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D&O insurance and IPO performance: What can we learn from insurers?

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ABSTRACT

We investigate whether a firm's directors' and officers' liability insurance contract at the time of the IPO is related to insured firms' first year post-IPO performance. We find that insurers charge a higher premium per dollar of coverage to protect the directors and officers of firms that will subsequently have poor first year post-IPO stock performance. A higher price of coverage is also associated with a higher post-IPO volatility and lower Sharpe ratio. Our results are robust to various econometric specifications and suggest that even when the high level of information asymmetry inherent to the IPO context prevails, insurers have information about the firms' prospects that should be valuable to outside investors.

1. Introduction

When a firm goes public, investors typically know very little about the cash flow prospects of a firm. A high level of information asymmetry prevails during the initial public offering of a firm.

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Investors are cognizant of governance risk, yet as of today, there is no easy and reliable way to assess this particular type of risk. As representatives of the corporation, directors and officers are personally liable[1] for damages caused by the corporation's actions, or absence thereof. Having their personal wealth exposed to such an important liability risk induces managers to request protection in the event a lawsuit is brought against them as representatives of the corporation. This insurance, known as directors' and officers' liability insurance (D&O insurance hereinafter), is extremely common in public corporations.[2]

The goal of this paper is to assess whether the information that insurers acquire in their underwriting process is valuable for capital markets. To achieve this goal we use a sample of Canadian firms that have become public through an initial public offering and that had the opportunity to purchase D&O insurance before the IPO to cover their directors and officers in the event of a costly lawsuit. Our results show that the higher a firm's D&O insurance premium per dollar of coverage (which is known as the *rate-on-line* in the insurance industry), the higher the firm's stock market volatility and idiosyncratic risk in the first year after the IPO, and the lower its return. In other words, firms that insurers deem riskier at the time of the IPO have a lower (higher) stock market return (risk or volatility) in the first year post-IPO. Our results suggest that D&O insurers possess information that could be valuable to stock market participants. The results are robust to many econometric specifications (simultaneous equations, treatment effects) and robustness checks. Although further research is needed to formally test it, the results in this paper imply that the price of D&O liability insurance may be used as an assessment of a firm's governance risk; such information could prove to be valuable to market participants.

Our results provide new insights into the insurers' ability to price risk. Baker and Griffith (2007a) find that corporate governance is key in the insurance underwriting process and the main focus of insurers' risk evaluation. Insurers are interested in a firm's "deep governance" features, i.e. the *culture* within the firm as well as its executives' *character*. Provided that insurers use the correct technology to transform a firm's characteristics into a D&O liability insurance premium, the insurance contract should provide information on the firm's prospects, the quality of its management team and its "deep governance" features. Furthermore, insurers have the appropriate incentives to correctly measure the expected cost of litigation so that the structure of a D&O insurance contract could prove to be an unbiased measure of a firm's governance risk. As suggested by Griffith (2006), disclosing D&O insurance information to capital markets could be used as an antidote for the failure of boards to properly monitor managerial behavior. A *"managerial character score"* such as this one would be similar to credit ratings that are default probability indicators.

The results in this paper have several financial economics implications. First, the positive correlation between insurance pricing and stock market volatility reconciles economic theory with empirical evidence by providing the literature's missing link: insurers charge a higher price *ex ante* to firms that are riskier *ex post*. Second, our findings are of interest for the asset pricing literature inasmuch as one believes that D&O insurance providers have a technology that allows them to assess one type of risk. This means that the rate-on-line should be priced in the cross-section of returns in such a way that a factor constructed to capture the excess return of firms with a low rate-on-line over firms with a high rate-on-line should have a significant coefficient. Because of the low number of observations, we are currently unable to perform such an empirical asset pricing test.

Third, our results provide a potential evaluation tool for investors in firms in which information asymmetry is important. This tool should be especially valuable when investors are looking for a way to assess the management quality and the risk associated with governance issues. A growing body of research suggests that a one-size-fits-all governance structure is ineffective in improving firm performance (see Larcker and Tayan, 2013). It seems instead that what matters are individual managerial characteristics and qualities. And as D&O insurance prices reflect an insurer's assessment of a firm's "deep governance", a firm's rate-on-line should therefore be related to its personal and personnel

[1] A corporate director's duty goes beyond a simple firm value maximizing paradigm to include a fiduciary duty, a duty of loyalty and a duty of care.

[2] According to different Towers-Watson surveys (that were in the past published by Tillinghast Towers-Perrin, and before that by Watson-Wyatt), approximately 95% of public corporations in the United States and 75% of public corporations in Canada provide such insurance to their managers.

characteristics. Although our results point in this direction, further research is needed to formally evaluate the extent to which D&O insurance information may substitute commercial governance indices.

The volatility and return results complement each other and are two sides of the same coin. If one was to interpret post-IPO volatility as a proxy for information asymmetry (or risk unknown to the market at the time of the IPO), then it would follow that, as investors become aware of additional risks after the IPO, realized returns drop. Both results suggest that insurers have information that investors do not have and that they value. Our results speak to the risk perceived by the insurance companies, provide a missing link in the literature, and complement the results stemming from the managerial incentives in Chalmers et al. (2002), the study closest to ours. Indeed, whereas Chalmers et al. (2002) find that insurers penalize abnormal insurance coverage purchased at the time of the IPO, they cannot find a significant relationship between post-IPO returns and the premium paid by firms. Moreover, they find a negative relationship between post-IPO volatility and the price of coverage, which they find puzzling.

The remainder of the paper is organized as follows. Section 2 presents a short primer on directors' and officers' insurance contracts. We develop the hypotheses and describe the data in Section 3, and present the main results of the paper in Section 4. Section 5 is devoted to robustness checks. Section 6 concludes with a discussion.

2. Directors' and officers' insurance: a primer

Directors' and officers' liability insurance contracts cover corporate directors and officers against lawsuits brought against them as representatives of the corporation. Diverging interests mixed with asymmetric information between managers (including both directors and officers) and shareholders is the main source of conflict, and potentially the costliest. The insurance company will reimburse the corporation and/or its managers for the costs of settling and defending the lawsuit up to the policy limit, provided the firm's directors and officers have acted honestly and in good faith. In theory, should managers and their company have acted in a fraudulent manner, the insurance company could decide not to honor the policy (see Weisdom et al., 2006, for more details on the three distinct types of coverage that are included in D&O insurance policies). Baker and Griffith (2008) argue that shareholders are the most likely firm stakeholders to sue directors and officers, and that security class actions on the basis of misrepresentation are the most costly type of lawsuits (also see the different Towers-Watson[3] surveys). The threat of a class action lawsuit is so important that it prompts firms to significantly invest in decreasing the potential cost of agency problems (see McTier and Wald, 2011).

2.1. Timing of D&O insurance information release

An important feature is the timing of information release in the Canadian investment context since the release of D&O insurance information generally occurs much later after its purchase. The figure in Appendix A provides a typical timeline of the purchase and release of D&O insurance information for the firms that are becoming public through an IPO. See Appendix B for examples of information that can be found in management proxies related to the D&O insurance contract and that illustrate the timing of the purchase of D&O insurance and information release.

2.2. The pricing of D&O insurance coverage

Insurance companies must accurately assess the potential cost of each policyholder since they ultimately bear the full cost of any mistake. As a result, D&O insurance underwriters have developed

[3] According to many of these surveys, 20% of U.S. firms had at least one lawsuit brought against their directors in the previous ten years, of which half, and the most costly, came from shareholders.

specific risk assessment tools that allow them to properly select clients and their litigation risk. Underwriters use three sources of information: The written application that contains a full array of documentation, the public financial and accounting data analysis, and interviews with the prospective insured's senior management team.[4] The information gathered by the insurer about a potentially insured firm's internal processes and structure is not divulged to other market participants.[5]

As in the pricing of any insurance contract, insurers must assess the probability that a claim will be paid as well as the severity of such a claim. Since the most costly D&O lawsuits originate from the firms' shareholders, they are then likely linked to stock market performance. Using the *Culture & Character* approach of Baker and Griffith (2007a), we measure a firm's potential cost of litigation based on its financial information, the industry's perspective and its governance risk factors. Of particular interest is the fact that insurers appear to place the analysis of governance characteristics into two categories: *Culture*, which refers to the stringency of the firm's formal and informal internal controls (how the information is disseminated in the firm), and *Character*, which refers to the directors' and officers' attitude toward risk. In essence, *Culture* seeks to identify the source of potential D&O litigation whereas *Character* aims at uncovering the managers' sense of ethics.

3. Hypotheses development, data and variables description

3.1. Hypotheses and data

The main hypothesis we develop in this paper is that firms that are riskier in the eyes of D&O insurance providers have a post-IPO stock return that is lower and more volatile. Underpinning this question is the assertion that providers of D&O insurance use a plethora of publicly unavailable information from which a premium emerges, much like a credit score. The question we seek to answer is whether such information is valuable to investors.

As highlighted in Baker and Griffith (2007a), the risk assessment conducted by D&O insurers is partly based on private information regarding the inner working and the governance quality of the firms as well as on the D&O insurers' risk underwriting technology that is insurer-specific and not publicly known. Because they are usually absent from the offering prospectus, information about D&O insurance coverage and premiums is not publicly known at the time of the IPO, even though such information is revealed later in the life of the firm (see Appendix A). When such information reaches the market, it should be embedded immediately in the prices. The null hypothesis is therefore that D&O insurance contract parameters have no power in explaining future risk and returns. The alternative hypothesis is that D&O insurance contract parameters have some ability to forecast a firm's stock market risk and returns in the first year of public life post-IPO.

$H1_0$. A firm's D&O insurance rate-on-line at the time of the IPO has no power in explaining the firm's first year stock market risk and return.

$H1_A$. A firm's D&O insurance rate-on-line at the time of the IPO is linked to higher stock market volatility and lower return in the first year of trading.

The measure we use to assess an insurer's perception of a firm's D&O liability risk is the "rate-on-line". The rate-on-line is calculated as the ratio of the total premium paid to the maximum possible coverage (or the policy limit); it is essentially the price per unit of coverage. Since firms that pay a higher rate-on-line are more susceptible to file a claim, their stock market return in the first year

[4] Baker and Griffith (2007a) provide a valuable in-depth account of the pricing approach used by D&O underwriters using detailed interviews of 41 D&O insurance professionals (underwriters, actuaries, brokers, risk managers, lawyers and claim process specialists). They also report that, in the United States, the average settlement was $13.3 million for the period 1996–2001, $22.3 million for the period 2002–2005 and $33 million in 2006–2007.

[5] See Knepper and Bailey (1998) and Baker and Griffith (2007a) for more details on the underwriting and auditing process of insurers. In the case of D&O insurance, the moral hazard hypothesis that is often linked to having insurance was shown to be inconsequential by Bhagat et al. (1987) who find that the decision to purchase D&O insurance does not decrease shareholder wealth.

post-IPO should be lower and more volatile.[6] If a D&O insurance contract's rate-on-line conveys information, then a corollary to hypothesis $\mathbf{H1_A}$ should be that the firm's stock market performance after the information is revealed should be uncorrelated to such information. The information gathered by insurers to form an opinion regarding the IPO firm's liability risk before the IPO date becomes known to market participants after the first year post-IPO. This information should then be incorporated in the stock prices so that D&O insurance information should not have any long-term predictive power.[7]

Our results show strong support for rejecting hypothesis $\mathbf{H1_0}$ in favor of hypothesis $\mathbf{H1_A}$, Consequently, we conclude that basic D&O insurance contract parameters have some power to predict stock market returns and risk in the first year post-IPO.

