608	2.06	0.412	1.91
PAR_VOTE%	-/?	-1.601	-2.33	0.019	0.08
N		222		139	
McFadden R ²		13.6%			
Adjusted R ²				43.2%	
Model p-value		0.001		0.0001	
139 Firms with D&O:					
Correctly Predicted (%)		106	76.3%		
83 Firms Without D&O:					
Correctly Predicted (%)		28	33.7%		
Overall		134	60.4%		

Note: Dependent variables are a dummy variable equal to one if firm purchased D&O insurance and the logarithm of the personal coverage limit (in millions of Canadian dollars). Independent variables are defined in Table 3.

^a T-statistic based on maximum likelihood standard error.

^b T-statistic based on White (1980) standard error.

Neither the logit model nor the regression model for the logarithm of the limit support the hypothesis that other forms of director pay substitute for D&O compensation: firms with higher excess director pay (EXCESS_PAY) are more likely to carry D&O insurance coverage and purchase higher limits. These results are in contrast to the predictions of models based on efficient contracting, such as Parry and Parry (1991), and to the common assumption that various compensation components are substitutes. These results are more consistent with compensation components becoming complements because they are bundled together by an insider who does not internalize their cost, or because little attention is given to designing director compensation plans.²⁹ In other words, managerial entrenchment may prevent efficient contracting with outside directors.

The results presented in Table 4 are consistent with the hypothesis that firms with higher litigation risk are more likely to purchase D&O insurance and carry higher limits. Excluding the two size proxies, six of the eight litigation risk proxies have the hypothesized signs in the logit model, and five of the eight litigation risk proxies have the hypothesized signs in the regression model, although STK_VOL and ROA have unexpected signs in both models. These unexpected signs may result from multicollinearity in the litigation risk measures (STK_VOL has high negative correlations with ROA and both size measures). Firms with a disclosure of pending or prior litigation are significantly more likely to purchase insurance and carry significantly higher limits. Although the percentage of a firm's operations located in the United States (US_ASSET%) is a significant determinant of the decision to purchase insurance, it does not have a significant impact on the choice of the limit; conversely, firms with a U.S. exchange listing (US_EXCH) purchase significantly higher limits but are not significantly more likely to purchase insurance. Since a U.S. exchange listing exposes firms to a greater probability of a non-indemnifiable shareholder derivative suit, it makes sense that US_EXCH is a significant determinant of the personal coverage limit; however, the same logic implies that US_EXCH would be a significant determinant of the decision to purchase insurance (which it is not). Divesting firms (DIVESTORS) are more likely to purchase insurance, and purchase significantly more insurance. However, acquiring firms (ACQUIRORS) are not significantly more likely to purchase insurance, nor do they purchase more insurance.³⁰

Firms with higher distress probability (DISTRESS) are significantly more likely to purchase insurance and carry higher limits, which is consistent with the hypotheses that these firms demand more insurance because of their higher litigation risk and in order to minimize bankruptcy costs.

²⁹ As discussed above, the interpretation of this result is colored by the fact that the EXCESS_PAY variable is a noisy and potentially biased proxy. However, no specification of either model could be found in which board pay achieved its expected negative sign. For example, the *level* of director pay is positive and significant when included in the logit and ordinary least squares models and when included as an instrumented variable in a model for lnLIMIT.

³⁰ This result is not driven by the fact that the ACQUIROR variable includes a number of firms making small acquisitions. ACQUIROR is not significantly positively associated with D&O insurance if ACQUIROR is redefined to include only firms that made acquisitions that increased their assets by 20 percent or more.