The use of Canadian data is dictated by data availability challenges. For instance, basic D&O insurance contract characteristics are not publicly available for most U.S. firms (see Griffith, 2006). That is why Chalmers et al. (2002) and Kaltchev (2006) have relied on a broker's private book of business. A second strategy (see Linck et al., 2009) is to use the 27 firms incorporated in the state of New York and the 12 S&P firms that voluntarily disclose enough information to examine the determinants of D&O premiums paid by each company. Unfortunately, these companies do not reveal how much coverage they purchased, thus limiting the quality of the signal associated with the premium paid. A third alternative is to use excerpts from the Towers-Watson surveys, as in Cao and Narayanamoorthy (2011) and Fier et al. (2010) who use only two survey years (2001 and 2002). A fourth approach is to use Canadian data as in Core (1997, 2000), Boyer (2003, 2014), Park Wynn (2008), Gillan and Panasian (forthcoming), Lin et al. (2011), Rees et al. (2011) and Boyer and Stern (2012) since Canadian firms typically disclose their D&O insurance coverage and premium. Unlike most studies on D&O insurance that examine large and well established firms (the notable exceptions being Chalmers et al., 2002, and Boyer and Stern, 2012), we focus on firms that just went public through an initial public offering (IPO).

Chalmers et al. (2002) find that firms with more coverage at the time of the IPO are more likely to be sued for mispricing. However, the dataset used in Chalmers et al. (2002) does not include only D&O liability insurance protection contracts. Their dataset includes IPO liability insurance contracts (known also as *Public Offering of Securities Insurance* or POSI) that cover the firm's managers as well as the investment bankers, the venture capitalists and the angel investors who are seeking an exit. IPO liability insurance contracts are accordingly more expensive.[8] Also, in contrast to Chalmers et al. (2002) and Kaltchev (2006), our sample includes firms that opted for no insurance, thus reducing the potential bias involved in using only firms that purchased insurance from one particular insurance broker.

To gather data to test our hypothesis, we used the same approach as in Huson and Pazzaglia (2007). Starting with the 2000-odd new securities issued in Canada over the period 1995–2010, we are left with 340 firms that correspond to the classic definition of an IPO (see Huson and Pazzaglia, 2007, for more details). Financial data is collected from Compustat and from SEDAR, the Canadian equivalent of EDGAR. As many firms' first proxy circular or annual reports are not available on SEDAR, and because there is much missing information in annual reports and management proxies, the number of usable observations drops to 241. We then removed the firms for which the first day of the D&O insurance contract is after the IPO completion date (11 observations), and the firms that report the D&O insurance premium and policy limit in the IPO prospectus (21 observations). The final dataset

[6] Boyer and Tennyson (2008) and Boyer (2003, 2014) argue that similar to any insurance contract, D&O insurance premiums depend on the frequency as well as on the severity of claims, as well as the cost of risk and other expenses. Assuming that premiums are the product of frequency (f), severity (s) and a proportional loading factor (m), and that severity can be measured by the policy limit, we believe that the rate-on-line (the ratio of premium to policy limit) is a good proxy for the frequency of lawsuits. To see why, let $P = f * s * m$ so that $P/S = f * m$. If the loading factor is the same for all firms, then it will be picked-up in the regression constant when we use the log of the rate-on-line as an independent variable. Given that the different Towers-Watson surveys report that lawsuits are more likely to occur (and with more severity) following a decrease in the stock price, the result is that the D&O insurance market is efficient if the premium-to-coverage ratio is a function of the likelihood that the stock price will decline.

[7] In a previous iteration of the paper, we tested whether the first year's D&O insurance information had any impact in explaining the second year's return. In line with the efficient market hypothesis, we found that it had no impact. These results are available from the authors upon request.

[8] For instance in the case of the Addax corporation (IPO completed on February 16th 2006), the management proxy states that "The total 2006 premium payable is $374,500 for the D&O twelve month cover and $505,000 for the POSI 72 month cover".

Table 1
Number of Canadian IPOs per year in sample: year of IPO initiation and year of IPO completion.

Year	IPO initiated	IPO completed
1995	4	2
1996	11	12
1997	16	15
1998	5	6
1999	9	8
2000	10	12
2001	9	7
2002	25	27
2003	14	13
2004	26	26
2005	26	22
2006	20	23
2007	12	8
2008	2	8
2009	3	2
2010	15	10
2011	–	6
Missing	2	2
Total	209	209

For the firms in our sample (see Appendix C for the complete list), we present the number of IPOs initiated between 1995 and 2010, and completed between 1995 and 2011.

contains 209 observations (the list of all companies is available in Appendix C). The first column of Table 1 displays the number of initiated IPOs per year, whereas the second column displays the number of completed IPOs per year.

Financial variables are collected as of the end of the first fiscal year post-IPO. The governance and insurance information is collected in the first available management proxy. All numbers are in Canadian dollars and a conversion to Canadian dollars as of the end of the firm's fiscal year was applied when needed.

3.2. Description of variables

3.2.1. Dependent variables

The dependent variables we use reflect the firm's observed stock market risk and return following the date of the IPO. Starting with our risk measurements, the *Volatility* variable is calculated as the standard deviation of annualized daily returns. We expect firms that are deemed riskier by insurers, as reflected by a higher rate-on-line, to have higher stock market volatility. We also calculated the firm's idiosyncratic risk of returns (*Idiosyncratic*) as in Ang et al. (2006) and used the standard deviation of the residual of a daily three-factor Canadian Fama–French model (see Francoeur et al., 2008, for the source of these factors).[9]

To evaluate the stock performance of firms we use the *First year excess return* as well as the firm's *First year total return*. If D&O insurance providers have private information regarding the operations and governance of insured firms, firms that have a higher risk assessment measure should have a lower return. *First year excess return* is equal to the *First year total return* of the firm post-IPO minus the return on the S&P/TSX, Canada's main stock market index, over the same period. If D&O insurers are able to charge a higher premium to firms that will perform poorly because of their revealed poor governance and opaque operations, then the relationship between the first year excess return and our measure of D&O insurance risk will be negative.

[9] Canadian factors are only available until 2009.

We also combine the risk and return variables by calculating three quasi-Sharpe ratios: *Total Sharpe ratio*, *Excess Sharpe ratio*, and *Idiosyncratic Sharpe ratio*. The first measure is computed by dividing *First year total return* by *Volatility;* the second, by dividing *First year excess return* by *Volatility*; and the third, by dividing *First year total return* by *Idiosyncratic*. If the rate-on-line is associated with higher volatility and lower returns, it should also be associated with lower quasi-Sharpe ratios.

IPO issue prices were collected using the firms' prospectus available on SEDAR. Values were verified using the FPInfomart database. Subsequent stock market price information comes from Bloomberg.

3.2.2. Main independent variables

The main variable of interest in this paper is the ratio of the total premium paid to the maximum possible coverage (or the policy limit). This information is released in the first management proxy after the firm becomes public.[10] As D&O insurance is considered by the board of directors to be a part of the managerial compensation package, the information that is released indicates the previous year's protection (just as salary information relates to the previous year's compensation). In the paper, this rate-on-line measure is modified in two ways, to make it more tractable. First, we use the natural logarithm of the ratio of the D&O premium to $1000 dollars of coverage (*Ln_ROL*) to reduce the impact of very large rate-on-lines on the results. Second, we use the D&O premium divided by $1000 dollars of coverage (*Rate-on-line*). In both cases, a firm that pays a higher rate-on-line is hypothesized to be perceived by the insurer as riskier since it is paying more per unit of coverage. We therefore test whether the rate-on-line is related to stock market volatility and returns (as well as the quasi-Sharpe ratios) in the first year of operations post-IPO.

The decision to purchase or not to purchase insurance is used in the first step regression equation of the Heckman two-step procedure (see the Robustness section), to account for the possible selection bias where the rate-on-line was not random for the sample of firms we observed. In other words, we need to account for the fact that we do not observe the rate-on-line for firms that choose to remain uninsured. *Insurance* is thus an indicator variable equal to one if the firm reported that it carried D&O insurance in its first management proxy following its first annual report post-IPO, and it should be zero otherwise.[11]

Appendix D provides a detailed description of all control variables.

3.3. Sample statistics

Table 2 presents the main sample statistics, starting with the dependent variables, the variables related to the D&O insurance contract and finishing with the different control variables and the variables used in the treatment equation related to the decision to purchase D&O insurance. Dichotomous variables in Table 2 are those for which the entire sample statistic is not provided.

It is interesting to note that the average return in the first year is 11.5%, giving an average excess return in the first year of 4.4%, whereas the median return is only 7.8% with a median excess return of −2.9%. Eight companies did not reach the end of the first year of operations.

Our sample consists of 148 firms that reported having D&O insurance in the first year post-IPO and 61 not reporting having insurance, which give us a take up of 71%, a percentage very similar to the average D&O insurance penetration in the Canadian market according to the different Tillinghast-Towers reports. In terms of the main variables of interest, information about the *Rate-on-line* is available for 96 firms out of the original 209. Of the 113 firms for which no rate-on-line is available, 61 did not purchase D&O insurance whereas the other 52 purchased D&O insurance but did not give enough details to calculate the rate-on-line. These 52 firms must be kept in the dataset regressions because the mere fact that they purchased insurance tells us something about their behavior toward insurance.

[10] In some rare instances, the D&O insurance information is released in the prospectus. We thank a referee for pointing out this issue; we therefore deleted from our final sample all firms that divulged their D&O insurance information in their prospectus.

[11] As in Core (1997), Park Wynn (2008), Lin et al. (2011) and Boyer and Stern (2012), we assume that the lack of D&O insurance information disclosure in a firm's proxy circular means that the firm is uninsured.

Table 2
Summary statistics of the sample data set.

Variable	Obs	Mean	Std. Dev.	Min	5%	25%	Median	75%	95%	Max
Dependent variables										
First year total return	199	0.115	0.562	−0.939	−0.673	−0.180	0.078	0.306	1.200	2.928
First year excess return	199	0.044	0.544	−1.027	−0.762	−0.262	−0.029	0.246	1.032	2.830
Volatility	202	0.436	0.352	0.128	0.148	0.226	0.315	0.511	1.100	2.600
Idiosyncratic	186	0.0276	0.0224	0.0080	0.0092	0.0141	0.0198	0.0319	0.0685	0.1645
SharpeExcess	197	0.265	1.331	−2.265	−1.352	−0.652	−0.050	0.978	2.631	5.085
Main independent variables										
Rate-on-line (per $1000)	96	7.191	5.273	1.000	2.088	3.775	5.675	9.354	15.500	37.500
ln_ROL (per $1000)	96	1.762	0.654	0.000	0.736	1.328	1.736	2.236	2.741	3.624
Insurance	209	0.708	0.456							
Financial variables										
FirstDayReturn	193	0.040	0.111	−0.152	−0.061	−0.010	0.011	0.074	0.235	0.867
MarketRet	207	0.077	0.190	−0.409	−0.281	−0.069	0.127	0.213	0.307	0.563
RiskFree	186	0.024	0.007	0.008	0.016	0.018	0.022	0.029	0.035	0.038
SMB	186	0.158	0.185	−0.173	−0.066	0.023	0.124	0.265	0.513	0.783
HML	186	0.051	0.273	−0.443	−0.248	−0.093	0.002	0.114	0.731	1.301
lnMVE_IPO	206	18.819	1.209	13.638	16.743	18.201	18.853	19.488	20.577	22.504
Growth	190	1.313	1.814	0.003	0.308	0.697	0.927	1.232	3.149	17.767
ROA	207	−0.004	0.199	−1.453	−0.277	−0.008	0.025	0.062	0.114	0.937
Debt_Ratio	207	0.374	0.240	0.003	0.011	0.175	0.350	0.535	0.828	0.995
Governance variables										
Duality	209	0.273	0.446							
Blockholder	209	0.722	0.449							
Independence	209	0.708	0.164	0.182	0.429	0.600	0.714	0.818	1.000	1.000
ITCE	209	0.464	0.500							
Other variables										
Board_size	205	6.878	2.091	3	4	5	7	8	11	15
Risky_Industry	209	0.335	0.473							
Age	205	25.97	29.92	0.000	0.323	5.000	14.000	38.40	97.17	130.00
IPOfeerat	188	0.0584	0.0215	0.0065	0.0438	0.0550	0.0600	0.0600	0.0675	0.3240
Float	204	0.546	0.320	0.048	0.140	0.243	0.495	0.887	1.000	1.023
Big5	185	0.686	0.465							
US_Presence	209	0.536	0.500							
US_Sales	198	0.208	0.310	0.000	0.000	0.000	0.000	0.403	0.860	1.000

We present for each variable mentioned in the paper the number of available data points, the mean, standard deviation and the value of the non-dummy variables for different distribution points. The table separates the different variables with respect to the categories in which they were presented in the paper.

4. Analysis of results

The theoretical econometric model has the following structure.

1. Firms decide to go public through an initial public offering.
2. Firms decide to purchase D&O insurance or not.
3. Insurers give firms that purchase D&O insurance a price per unit of coverage (rate-on-line).
4. The stock market reacts to the flow of information during the year.

The variables that determine whether a firm goes public (step 1) are not measurable since we do not have access to information for non-public firms. After deciding to go public, a firm purchases a D&O insurance contract (or not) in step 2, an information that is available. Regarding step 3, we

observe a firm's rate-on-line only if it purchased insurance. To control for the potential selection bias in steps 2 and 3, we will conduct a classic Heckman two-step procedure as a robustness check.

4.1. Preliminary results

Table 3 separates the observations presented in Table 2 between firms that have D&O insurance and firms that do not, and offers some descriptive statistics. Of the 71% of IPO firms that reveal they purchased D&O insurance before their IPO date, the average premium is approximately $145,658 for an average coverage of $22 million. There is a very wide distribution for the rate-on-line variable, which is reported as the premium paid per $1000 of coverage. The 95th percentile rate-on-line is more than 7 times larger than the 5th percentile rate-on-line, with an average of $7.19 per $1000 of coverage and a median of $5.27 per $1000 of coverage. This provides some justification for using a log-transformation of the rate-on-line.

When examining the decision to purchase insurance (the *Insurance* variable is equal to one if the firm revealed carrying D&O insurance, and zero otherwise), the hypothesis is that this decision should be influenced by financial and governance measures as well as other control variables. It is interesting to see that none of the return variables differ in distribution as a function of whether insurance is purchased or not. This provides a possible indication that the mere fact of purchasing insurance or not conveys no information to the market.

Table 3
Separation and test between firms that have D&O insurance or not.

	No D&O insurance (61)				D&O insurance (148)				Tests[a] of differences in	
	Obs	Mean	Std. Dev.	Median	Obs	Mean	Std. Dev.	Median	Mean	Median
Return variables										
First year return	57	0.076	0.582	0.070	142	0.131	0.556	0.081	ns	ns
First year excess return	57	0.015	0.538	−0.037	142	0.056	0.547	−0.015	ns	ns
First day return	54	0.032	0.083	0.014	139	0.043	0.120	0.010	ns	ns
First day return (imputed)	61	0.029	0.079	0.001	148	0.041	0.117	0.004	ns	ns
Volatility	59	0.426	0.394	0.274	143	0.440	0.334	0.325	ns	ns
Idiosyncratic	49	0.028	0.027	0.015	137	0.028	0.207	0.020	ns	ns
Sharpexs (Excess return/ volatility)	56	0.158	1.314	−0.182	141	0.308	1.341	−0.019	ns	ns
Other independent variables										
Ln (MVE at IPO)	60	18.502	1.392	18.483	146	18.950	1.104	18.923	1.45%	1.73%
Debt_Ratio (%)	60	0.351	0.256	0.318	147	0.383	0.233	0.354	ns	ns
ROA	60	−0.028	0.296	0.032	147	0.006	0.142	0.024	ns	ns
Growth	48	1.133	1.385	0.829	142	1.373	1.938	0.951	ns	ns
IPO fees/MVE at IPO	54	0.056	0.009	0.060	134	0.059	0.025	0.060	ns	ns
IPO fees/MVE at IPO (imputed)	61	0.057	0.009	0.060	148	0.059	0.024	0.060	ns	ns
Risky industry	61	0.266	0.444	0	148	0.365	0.483	0.000	7.86%	ns
US Presence	61	0.377	0.489	0	148	0.601	0.491	1.000	0.16%	0.32%
US sales	59	0.109	0.257	0	139	0.250	0.322	0.010	0.07%	0.10%
Age	58	24.618	31.658	9.339	147	26.505	29.295	14.302	ns	ns
Float	59	0.609	0.330	0.636	145	0.520	0.311	0.427	3.91%	ns
Income trust	61	0.590	0.496	1	148	0.412	0.494	0	0.99%	1.93%
Independence	61	0.725	0.184	0.750	148	0.701	0.156	0.707	ns	ns
Duality	61	0.311	0.467	0	148	0.257	0.438	0	ns	ns
Blockholder	61	0.639	0.484	1.000	148	0.757	0.430	1	5.15%	8.56%

We test for differences in means and median between the sample of firms that purchased D&O insurance (148 firms) and firms that did not purchase D&O insurance (61 firms). A selection of independent control variables are presented.

[a] A *t*-stat was used to test the equality of the two sample means (with equal variance), whereas we used a Wilcoxon rank-sum test for the test of equality of medians. Only differences significant at the 10% level or better are highlighted.

In the second part of Table 3, we see that firms that take up insurance are in some respect significantly different from firms that do not. For instance, firms that are larger (in terms of market capitalization at the time of their IPO) are more likely to have D&O insurance. Firms that have operations in the U.S. are also more likely to carry D&O insurance. As the U.S. relies more on litigation to keep firms in line, it seems logical that the more important the presence in the U.S., the more likely a lawsuit could occur so that carrying insurance becomes more likely. The only other dimension over which insured and non-insured firms differ in means and median is in terms of their corporate structure. It seems that income trusts are more likely to have no insurance than common equity firms. Table 4 shows the results of a simple probit model regarding the decision to purchase D&O insurance for different model specifications.

The results are consistent across model specifications, with four variables remaining generally significant throughout: *Duality*, *US_Presence*, *ITCE* and *Hard*. It therefore seems that firms that are more likely to purchase D&O insurance are those that have a chairman of the board who is not the CEO, that have activities in the U.S. and that are incorporated as common equity firms. Firm size, as measured by the natural logarithm of the firm's market value of equity (*lnMVE_IPO*), seems to have only a marginal impact on the decision to purchase D&O insurance when controlling for other factors. These results are in line with most studies that examine the demand for D&O insurance (see Rees et al., 2011; Core, 1997 and Boyer, 2003, 2014). Specification 2 will be the model used later as the Heckman's selection regression (first stage) model since it is the one that has the best goodness of fit.

4.2. The predictive power of D&O insurance rate-on-line

Table 5 reports the results from OLS regressions where we examine the relationship between the main independent variables (the log of the rate-on-line or the premium per $1,000 of coverage) and the first year excess return (Panel A) and the total return (Panel B) post IPO. In Panel A, the first regression model presents the results when we do not include the rate-on-line variables in the regression. We see that only two variables have the power to explain the returns in the first year post-IPO: return on assets and the type of incorporation. No other variable has any explanatory power at the 5% level or better.

Model specifications 2 and 3 are very parsimonious and control only for basic financial and governance variables in addition to either rate-on-line measures: Specification 2 uses the natural log of the rate-on-line whereas Specification 3 uses the rate-on-line as the main independent variable of interest. In the next set of two regressions, we add more financial and governance control variables as well as variables related to the IPO (the fee ratio and the float). Specifications 6 and 7 are similar to Specifications 4 and 5 with the difference that they control whether the firm went public during a "hard market year" in the D&O insurance industry (i.e., when premium levels were high). Across all model specifications, the price per unit of D&O insurance coverage (whether it is the log of the rate-on-line or simply the premium-to-coverage ratio) is negatively and significantly related to the firm's excess stock market return in the first year after the IPO. Panel B shows regressions that predict first year total returns while controlling for systematic risks using three Canadian Fama–French measures. Results are the same in Panel B and in Panel A: the rate-on-line is negatively and significantly related to the firm's stock market return in the first year post IPO.

All results in both panels of Table 5 are consistent with the hypothesis that D&O liability insurers have information at the time of the IPO that should be valuable to stock market participants. Our results are economically significant. Using any model specification that uses the natural logarithm of the rate-on-line in Panel B of Table 5, we can conclude that a 50% increase in the rate-online (resp. a 10% increase) leads to an approximate 7.3% to 9.4% (resp. 1.7% to 2.2%) decrease in the one-year excess return post IPO.

We then turn to examine whether the rate-on-line is related to other stock performance measures in the first year post-IPO: risk, and return per unit of risk. We use two measures of risk in our OLS regressions. *Volatility* is the standard deviation of annualized daily returns, whereas *Idiosyncratic* is the standard deviation of the residual of a daily three-factor Canadian Fama–French model. We use the idiosyncratic risk to verify that our results on volatility are not contaminated by market volatility.

Table 4
Marginal impact on the decision to purchase D&O insurance.