Neither size variable is significant in the logit model, which is consistent with the interpretation that size has offsetting effects on firms' decisions to purchase D&O insurance: because of their higher litigation risk, larger firms are more likely to purchase personal coverage, but, because they have lower bankruptcy costs and lower need for claims administration, larger firms are less likely to purchase corporate coverage. Consistent with the hypothesis that firms with higher litigation risk purchase more personal coverage, larger firms (as measured by $\ln\text{ASSETS}$) purchase significantly higher limits. However, the limit as a proportion of firm size decreases as firm size increases (the coefficients on $\ln\text{ASSETS}$ and $\ln\text{MVEQ}$ are both significantly less than one), consistent with the hypothesis of Mayers and Smith (1982) that larger firms purchase proportionately less insurance than smaller firms. Surprisingly, firms with greater stock value (which are more attractive targets for stockholder suits) do not carry significantly higher limits.³¹

Consistent with the hypotheses that firms with greater growth opportunities purchase more D&O insurance in order to improve directors' decision-making and to avoid underinvestment, firms with greater VALUE/A are more likely to purchase insurance and purchase more insurance (one-sided p -values < 0.10). However, the result is statistically fragile. If either size measure is dropped from the models, the VALUE/A variable loses significance in the logit model, although it retains significance in the better-specified model for $\ln\text{LIMIT}$, in which $\ln\text{ASSETS}$ is included as the sole size measure. In a logistic regression model (not shown), firms are significantly more likely to grant options and stock to their directors when they have higher growth opportunities (contrary to the intuition that firms with greater growth opportunities would wish to impose less risk on their directors). Firms with greater growth opportunities tend to be cash-constrained, and, as part of an overall strategy to conserve cash, these firms may substitute noncash compensation (such as stock options) for an otherwise optimal amount of insurance.

Utilities are more likely to purchase insurance, and purchase significantly higher limits, consistent with the Mayers and Smith (1982) hypothesis that rate-regulated firms carry more insurance coverage.

Firms with higher levels of insider stock ownership (INS_VALUE\%) are significantly less likely to carry insurance and carry significantly lower limits. This finding indicates that the benefits of improved incentives and monitoring associated with concentration of insider ownership dominate the costs of reduced risk-sharing. Firms with higher levels of insider voting control (INS_VOTE\%) are significantly more likely to purchase insurance and carry higher limits.³² This result is consistent with the interpretation that managers use their voting control to divert resources from outside shareholders, and is consistent with Eckbo and

³¹ These findings on size are not the result of collinearity in the size measures. The same qualitative results are obtained if either size measure is dropped.

³² These results are not an artifact of the high correlation between the INS_VALUE\% and INS_VOTE\% variables. If INS_VOTE\% is replaced by a variable measuring the excess of votes over value controlled by insiders (INS_VOTE\% minus INS_VALUE\%), this variable is positive and significant and INS_VALUE\% remains negative and significant.

Verma's (1994) findings on dividend policy and Core's (1996) findings on CEO compensation.

Sensitivity Analysis

The overall results are robust to alternative model specifications. With the exception of the impact on VALUE/A discussed above, the remaining qualitative results are unchanged if either size variable is dropped from the models. Because EXCESS_PAY is by construction almost orthogonal to the remaining regressors, its deletion has no impact on inference. Inference is unaffected if the single most influential observation, as identified by Pregibon's (1981) \bar{c} statistic or Belsley, Kuh, and Welsch's (1980) DFFITS statistic, is deleted from the logit or ordinary least squares model, respectively. Inference is also unaffected if the most influential observations in each of the logit and ordinary least squares models are down-weighted following the bounded influence technique of Welsch (1980).

Corporate Deductible

Estimated results for the logarithm of the corporate deductible are consistent with the hypothesis that firms with higher litigation risk carry higher corporate deductibles (see Table 5). Model 1 contains the full set of variables, and Model 2 contains only the hypothesized litigation risk measures. In both models, seven of the ten litigation risk variables have the hypothesized signs, and STK_VOL, US_ASSET%, US_EXCH, lnASSETS, and lnMVEQ are significant. A partial F-test is unable to reject the hypothesis that the explanatory power of Model 1 is greater than that of Model 2, which is consistent with the hypothesis that only litigation risk affects the size of corporate deductibles.