Variables	(1) Insurance	(2) Insurance	(3) Insurance	(4) Insurance	(5) Insurance	(6) Insurance
lnMVE_IPO	0.045	0.028	0.035	0.030	0.026	0.051*
	(0.028)	(0.029)	(0.029)	(0.027)	(0.028)	(0.028)
Debt_Ratio	0.063	0.055	0.068	0.093	0.065	
	(0.141)	(0.140)	(0.139)	(0.137)	(0.140)	
Growth	0.008	0.006	0.001	0.018	0.002	
	(0.018)	(0.020)	(0.019)	(0.022)	(0.021)	
ROA		0.123	0.091	0.088	0.109	
		(0.181)	(0.186)	(0.184)	(0.193)	
Duality	−0.172**	−0.165*		−0.137*		−0.092
	(0.084)	(0.084)		(0.082)		(0.082)
Blockholder	−0.008	−0.011		0.092	0.032	0.056
	(0.074)	(0.072)		(0.077)	−0.073	(0.076)
Independence	−0.146	−0.184		−0.178	−0.037	−0.140
	(0.218)	(0.214)		(0.213)	(0.211)	(0.210)
Risky industry	0.043	0.071	0.072		0.053	0.072
	(0.070)	(0.069)	(0.068)		(0.070)	(0.070)
US Presence	0.193***	0.195***	0.193***		0.188***	0.151**
	(0.069)	(0.069)	(0.068)		(0.068)	(0.068)
IPOfeerat	2.393	2.527	2.213			
	(3.178)	(3.572)	(3.391)			
Float	0.121	0.108	0.111			
	(0.155)	(0.153)	(0.153)			
ITCE	−0.157	−0.290**	−0.280**		−0.208**	−0.269***
	(0.101)	(0.117)	(0.116)		(0.094)	(0.083)
Age	0.001	0.001	0.001			
	(0.001)	(0.002)	(0.002)			
Hard		0.230**	0.243**	0.0450	0.244**	0.291***
		(0.108)	(0.108)	(0.0700)	(0.102)	(0.084)
Constant						
PseudoR2	0.123	0.154	0.132	0.044	0.108	0.138
LL	−88.485	−85.410	−87.653	−101.11	−94.306	−107.18
Observations	183	183	183	188	188	206

We evaluate the marginal impact of control variables on a firm's likelihood to purchase D&O insurance. The dependent variable is *Insurance*, an indicator variable equal to one if the firm purchased D&O insurance in the first year post IPO. Only the marginal effects are reported for ease of interpretation of the estimated coefficients.
lnMVE_IPO is the log of the market value of equity at the time of the IPO. *Debt_ratio* is the ratio of total debt to market value of equity at the time of the IPO. *Growth* is the market value of equity plus the book value of liability, divided by the book value of assets. *ROA* is the firm's return on assets. *Duality* takes on the value one if the CEO of the company is also the chairman of the board. *Blockholder* is an indicator variable equal to one if a shareholder owns 10% or more of the firm's voting shares. Independence is the proportion of directors deemed independent in Canada. *Risky_Industry* is an indicator variable equal to one if the company operates in one of the industries classified as risky in Bajaj et al. (2000). *US_Presence* is an indicator variable equal to 1 if the firm has activities in the United States and zero otherwise. *IPOfeerat* is equal to the fees paid to the investment banker divided by the firm's market value of equity at the time of the IPO. *Float* is the ratio of the number of shares available at the IPO to the total number of shares outstanding. *ITCE* is a dummy variable equal to 1 if the firm is an income trust and 0 otherwise. *Age* is the age of the operating firm at the time of the IPO. Hard is equal to one if the D&O insurance market is characterized by higher than normal premiums.
In all cases, the standard deviation is in parentheses.
Model specification 2 is used as our first stage regression in our Heckman two-stage regression.
* Indicates significance at the 10% level.
** Indicates significance at the 5% level.
*** Indicates significance at the 1% level.

With respect to the return per unit of risk, we shall use different quasi-Sharpe ratio measures by dividing a return measure by a risk measure.

Tables 6 and 7 present the regression results for the two risk measurements. In both tables, the first specification presents the regression results when no rate-on-line variable is included. Specifications 2 & 3 control for financial variables and variables related to the firm's governance. The second set of two regressions controls for the same variables, but a dummy variable to control for a hard insurance

Table 5
(A) OLS regression that measures the firms' first year excess return. (B) OLS regression that measures the firms' first year total return.

Variables	(1) First year excess return	(2) First year excess return	(3) First year excess return	(4) First year excess return	(5) First year excess return	(6) First year excess return	(7) First year excess return
Panel A. OLS regression that measures the firms' first year excess return.							
ln_ROL		−0.124**		−0.122*		−0.129**	
		(0.059)		(0.063)		(0.060)	
Rate-on-line			−0.0167***		−0.0177***		−0.0183***
			(0.006)		(0.006)		(0.006)
FirstDayReturn	0.596			0.220	0.297	0.249	0.325
	(0.429)			(0.395)	(0.396)	(0.400)	(0.398)
lnMVE_IPO	0.033	0.028	0.022	0.031	0.022	0.025	0.016
	(0.040)	(0.042)	(0.043)	(0.045)	(0.047)	(0.049)	(0.051)
Growth	−0.011			0.008	0.008	0.004	0.004
	(0.034)			(0.049)	(0.048)	(0.045)	(0.044)
DebtRatio	0.205			0.323	0.316	0.326	0.318
	(0.164)			(0.230)	(0.232)	(0.231)	(0.232)
ROA	0.892***	0.927**	0.967***	0.800**	0.836**	0.768*	0.810*
	(0.191)	(0.362)	(0.362)	(0.391)	(0.386)	(0.422)	(0.416)
IPOfeerat	−1.245			−0.530	−0.518	−0.746	−0.697
	(1.605)			(2.065)	(2.066)	(2.141)	(2.134)
Float	−0.063			−0.0841	−0.110	−0.104	−0.129
	(0.149)			(0.257)	(0.248)	(0.272)	(0.265)
ITCE	−0.259**			−0.236	−0.231	−0.279*	−0.268*
	(0.108)			(0.145)	(0.143)	(0.160)	(0.156)
US_sales	−0.134			−0.160	−0.169	−0.146	−0.157
	(0.115)			(0.183)	(0.183)	(0.180)	(0.181)
Independence	−0.211	−0.164	−0.188	−0.086	−0.113	−0.088	−0.117
	(0.242)	(0.295)	(0.284)	(0.358)	(0.346)	(0.368)	(0.359)
Duality	−0.132			−0.195	−0.213	−0.181	−0.201
	(0.106)			(0.174)	(0.176)	(0.165)	(0.167)
Blockholder	−0.127*	−0.016	−0.029	−0.040	−0.057	−0.04	−0.061
	(−0.071)	(0.095)	(0.094)	(0.113)	(0.112)	(0.110)	(0.108)
Age	0.002			0.003	0.003	0.003	0.003
	(−0.001)			(−0.003)	(−0.003)	(−0.003)	(−0.003)
Hard	−0.006					0.082	0.071
	(−0.132)					(−0.196)	(−0.197)
Constant	−0.170	−0.146	−0.100	−0.208	−0.074	−0.081	0.037
	(0.852)	(0.836)	(0.847)	(0.958)	(0.997)	(1.049)	(1.086)
Observations	167	93	93	87	87	87	87

(*continued on next page*)

Table 5 (*continued*)

Variables	(1) First year excess return	(2) First year excess return	(3) First year excess return	(4) First year excess return	(5) First year excess return	(6) First year excess return	(7) First year excess return
R-squared	0.235	0.128	0.131	0.209	0.214	0.211	0.216
Variables	(1) First year total return	(2) First year total return	(3) First year total return	(4) First year total return	(5) First year total return	(6) First year total return	(7) First year total return
Panel B. OLS regression that measures the firms' first year total return							
ln_ROL		−0.180**		−0.226***		−0.232***	
		(0.084)		(0.079)		(0.077)	
Rate-on-line			−0.0251**		−0.0300***		−0.0297***
			(0.010)		(0.009)		(0.009)
FirstDayReturn				0.140	0.319	0.310	0.477
				(0.469)	(0.462)	(0.513)	(0.522)
MarketRet	0.480**	0.564*	0.527*	−0.008	−0.068	−0.270	−0.311
	(0.207)	(0.299)	(0.293)	(0.286)	(0.287)	(0.364)	(0.362)
RiskFree	0.139	−6.457	−8.250	−1.467	−4.984	7.857	3.943
	(5.697)	(6.743)	(6.960)	(10.64)	(10.40)	(15.84)	(15.85)
SMB	0.0783	−0.400	−0.416	−0.307	−0.287	−0.203	−0.189
	(0.217)	(0.336)	(0.340)	(0.327)	(0.328)	(0.290)	(0.291)
HML	−0.148	−0.177	−0.181	−0.513	−0.512	−0.577*	−0.568*
	(0.133)	(0.203)	(0.205)	(0.316)	(0.317)	(0.331)	(0.330)
lnMVE_IPO	0.114**	0.073	0.068	0.101*	0.089	0.072	0.061
	(0.044)	(0.062)	(0.062)	(0.056)	(0.058)	(0.055)	(0.056)
Growth				0.021	0.018	0.010	0.008
				(0.061)	(0.060)	(0.053)	(0.053)
DebtRatio				0.398	0.400	0.394	0.398
				(0.245)	(0.250)	(0.263)	(0.266)
ROA	0.747***	0.792*	0.854**	0.584	0.649	0.515	0.589
	(0.160)	(0.432)	(0.423)	(0.444)	(0.434)	(0.459)	(0.450)
IPOfeerat				−1.316	−1.269	−2.135	−2.001
				(1.831)	(1.845)	(1.814)	(1.832)
Float				0.0432	−0.0630	−0.0257	−0.129
				(0.245)	(0.237)	(0.237)	(0.236)
ITCE				−0.086	−0.083	−0.232	−0.218
				(0.189)	(0.185)	(0.198)	(0.195)
US_sales				−0.276	−0.270	−0.239	−0.235
				(0.192)	(0.197)	(0.181)	(0.187)
Independence	−0.045	0.031	−0.022	0.064	0.038	0.044	0.013
	(0.194)	(0.315)	(0.297)	(0.418)	(0.407)	(0.452)	(0.442)

Duality				−0.239	−0.252	−0.235	−0.247
				(0.206)	(0.205)	(0.210)	(0.207)
Blockholder	−0.038	0.078	0.058	0.189	0.144	0.189	0.143
	(0.078)	(0.082)	(0.077)	(0.148)	(0.141)	(0.144)	(0.139)
Age				0.004	0.004	0.004	0.004
				(0.003)	(0.003)	(0.003)	(0.003)
Big5	−0.117	−0.273	−0.297	−0.252	−0.263	−0.223	−0.232
	(0.112)	(0.192)	(0.199)	(0.157)	(0.161)	(0.155)	(0.161)
Hard						0.363	0.338
						(0.300)	(0.301)
Constant	−1.962**	−0.637	−0.557	−1.346	−1.106	−1.097	−0.885
	(0.821)	(1.124)	(1.152)	(1.251)	(1.309)	(1.179)	(1.236)
Observations	160	82	82	78	78	78	78
R-squared	0.205	0.191	0.203	0.302	0.314	0.330	0.339

We evaluate in Panel A (resp. Panel B) the impact of price per unit of coverage on the firms' market-adjusted stock return (resp. on the firms' total stock return) in the first year following the IPO. The dependent variable is the first year total return minus the return of the market over the same year (FirstYearReturn – Mkt1Year) in Panel A and the first year total return (FirstYearReturn) in Panel B. The two main variables of interest are Rate-on-line, calculated as the premium per thousand dollars of maximum coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the firm's first year excess return and the firm's first year total return.

FirstDayReturn is our control variable for underpricing and is computed as the first day return on the close of the first trading day. LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares). Growth is the market value of equity plus the book value of liability, divided by the book value of assets. DebtRatio is the ratio of total debt to assets. ROA is the firm's return on assets. IPOfeerat is the ratio of the IPO fees paid per million dollars of market value of equity. Float is computed as the ratio of the number of shares issued over the total number of shares outstanding. ITCE is a dummy variable equal to 1 if the firm is an income trust. US_Sales is the percentage of sales carried out in the US. Independence is the proportion of board members that are classified as independent. Duality is equal to 1 if the CEO is also the Chairman of the board and zero otherwise. Blockholder is equal to 1 if there is a major shareholder that holds more than 10% of the shares after the IPO and 0 otherwise.

MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama-French size and growth portfolios respectively. Age is the age of the operation entity before the IPO. Big5 is a dummy variable equal to 1 when one of the top-5 Canadian Banks was the lead underwriter. Hard is a dummy variable equal to 1 to account for the period of time when D&O insurance premium were abnormally high.

Coefficients are reported with their robust standard deviation in parentheses.

* Indicate significance at the 10% level.

** Indicate significance at the 5% level.

*** Indicate significance at the 1% level.

Table 6
OLS regression that measures the firms' idiosyncratic risk in the first year post-IPO.

Variables	(1) Idiosyncratic Risk	(2) Idiosyncratic Risk	(3) Idiosyncratic Risk	(4) Idiosyncratic Risk	(5) Idiosyncratic Risk	(6) Idiosyncratic Risk	(7) Idiosyncratic Risk
ln_ROL		0.00533*		0.00607**		0.00636**	
		(0.00272)		(0.00274)		(0.00242)	
Rate-on-line			0.000714**		0.000764**		0.000785***
			(0.000286)		(0.000295)		(0.000265)
lnMVE_IPO	−0.00330	−0.00758**	−0.00734**	−0.00712**	−0.00689**	−0.00729**	−0.00703**
	(0.00234)	(0.00326)	(0.00331)	(0.00322)	(0.00328)	(0.00281)	(0.00284)
Growth	0.00166**	0.000819	0.000856	0.00129*	0.00127*	0.00142**	0.00141*
	(0.000743)	(0.000759)	(0.000769)	(0.000741)	(0.000749)	(0.000699)	(0.000727)
DebtRatio	−0.00667	−0.00367	−0.00300	−0.00371	−0.00310		
	(0.00629)	(0.00882)	(0.00874)	(0.00909)	(0.00901)		
IPOfeerat	0.00491	−0.0600	−0.0624	−0.0333	−0.0388		
	(0.0482)	(0.0471)	(0.0474)	(0.0464)	(0.0461)		
Float	−0.0137**	−0.0262***	−0.0250***	−0.0237***	−0.0224***	−0.0183***	−0.0166***
	(0.00631)	(0.00687)	(0.00635)	(0.00652)	(0.00615)	(0.00527)	(0.00490)
ITCE	−0.00517	−0.00644	−0.00646	−0.00257	−0.00289	−0.00453	−0.00476
	(0.00352)	(0.00464)	(0.00449)	(0.00515)	(0.00497)	(0.00528)	(0.00500)
US_sales	0.00578	0.0106	0.0108	0.00909	0.00937		
	(0.00459)	(0.00707)	(0.00706)	(0.00739)	(0.00735)		
RiskyIndustry	0.00694**	0.00875**	0.00961**	0.00780**	0.00880**	0.00889**	0.00984***
	(0.00313)	(0.00399)	(0.00391)	(0.00391)	(0.00387)	(0.00336)	(0.00333)
Blockholder	0.00178	−0.00470	−0.00423	−0.00418	−0.00364	−0.00328	−0.00262
	(0.00268)	(0.00354)	(0.00336)	(0.00341)	(0.00328)	(0.00309)	(0.00299)
Age	−2.50e−05	−3.48e−05	−3.25e−05	−3.94e−05	−3.68e−05		
	(3.04e−05)	(3.83e−05)	(3.68e−05)	(3.61e−05)	(3.54e−05)		
Big5	−0.00531	−0.00376	−0.00370	−0.00305	−0.00315	−0.00208	−0.00216
	(0.00327)	(0.00464)	(0.00456)	(0.00434)	(0.00427)	(0.00429)	(0.00428)
Hard				−0.00782	−0.00719	−0.0101**	−0.00965**
				(0.00509)	(0.00490)	(0.00478)	(0.00467)
Constant	0.0957**	0.181***	0.179***	0.171***	0.170**	0.169***	0.168***
	(0.0465)	(0.0651)	(0.0659)	(0.0643)	(0.0652)	(0.0539)	(0.0547)
Observations	158	83	83	83	83	84	84
R-squared	0.367	0.587	0.594	0.600	0.606	0.581	0.586

We evaluate the impact of price per unit of coverage on the firms' idiosyncratic risk calculated as the variance of the error term of a Canadian three-factor Fama–French market model in the first year following the IPO. The two main variables of interest are Rate-on-line, calculated as the premium per thousand dollars of maximum coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be positively related to the firm's idiosyncratic risk.
LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares). Growth is the market value of equity plus the book value of liability, divided by the book value of assets. DebtRatio is the ratio of total debt to assets. IPOfeerat is the ratio of the IPO fees paid per million dollars of market value of equity. Float is computed as the ratio of the number of shares issued over the total number of shares outstanding. ITCE is a dummy variable equal to 1 if the firm is an income trust. US_Sales is the percentage of sales carried out in the US. RiskyIndustry is equal to 1 if the firm is a member of a risky industry as defined by Bajaj et al. Blockholder is equal to 1 if there is a major shareholder that holds more than 10% of the shares after the IPO and 0 otherwise. Age is the age of the operation entity before the IPO. Big5 is a dummy variable equal to 1 when one of the top-5 Canadian Banks was the lead underwriter. Hard is a dummy variable equal to 1 to account for the period of time when D&O insurance premium were abnormally high.
Coefficients are reported with their robust standard deviation in parentheses.
* Indicate significance at the 10% levels.
** Indicate significance at the 5% levels.
*** Indicate significance at the 1% levels.

market is added. Finally, model specifications 6 & 7 show how our results hold with a more parsimonious model specification.

In all specifications, results show that the price of coverage is statistically and positively related to the one-year ahead total return volatility and idiosyncratic risk. In addition, the results are economically significant. Using Specification 4 in Table 7, the estimated coefficient for the natural

Table 7
OLS regression that measures the firms' stock volatility in the first year post-IPO.

Variables	(1) Volatility	(2) Volatility	(3) Volatility	(4) Volatility	(5) Volatility	(6) Volatility	(7) Volatility
ln_ROL		0.0556*		0.0702**		0.0823***	
		(0.0302)		(0.0308)		(0.0309)	
Rate-on-line			0.00807**		0.00910**		0.0104***
			(0.00361)		(0.00386)		(0.00362)
lnMVE_IPO	−0.0857***	−0.109**	−0.107*	−0.100*	−0.0976*	−0.101**	−0.0977**
	(0.0226)	(0.0541)	(0.0548)	(0.0533)	(0.0542)	(0.0476)	(0.0484)
Growth	0.0327***	0.00549	0.00615	0.0147	0.0147	0.0199*	0.0198*
	(0.0109)	(0.0108)	(0.0111)	(0.0109)	(0.0112)	(0.0103)	(0.0108)
DebtRatio		−0.174	−0.165	−0.175	−0.167		
		(0.130)	(0.129)	(0.132)	(0.131)		
IPOfeerat		−1.113	−1.128	−0.585	−0.643		
		(0.708)	(0.718)	(0.733)	(0.735)		
Float	−0.215***	−0.348***	−0.339***	−0.299***	−0.286***	−0.234***	−0.213***
	(0.0742)	(0.102)	(0.0972)	(0.0870)	(0.0849)	(0.0771)	(0.0740)
ITCE	−0.112*	−0.159**	−0.159**	−0.0825	−0.0860	−0.123	−0.126*
	(0.0595)	(0.0697)	(0.0681)	(0.0831)	(0.0806)	(0.0774)	(0.0731)
US_sales		0.132	0.134	0.102	0.105		
		(0.112)	(0.112)	(0.115)	(0.114)		
RiskyIndustry	0.0594	0.0990*	0.109*	0.0802	0.0920*	0.0978**	0.110**
	(0.0388)	(0.0579)	(0.0555)	(0.0546)	(0.0521)	(0.0465)	(0.0447)
Blockholder	0.00727	−0.0663	−0.0621	−0.0559	−0.0500	−0.0556	−0.0473
	(0.0437)	(0.0451)	(0.0436)	(0.0411)	(0.0406)	(0.0405)	(0.0395)
Age		−0.000673	−0.000646	−0.000765	−0.000733		
		(0.000479)	(0.000454)	(0.000475)	(0.000460)		
Big5		−0.0984	−0.0960	−0.0843	−0.0847	−0.0712	−0.0715
		(0.0764)	(0.0770)	(0.0696)	(0.0705)	(0.0716)	(0.0729)
Hard	−0.153**			−0.155*	−0.148*	−0.187**	−0.181**
	(0.0662)			(0.0808)	(0.0769)	(0.0760)	(0.0732)
Constant	2.247***	2.856***	2.830***	2.653**	2.641**	2.532***	2.514***
	(0.449)	(1.050)	(1.063)	(1.039)	(1.054)	(0.902)	(0.915)
Observations	180	83	83	83	83	84	84
R-squared	0.453	0.612	0.617	0.633	0.637	0.609	0.613

We evaluate the impact of price per unit of coverage on the firms' stock market volatility in the first year following the IPO. Volatility is calculated as the annualized standard deviation of daily returns. The two main variables of interest are Rate-on-line, calculated as the premium per thousand dollars of maximum coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be positively related to the firm's stock volatility.
LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares). Growth is the market value of equity plus the book value of liability, divided by the book value of assets. DebtRatio is the ratio of total debt to assets. IPOfeerat is the ratio of the IPO fees paid per million dollars of market value of equity. Float is computed as the ratio of the number of shares issued over the total number of shares outstanding. ITCE is a dummy variable equal to 1 if the firm is an income trust. US_Sales is the percentage of sales carried out in the US. RiskyIndustry is equal to 1 if the firm is a member of a risky industry as defined by Bajaj et al. Blockholder is equal to 1 if there is a major shareholder that holds more than 10% of the shares after the IPO and 0 otherwise. Big5 is a dummy variable equal to 1 when one of the top-5 Canadian Banks was the lead underwriter. Age is the age of the operation entity before the IPO. Hard is a dummy variable equal to 1 to account for the period of time when D&O insurance premium were abnormally high.
Coefficients are reported with their robust standard deviation in parentheses.
* Indicate significance at the 10% levels.
** Indicate significance at the 5% levels.
*** Indicate significance at the 1% levels.

logarithm of the rate-on-line shows that if the rate-on-line of the average firm in our sample was to increase by 50% (resp. 10%), the one-year post IPO volatility would increase by 2.8% (resp. 0.7%). Apart from the rate-on-line variables, only firm size (as measured by *lnMVE_IPO*) and *Float* are significant at the 5% level or better in all model specifications in both tables.

Results in Tables 6 and 7 are remarkably similar. Insurers appear to be able to charge a higher price to IPO firms that will have more volatile stock returns in the first year following their IPO. These results are in line with economic theory, in contrast with the results in Chalmers et al. (2002).

Table 8
OLS regression that measures the firms' return-to-risk ratio in the first year post-IPO.