The ACQUIROR and DIVESTOR variables have the wrong signs in both models but are insignificant. The corporate deductible may not reflect past acquisitions and divestitures because these events do not lead to greater litigation from third parties (which would be covered under the corporate coverage portion), but lead to greater litigation from shareholders (which would typically be covered under the personal coverage portion). The insignificant coefficients on the LIT_DISC variable in the models for the corporate deductible suggest that LIT_DISC may not be a proxy for litigation risk (since the actuary who sets the deductible does not increase it to reflect LIT_DISC). The positive and significant coefficients on LIT_DISC in the D&O purchase and limit models suggest that LIT_DISC may instead proxy for the fact that firms that have been exposed to prior litigation are more aware of the risks of litigation, and consequently have a greater demand for insurance.

Table 5
Ordinary Least Squares Estimates for lnDED

Variable	Expected Sign	Full Model		Restricted Model	
		Coefficient	t-Statistic ^a	Coefficient	t-Statistic ^a
INTERCEPT		-5.567	-8.96	-5.701	-10.55
EXCESS_PAY	?	0.128	1.65		
STK_VOL	+	0.838	2.21	0.690	2.23
ROA	-	-0.464	-0.90	-0.372	-0.59
LIT_DISC	+	-0.091	-0.60	-0.062	-0.42
US_ASSET%	+	1.169	4.01	1.230	4.54
US_EXCH	+	0.415	2.28	0.320	1.74
ACQUIROR	+	-0.219	-1.37	-0.152	-0.92
DIVESTOR	+	-0.131	-0.59	-0.141	-0.59
DISTRESS	+	0.001	0.12	0.007	0.95
lnASSETS	+	0.325	4.16	0.392	6.49
lnMVEQ	+	0.251	2.85	0.160	2.32
VALUE/A	?	-0.226	-2.05		
UTILITY	?	-0.311	-0.81		
INS_VALUE%	?	0.099	0.16		
INS_VOTE%	?	0.201	0.49		
PAR_VOTE%	?	0.200	0.59		
N		125		125	
R ²		56.3%		53.9%	
Adjusted R ²		49.9%		49.9%	
Model p-Value		0.0001		0.0001	
F-Test for Restriction				0.99	
p-Value				0.44	

Note: Dependent variable is the logarithm of the corporate deductible (in millions of Canadian dollars). Independent variables are defined in Table 3.

^a T-statistic based on White (1980) standard error.

CONCLUSION

This article examines three sources of demand for directors' and officers' insurance: the efficient demand arising from writing a contract with a risk-averse outside director; the efficient demand for corporate insurance discussed by Mayers and Smith (1982, 1987, 1990); and the demand for insurance arising from managerial entrenchment. Consistent with efficient outside director contracting, firms with greater litigation risk and higher distress probability are more likely to purchase D&O insurance and carry higher limits. However, the data do not support the hypothesis that D&O insurance and director cash compensation are substitutes. The findings on distress probability and rate regulation are consistent with the de-

terminants of corporate insurance purchases hypothesized by Mayers and Smith (1982, 1987). Even though the hypotheses based on efficient outside director contracting and efficient corporate demand for insurance both predict a positive relation between growth opportunities and D&O insurance purchases, the empirical evidence of a positive relation is weak and not robust. In contrast to the prediction of Mayers and Smith (1982) and to the findings of Mayers and Smith (1990), firms with higher levels of inside shareownership are less likely to purchase insurance and carry lower limits. Firms with greater managerial entrenchment, measured by low inside ownership and high inside voting control, are more likely to purchase D&O insurance and carry higher limits.

Three findings—sample firms without D&O coverage are difficult to predict; there is no evidence of substitution between D&O insurance and cash compensation; and a disclosure of prior litigation increases the limit but not the deductible—suggest that some outside directors may not understand the risks that they face. This study's findings on this issue are limited by the small sample size and the weak proxy for director compensation. Whether outside directors have unbiased beliefs about the risks to which they are exposed and how directors' decisions are affected by the risk imposed by their compensation contracts are promising areas for future research.

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