Variables	(1) Total Sharpe Ratio	(2) Excess Sharpe Ratio	(3) Excess Sharpe Ratio	(4) Total Sharpe Ratio	(5) Total Sharpe Ratio	(6) Idiosyncratic Sharpe Ratio	(7) Idiosyncratic Sharpe Ratio
ln_ROL		−0.481**		−0.472**		−7.681**	
		(0.203)		(0.225)		(3.646)	
Rate-on-line			−0.0579**		−0.0696**		−1.144***
			(0.0247)		(0.0263)		(0.427)
FirstDayReturn	0.883	0.763	1.128	0.364	0.848	5.683	13.62
	(1.025)	(1.345)	(1.343)	(1.027)	(0.982)	(16.59)	(15.79)
MarketRet	−0.119			−0.551	−0.635	−9.775	−11.17
	(0.595)			(0.782)	(0.765)	(13.02)	(12.74)
RiskFree	5.508			−24.39	−35.84	−353.5	−543.3
	(24.29)			(28.47)	(27.77)	(476.8)	(461.8)
SMB	0.647			−0.213	−0.223	−4.169	−4.348
	(0.553)			(0.726)	(0.729)	(11.84)	(11.89)
HML	−0.599			−0.994	−0.988	−17.19	−17.11*
	(0.374)			(0.611)	(0.597)	(10.31)	(10.09)
lnMVE_IPO	0.225**	0.133	0.109	0.171	0.153	2.781	2.492
	(0.0952)	(0.117)	(0.113)	(0.118)	(0.117)	(1.884)	(1.858)
Growth	0.0391	0.0193	0.0237	0.0600	0.0553	1.104	1.023
	(0.0694)	(0.0885)	(0.0835)	(0.0957)	(0.0922)	(1.658)	(1.598)
DebtRatio	0.801*	0.968	0.951	1.045	1.027	16.69	16.37
	(0.482)	(0.658)	(0.662)	(0.628)	(0.629)	(10.08)	(10.10)
ROA	1.952***	1.886	1.956	1.482	1.492	20.94	21.08
	(0.441)	(1.228)	(1.197)	(1.115)	(1.083)	(19.05)	(18.52)
IPOfeerat	−1.867	−3.205	−2.681	−4.467	−4.137	−70.46	−65.30
	(3.795)	(4.764)	(4.707)	(4.126)	(4.136)	(66.43)	(66.56)
Float	−0.280	−0.191	−0.352	−0.633	−0.815	−9.800	−12.75
	(0.439)	(0.810)	(0.788)	(0.652)	(0.632)	(10.47)	(10.15)
ITCE	−0.362	−0.607	−0.564	−0.0610	−0.0631	−1.415	−1.463
	(0.354)	(0.533)	(0.531)	(0.480)	(0.467)	(7.686)	(7.476)
US_sales	−0.481*	−0.437	−0.417	−0.686*	−0.670*	−11.29*	−11.02*
	(0.269)	(0.540)	(0.540)	(0.373)	(0.373)	(6.024)	(6.005)
Independence	0.127	−0.288	−0.387	0.470	0.483	6.914	7.186
	(0.618)	(0.962)	(0.954)	(1.013)	(0.984)	(16.72)	(16.23)
Duality	−0.419*	−0.555	−0.622	−0.706	−0.774*	−12.34*	−13.48*
	(0.246)	(0.454)	(0.455)	(0.428)	(0.425)	(7.201)	(7.162)
Blockholder	−0.0220	−0.162	−0.235	0.639*	0.593	10.76*	10.02
	(0.219)	(0.401)	(0.407)	(0.374)	(0.361)	(6.369)	(6.165)
Age	0.00646*	0.00613	0.00556	0.00661	0.00632	0.116	0.112
	(0.00355)	(0.00673)	(0.00674)	(0.00594)	(0.00579)	(0.101)	(0.0981)

RiskyIndustry	−0.276	−0.334	−0.411	−0.532	−0.650	−9.396	−11.35
	(0.236)	(0.476)	(0.483)	(0.426)	(0.438)	(7.096)	(7.294)
Big5	−0.378	−0.526	−0.515	−0.681**	−0.727**	−10.93**	−11.71**
	(0.263)	(0.402)	(0.401)	(0.340)	(0.343)	(5.451)	(5.514)
Hard	0.247	0.0274	−0.0259	0.000379	−0.0927	0.492	−1.036
	(0.400)	(0.446)	(0.449)	(0.557)	(0.556)	(9.045)	(8.995)
Constant	(1.854)	−0.412	−0.157	−0.991	−0.442	−17.09	−8.007
	(1.828)	(2.244)	(2.244)	(2.149)	(2.181)	(34.53)	(34.91)
Observations	144	82	82	78	78	78	78
R-squared	0.296	0.282	0.283	0.422	0.443	0.418	0.439

We evaluate the impact of price per unit of coverage on different measures of the firms' return-to-risk ratio (quasi-Sharpe ratios) in the first year following the IPO. The dependent variable is one of the following: Excess Sharpe (First year excess return divided by Volatility), Total Sharpe (First year total return divided by Volatility) and Idiosyncratic Sharpe (First year total return divided by Idiosyncratic Risk). The two main variables of interest are Rate-on-line, calculated as the premium per thousand dollars of maximum coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the firm's return-to-risk ratio.

FirstDayReturn is our control variable for underpricing and is computed as the first day return on the close of the first trading day. MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama–French size and growth portfolios respectively. Mkt1Year is the market return during the first year of the IPO. LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares). Growth is the market value of equity plus the book value of liability, divided by the book value of assets. DebtRatio is the ratio of total debt to assets. ROA is the firm's return on assets. IPOfeerat is the ratio of the IPO fees paid per million dollars of market value of equity. Float is computed as the ratio of the number of shares issued over the total number of shares outstanding. ITCE is a dummy variable equal to 1 if the firm is an income trust. US_Sales is the percentage of sales carried out in the US. Independence is the proportion of board members that are classified as independent. RiskyIndustry is equal to 1 if the firm is a member of a risky industry as defined by Bajaj et al. Blockholder is equal to 1 if there is a major shareholder that holds more than 10% of the shares after the IPO and 0 otherwise. Age is the age of the operation entity before the IPO. Big5 is a dummy variable equal to 1 when one of the top-5 Canadian Banks was the lead underwriter. Hard is a dummy variable equal to 1 to account for the period of time when D&O insurance premium were abnormally high.

Coefficients are reported with their robust standard deviation in parentheses.

* Indicate significance at the 10% levels.

** Indicate significance at the 5% levels.

*** Indicate significance at the 1% levels.

Although we cannot assert that insurers are better at anticipating volatility than investors, we nevertheless believe that the metric provided by the rate-on-line could be very useful to market participants.

Our final set of results combines the first year excess return and volatility to analyze whether the excess Sharpe ratio (i.e. the ratio of the one-year excess return to volatility), the total Sharpe ratio (i.e. the ratio of the one-year total return to volatility), or the idiosyncratic Sharpe ratio (i.e. the ratio of the one-year total return to idiosyncratic risk) of our sample firms is negatively related to the D&O insurance rate-on-line. Results are presented in Table 8. No control variable seems to be consistently and significantly related to the excess Sharpe ratio of our sample firms. The only variable that is significant in explaining the return per unit of risk is the rate-on-line.

Again, our results strongly support the idea that the technology used by D&O insurers to transform the firms' liability risk characteristics into an insurance premium has some power in explaining the firms' first year basic stock market return characteristics. The data therefore supports the hypothesis that insurers are able to anticipate the performance of firms in their first year as a public company, even in a context where high information asymmetry prevails.

The results presented in Tables 5–8 use information that one could argue has already been incorporated by the investment banker in the offer price at the time of the IPO, or that it has been quickly and immediately incorporated in the stock price at the end of the first day. As a consequence, we could expect not to observe any link between known firm specific characteristics and the stock return in the first year. This offers an explanation for the low level of significance of most control variables in the regressions of Tables 5–8.

In Table 9, we therefore present regression results that only use the information that is unknown to investors at the time of the IPO: the rate-on-line, the return of market portfolio and the first day return. We also include a dummy variable to control for a hard insurance market, meaning that insurance policies are less affordable and that they come with more stringent constraints. Panel A uses the first day return as an explanatory variable. In Panel B, the first day return is included in the dependent variable. In Specifications 1 through 6, we use as our dependent variable the first year total return net of the first day, while controlling for market return. In Specifications 7 and 8, we use the excess return in the first year net of the first day as our dependent variable.

In Panel A of Table 9, we see that the paper's main hypothesis, that the rate-on-line conveys valuable information, is supported since returns and returns per unit of risk are negatively affected by both measures of the rate-on-line. The positive relationship between the rate-on-line and risk is not as significant though.[12] When we focus solely on the first year return after the first day, as in Panel B of Table 9, then both measures of the rate-on-line remain negatively and significantly related to the total return and to the excess return. The magnitude of the coefficients of *Ln_ROL* and *Rate-on-line* in Panel B are similar to what we had in the previous tables.

5. Robustness checks

This section reports the results of a series of robustness tests to see how sensitive our empirical results are to various econometric specifications.[13] First, we examine the possibility that the decision to purchase D&O insurance conveys information to the market that is not captured when we use an OLS regression. Indeed, given that we do not observe the rate-on-line of firms which do not purchase insurance, the distribution of insured and non-insured firms is not random and could therefore bias the results. We use a Heckman (1979) two step approach to reduce the potential bias. The first step consists in a probit regression that measures a firm's propensity to purchase D&O insurance before its IPO. Similar to the regression results in Table 4, the dependent variable in this regression is *Insurance*. We model the firms' decision to purchase insurance using Specification 2 in Table 4. The second step in

[12] If we concentrate only on the firms that have a high enough idiosyncratic risk (for instance more than 2%), then the main results of the paper hold with a significance of better than 1% on our variables of interest.

[13] For brevity purposes, we mainly focus from this point forward on results related to return and to return per unit of risk.

Table 9
(A) OLS regression that measures the firms' first year return and risk assuming all the information is incorporated in the price on the first day. (B) OLS regression that measures the firms' first year return assuming all the information is incorporated in the price on the first day, net of the first day.

Variables	(1) First year excess return	(2) First year excess return	(3) First year total return	(4) First year total return	(5) Idiosyncratic Risk	(6) Idiosyncratic Risk	(7) Excess Sharpe Ratio	(8) Excess Sharpe Ratio
Panel A. OLS regression that measures the firms' first year return and risk assuming all the information is incorporated in the price on the first day								
ln_ROL	−0.156***		−0.138**		0.00169		−0.452**	
	(0.0586)		(0.0604)		(0.00309)		(0.182)	
Rate-on-line		−0.0205***		−0.0184***		0.000360		−0.0525**
		(0.00615)		(0.00593)		(0.000508)		(0.0221)
FirstDayReturn	0.434	0.479	0.305	0.340	0.0246	0.0244	0.838	0.981
	(0.301)	(0.316)	(0.333)	(0.356)	(0.0225)	(0.0228)	(0.858)	(0.901)
MarketRet			0.734***	0.717***				
			(0.275)	(0.271)				
RiskFree			1.642	0.557				
			(8.736)	(8.597)				
SMB			−0.336	−0.352				
			(0.291)	(0.293)				
HML			−0.0478	−0.0495				
			(0.189)	(0.190)				
Constant	0.323**	0.192**	0.302	0.218	0.0227***	0.0231***	1.016***	0.587**
	(0.133)	(0.0939)	(0.212)	(0.190)	(0.00582)	(0.00435)	(0.376)	(0.236)
Observations	94	94	89	89	96	96	93	93
R-squared	0.041	0.043	0.101	0.104	0.022	0.027	0.052	0.044

Variables	(1) Return net of 1st day	(2) Return net of 1st day	(3) Return net of 1st day	(4) Return net of 1st day	(5) Return net of 1st day	(6) Return net of 1st day	(7) Excess return net of 1st day	(8) Excess return net of 1st day
Panel B. OLS regression that measures the firms' first year return assuming all the information is incorporated in the price on the first day, net of the first day								
ln_ROL	−0.122**		−0.106*		−0.139**		−0.134**	
	(0.0561)		(0.0580)		(0.0584)		(0.0577)	
Rate-on-line		−0.0156**		−0.0156**		−0.0203***		−0.0188***
		(0.00592)		(0.00635)		(0.00563)		(0.00602)
MarketRet	0.155	0.150	0.672**	0.653**	0.531**	0.503*		
	(0.359)	(0.356)	(0.295)	(0.292)	(0.256)	(0.256)		
RiskFree	23.27	21.75	3.022	1.910				
	(15.22)	(15.22)	(8.887)	(8.760)				
SMB	−0.171	−0.182	−0.167	−0.179				
	(0.279)	(0.280)	(0.290)	(0.291)				
HML	−0.238	−0.235	−0.00931	−0.0178				

(*continued on next page*)

Table 9 (*continued*)

Variables	(1) First year excess return	(2) First year excess return	(3) First year total return	(4) First year total return	(5) Idiosyncratic Risk	(6) Idiosyncratic Risk	(7) Excess Sharpe Ratio	(8) Excess Sharpe Ratio
	(0.208)	(0.211)	(0.195)	(0.197)				
Hard	0.467**	0.452*			0.149	0.151		
	(0.229)	(0.229)			(0.151)	(0.149)		
Constant	−0.578	−0.634	0.134	0.0887	0.188	0.0878	0.240*	0.137
	(0.463)	(0.453)	(0.219)	(0.199)	(0.152)	(0.130)	(0.127)	(0.0894)
Observations	86	86	86	86	91	91	91	91
R-squared	0.158	0.158	0.079	0.084	0.085	0.093	0.022	0.027

In Panel A We evaluate the impact of price per unit of coverage on the firms' excess return, idiosyncratic risk, volatility and quasi-Sharpe ratio in the first year following the IPO. The two main variables of interest are Rate-on-line, calculated as the premium paid for one thousand dollar of maximum possible coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the excess return and the Sharpe ratio, and positively related to the idiosyncratic risk and the volatility.
In Panel B We evaluate the impact of price per unit of coverage on the firms' stock market return net of the return on the first day. In all Models we control for the market return in the first year post IPO, but we only control for the risk free rate and the two Fama–French size and growth portfolios in Models 1 through 4. In Models 7 & 8, the market return is deducted from the dependent variable. The two main variables of interest are Rate-on-line, calculated as the premium paid for one thousand dollar of maximum possible coverage, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the return net of the first day.
FirstDayReturn is the firm's stock return on the first day post IPO. Hard is a dummy variable equal to 1 when the D&O insurance market is expensive for the firms seeking insurance. MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama–French size and growth portfolios respectively. Hard is a dummy variable equal to 1 when the D&O insurance market is expensive for the firms seeking insurance.
Coefficients are reported with their robust standard deviation in parentheses.
* Indicate significance at the 10% levels.
** Indicate significance at the 5% levels.
*** Indicate significance at the 1% levels.

Table 10
(A) Two-step regression that measures the first year's stock return and return-to-risk ratio by controlling for the purchase of insurance. (B) Two-step regression that measures the first year's stock return by controlling for the decision to reveal the D&O insurance premium and policy limit.

Variables	(1A) First year excess return	(2A) First year excess return	(3A) First year total return	(4A) First year total return	(5A) First year total return	(6A) First year total return	(7A) Return-to-Risk ratio	(8A) Return-to-Risk ratio
Panel A. Two-step regression that measures the first year's stock return and return-to-risk ratio by controlling for the purchase of insurance								
ln_ROL	−0.165***		−0.136**		−0.131**		−0.504**	
	(0.0634)		(0.0608)		(0.0621)		(0.199)	
Rate-on-line		−0.0274**		−0.0205*		−0.0202		−0.0840**
		(0.0126)		(0.0122)		(0.0135)		(0.0339)
FirstDayReturn	0.762	0.831	0.790	0.868	0.877	0.949*	1.834	2.043
	(0.496)	(0.532)	(0.539)	(0.547)	(0.556)	(0.565)	(1.339)	(1.404)
MarketRet			0.385	0.401	0.441	0.454		
			(0.321)	(0.337)	(0.346)	(0.382)		
RiskFree			−0.264	−0.267	−0.247	−0.250		
			(0.278)	(0.282)	(0.276)	(0.281)		
SMB			−0.273	−0.259	−0.184	−0.175		
			(0.233)	(0.257)	(0.268)	(0.314)		
HML			1.482	0.532	2.006	1.058		
			(10.07)	(9.679)	(10.21)	(9.820)		
lnMVE_IPO	0.0678	0.0662	0.0795	0.0781			0.159	0.154
	(0.0515)	(0.0538)	(0.0487)	(0.0495)			(0.108)	(0.109)
Constant	−0.857	−0.909	−1.083	−1.121	0.402	0.345	−1.698	−1.856
	(1.113)	(1.227)	(1.003)	(1.046)	(0.287)	(0.381)	(2.237)	(2.316)
Observations	128	128	128	128	128	128	129	129

Variables	(5A) First year excess return	(6A) First year excess return	(7A) First year total return	(8A) First year total return
Panel B. Two-step regression that measures the first year's stock return by controlling for the decision to reveal the D&O insurance premium and policy limit				
ln_ROL	−0.160**		−0.114*	
	(0.0636)		(0.0584)	
Rate-on-line		−0.0245**		−0.0155*
		(0.0108)		(0.00885)
FirstDayReturn	0.534	0.608	0.562	0.635
	(0.579)	(0.572)	(0.597)	(0.596)
MarketRet			0.240	0.242
			(0.321)	(0.322)
RiskFree			−0.264	−0.260
			(0.252)	(0.253)
SMB			−0.382*	−0.365
			(0.230)	(0.230)

(*continued on next page*)

HML			0.588	0.0708
			(9.638)	(9.450)
lnMVE_IPO	0.0481	0.0461	0.0586	0.0569
	(0.0640)	(0.0643)	(0.0557)	(0.0563)
IMR	−0.245	−0.256	−0.0724	−0.0834
	(0.286)	(0.299)	(0.291)	(0.299)
Constant	−0.282	−0.346	−0.509	−0.554
	(1.438)	(1.458)	(1.183)	(1.215)
Observations	126	126	122	122

In Panel A We evaluate the impact of price per unit of coverage on the firms' stock market return in the first year following the IPO controlling for the information imbeded in the purchase of insurance or not (model 2 in Table 4). The dependent variable is the return in excess of the market in Models 1 and 2, the total return in Models 3 through 6, and the total return net of the market return divided by the one year volatility in Models 7 and 8. The two main variables of interest are Rate-on-line, calculated as the premium-to-coverage ratio, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the first year return.
FirstDayReturn is our control variable for underpricing and is computed as the first day return on the close of the first trading day. MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama–French size and growth portfolios respectively. LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares).
The first stage regression (i.e., the decision to puchase insurance or not) is given by Model 2 in Table 4. In none of the regression models presented in this Table can we reject the hypothesis that the two equation are independent.
In Panel B We evaluate the impact of price per unit of coverage on the firms' stock market return in the first year following the IPO controlling for the information imbeded in the purchase of insurance or not (model 2 in Table 4) and the decision to reveal the premium paid and the coverage chosen. The dependent variable is the return in excess of the market in Models 1 and 2, and the total return in Models 3 and 4. The two main variables of interest are Rate-on-line, calculated as the premium-to-coverage ratio, and ln_ROL, the log of the Rate-on-line. We hypothesize that these two measures should be negatively related to the first year return.
FirstDayReturn is our control variable for underpricing and is computed as the first day return on the close of the first trading day. MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama–French size and growth portfolios respectively. IMR is the inverse-Mills ratio calculated from the insurance purchase decision regression of Model 2 in Table 4.
The first stage regression (i.e., the decision to reveal the D&O insurance premium and coverage is given by InsDetails = Growth + ROA + Blockholder + Debtratio + Float + Riskyindustry + us + Age + Big5. In none of the regression models presented in this Table can we reject the hypothesis that the two equations are independent.
Coefficients are reported with their robust standard deviation in parentheses.
* Indicate significance at the 10% levels.
** Indicate significance at the 5% levels.
*** Indicate significance at the 1% levels.

the Heckman two-step procedure involves an OLS regression to determine the impact of the rate-on-line on the different post-IPO dependent variables.

The second robustness analysis we conduct examines the consequences of a situation where the stock market risk and return are jointly determined and where each feedbacks into the other. We therefore modify the econometric models to simultaneously estimate the stock market returns and risk in the first year post-IPO. The econometric technique used is either a two-stage least square or three-stage least square regression to make sure that the results are not due to a misspecification of the econometric model.

5.1. Likelihood of carrying D&O insurance and two-step regression

The first robustness check is to verify whether the choice of being insured or not creates a significant selection bias in the sense that firms who choose to purchase insurance are fundamentally different from those that do not. We control for the potential selection bias by using a classic Heckman two-step approach in Table 10 (we only report the results from the second stage regressions), in order to explain the first year excess return, the first year total return, as well as the market excess quasi-Sharpe ratio (the selection regression model is omitted, but available from the authors). The basic results of the paper hold: there is a negative and significant relationship between the two measures of the rate-on-line and the firms' total return, excess return, and excess return per unit of risk in the first year post IPO.

As we see in Table 10, the two main variables of interest are significantly negatively associated with the return of firms that went public through an initial public offering. Not only do the selection bias regression results confirm the results presented in Table 5, the coefficients' value are extremely similar. This should tell us that the impact of the selection bias is small. Even when we use market-adjusted quasi-Sharpe ratios as our dependent variable, the results are similar to the results presented in Table 8. This again suggests that the selection bias, if it exists, is relatively small and economically inconsequential (which is confirmed by the Wald test). In unreported results, we find that the volatility results are also unchanged when controlling for the selection bias, and the inclusion of the full set of control variables.

In Panel B of Table 10, we also report regression results where we explicitly control for systematic differences which may exist between firms that purchase insurance and disclose the policy limit and premium and those that purchase insurance but do not provide this information. The econometric model therefore has three steps: the decision to purchase, the decision to reveal all information, and the return in the first year. Using the inverse Mills ratio from probit model 2 from Table 4, we run a Heckman selection model where the first dependent variable takes the value one for firms that disclose their policy limit and premium, and zero otherwise. The second stage is an OLS regression with our return and risk measures as dependent variables, and where the computed inverse Mills ratio variable is included as a control. Our results remain unchanged, which suggests that the impact of the disclosure selection bias is small or even inexistent.

5.2. Simultaneous (feedback) effects of risk and return

The results of Table 11 take into account the potential simultaneous determination of risk and return in the model since feedback effects could exist between risk (however measured) and return. We test our main hypothesis using a two-stage least square (Panel A) as well as a three-stage least square (Panel B) approach.

Correcting for the simultaneity of risk and return measures reduces the significance of the coefficients of interest but does not alter the overall results. In both panels we corrected for the selection bias and the feedback effect by including the inverse-Mills ratio in all of the regressions. Overall results show that the price-to-coverage ratio is positively associated with risk and negatively associated with returns. The main message of the paper is therefore supported using many different econometric models.

We can therefore be confident that the paper's main results presented in Tables 5–8 are robust, which means that the firms' first year returns are significantly related to their D&O insurance

Table 11
(A) Two-stage least square simultaneous regressions for the first year total return and risk. (B) Three-stage least square simultaneous regressions for the first year total return and risk.

Variables	(1) Two-stage least square	(2)	(3) Two-stage least square	(4)	(5) Two-stage least square	(6)	(7) Two-stage least square	(8)
	First year total return	Idiosyncratic	First year total return	Idiosyncratic	First year total return	Volatility	First year total return	Volatility
Panel A. Two-stage least square simultaneous regressions for the first year total return and risk								
ln_ROL	−0.265**	0.00436			−0.265**	0.0786*		
	(0.115)	(0.00268)			(0.115)	(0.0456)		
Rate-on-line			−0.0372***	0.000549*			−0.0372***	0.00948*
			(0.0136)	(0.000312)			(0.0136)	(0.00531)
FirstDayReturn	0.532		0.791		0.532		0.791	
	(0.744)		(0.736)		(0.744)		(0.736)	
MarketRet	−0.198		−0.253		−0.198		−0.253	
	(0.428)		(0.421)		(0.428)		(0.421)	
RiskFree	7.455		1.914		7.455		1.914	
	(14.66)		(14.80)		(14.66)		(14.80)	
SMB	−0.238		−0.230		−0.238		−0.230	
	(0.369)		(0.362)		(0.369)		(0.362)	
HML	−0.541*		−0.538*		−0.541*		−0.538*	
	(0.280)		(0.274)		(0.280)		(0.274)	
lnMVE_IPO	0.0827	−0.00783***	0.0754	−0.00759***	0.0827	−0.111***	0.0754	−0.107***
	(0.0753)	(0.00169)	(0.0736)	(0.00169)	(0.0753)	(0.0287)	(0.0736)	(0.0287)
Growth	0.00912	0.00123	0.00760	0.00121	0.00912	0.0189	0.00760	0.0183
	(0.0315)	(0.000753)	(0.0309)	(0.000744)	(0.0315)	(0.0128)	(0.0309)	(0.0127)
RiskyIndustry	−0.249	0.00350	−0.300	0.00420	−0.249	0.0628	−0.300	0.0750
	(0.190)	(0.00393)	(0.189)	(0.00393)	(0.190)	(0.0669)	(0.189)	(0.0669)
ROA	0.283		0.305		0.283		0.305	
	(0.481)		(0.470)		(0.481)		(0.470)	
IPOfeerat	−1.140	−0.0579	−0.851	−0.0615	−1.140	−0.764	−0.851	−0.840
	(2.316)	(0.0551)	(2.248)	(0.0544)	(2.316)	(0.936)	(2.248)	(0.926)
Float	0.100	−0.0187**	0.0116	−0.0174*	0.100	−0.293*	0.0116	−0.268*
	(0.397)	(0.00905)	(0.388)	(0.00891)	(0.397)	(0.154)	(0.388)	(0.152)
ITCE	−0.303	−0.00380	−0.329	−0.00406	−0.303	−0.0621	−0.329	−0.0676
	(0.347)	(0.00736)	(0.341)	(0.00731)	(0.347)	(0.125)	(0.341)	(0.125)
US_sales	−0.167		−0.142		−0.167		−0.142	
	(0.270)		(0.265)		(0.270)		(0.265)	
Independence	0.0612		0.0405		0.0612		0.0405	
	(0.492)		(0.479)		(0.492)		(0.479)	
Duality	−0.320		−0.367*		−0.320		−0.367*	
	(0.215)		(0.212)		(0.215)		(0.212)	

Blockholder	0.306*	−0.00360	0.278	−0.00305	0.306*	−0.0657	0.278	−0.0557
	(0.183)	(0.00412)	(0.178)	(0.00409)	(0.183)	(0.0700)	(0.178)	(0.0696)
Age	0.00349	−9.49e−05	0.00352	−8.94e−05	0.00349	−0.00144	0.00352	−0.00134
	(0.00306)	(6.75e−05)	(0.00300)	(6.74e−05)	(0.00306)	(0.00115)	(0.00300)	(0.00115)
Big5	−0.211	−0.00369	−0.230	−0.00382	−0.211	−0.0683	−0.230	−0.0722
	(0.171)	(0.00404)	(0.168)	(0.00398)	(0.171)	(0.0687)	(0.168)	(0.0678)
Hard	0.323	−0.0123**	0.292	−0.0119**	0.323	−0.210**	0.292	−0.202**
	(0.307)	(0.00549)	(0.302)	(0.00543)	(0.307)	(0.0933)	(0.302)	(0.0924)
IMR	0.162	−0.0105	0.226	−0.0105	0.162	−0.147	0.226	−0.147
	(0.622)	(0.0106)	(0.611)	(0.0106)	(0.622)	(0.181)	(0.611)	(0.180)
Constant	−0.446	0.178***	−0.241	0.175***	−0.529	0.178***	−0.333	0.175***
	(1.157)	(0.0315)	(1.149)	(0.0313)	(1.034)	(0.0294)	(1.027)	(0.0293)
Observations	86	86	86	86	86	86	86	86
R-squared	0.297	0.581	0.317	0.589	0.294	0.581	0.314	0.589
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Three-stage least square		Three-stage least square		Three-stage least square		Three-stage least square	
	First year total return	Idiosyncratic	First year total return	Idiosyncratic	First year total return	Volatility	First year total return	Volatility
Panel B. Three-stage least square simultaneous regressions for the first year total return and risk								
ln_ROL	−0.280***	0.00436*			−0.274***	0.0786*		
	(0.0962)	(0.00245)			(0.0964)	(0.0416)		
Rate-on-line			−0.0381***	0.000549*			−0.0375***	0.00948*
			(0.0113)	(0.000285)			(0.0114)	(0.00485)
FirstDayReturn	0.505		0.724		0.442		0.663	
	(0.587)		(0.583)		(0.594)		(0.590)	
MarketRet	−0.0971		−0.147		−0.112		−0.162	
	(0.337)		(0.334)		(0.341)		(0.338)	
RiskFree	3.631		−0.767		4.565		0.103	
	(11.56)		(11.73)		(11.70)		(11.86)	
SMB	−0.398		−0.384		−0.398		−0.384	
	(0.291)		(0.287)		(0.294)		(0.290)	
HML	−0.437**		−0.438**		−0.421*		−0.425*	
	(0.221)		(0.217)		(0.223)		(0.219)	
lnMVE_IPO	0.0832	−0.00783***	0.0739	−0.00759***	0.0801	−0.111***	0.0713	−0.107***
	(0.0628)	(0.00154)	(0.0615)	(0.00154)	(0.0629)	(0.0262)	(0.0617)	(0.0262)
Growth	0.00734	0.00123*	0.00658	0.00121*	0.00647	0.0189	0.00578	0.0183
	(0.0265)	(0.000688)	(0.0260)	(0.000679)	(0.0265)	(0.0117)	(0.0260)	(0.0116)
RiskyIndustry	−0.326**	0.00350	−0.374**	0.00420	−0.313**	0.0628	−0.361**	0.0750
	(0.157)	(0.00359)	(0.156)	(0.00359)	(0.158)	(0.0610)	(0.157)	(0.0610)
ROA	−0.000589		0.0326		0.0621		0.0919	
	(0.380)		(0.373)		(0.384)		(0.377)	
IPOfeerat	−1.126	−0.0579	−0.830	−0.0615	−1.204	−0.764	−0.908	−0.840

(*continued on next page*)

Table 11 (*continued*)

Variables	(1) Two-stage least square	(2)	(3) Two-stage least square	(4)	(5) Two-stage least square	(6)	(7) Two-stage least square	(8)
	First year total return	Idiosyncratic	First year total return	Idiosyncratic	First year total return	Volatility	First year total return	Volatility
	(1.945)	(0.0503)	(1.889)	(0.0496)	(1.948)	(0.855)	(1.891)	(0.845)
Float	0.0921	−0.0187**	0.000393	−0.0174**	0.0795	−0.293**	−0.0103	−0.268*
	(0.332)	(0.00826)	(0.325)	(0.00814)	(0.333)	(0.140)	(0.325)	(0.139)
ITCE	−0.265	−0.00380	−0.285	−0.00406	−0.259	−0.0621	−0.279	−0.0676
	(0.288)	(0.00671)	(0.283)	(0.00668)	(0.289)	(0.114)	(0.284)	(0.114)
US_sales	−0.159		−0.137		−0.148		−0.128	
	(0.213)		(0.210)		(0.215)		(0.212)	
Independence	0.167		0.143		0.170		0.147	
	(0.388)		(0.380)		(0.392)		(0.384)	
Duality	−0.294*		−0.334**		−0.279		−0.320*	
	(0.169)		(0.168)		(0.171)		(0.170)	
Blockholder	0.339**	−0.00360	0.306**	−0.00305	0.331**	−0.0657	0.300**	−0.0557
	(0.153)	(0.00376)	(0.148)	(0.00373)	(0.153)	(0.0639)	(0.149)	(0.0636)
Age	0.00339	−9.49e−05	0.00334	−8.94e−05	0.00336	−0.00144	0.00333	−0.00134
	(0.00255)	(6.17e−05)	(0.00251)	(6.15e−05)	(0.00255)	(0.00105)	(0.00251)	(0.00105)
Big5	−0.214	−0.00369	−0.226	−0.00382	−0.214	−0.0683	−0.227	−0.0722
	(0.143)	(0.00369)	(0.141)	(0.00363)	(0.144)	(0.0627)	(0.141)	(0.0619)
Hard	0.248	−0.0123**	0.221	−0.0119**	0.263	−0.210**	0.236	−0.202**
	(0.251)	(0.00501)	(0.247)	(0.00495)	(0.253)	(0.0851)	(0.249)	(0.0843)
IMR	0.0507	−0.0105	0.110	−0.0105	0.0556	−0.147	0.114	−0.147
	(0.507)	(0.00970)	(0.500)	(0.00966)	(0.510)	(0.165)	(0.503)	(0.165)
Constant	−1.068	0.199***	−0.902	0.197***	−1.047	2.908***	−0.886	2.879***
	(1.367)	(0.0325)	(1.348)	(0.0325)	(1.371)	(0.553)	(1.351)	(0.554)
Observations	78	78	78	78	78	78	78	78
R-squared	0.332	0.649	0.355	0.651	0.332	0.619	0.356	0.620

In Panel A We evaluate simultaneously the impact of price per unit of coverage on the firms' stock market return and risk in the first year following the IPO. The dependent variables are the first year total return and the first year idiosyncratic risk in Models 1 and 2, and volatility in Models 3 and 4. The two main variables of interest are Rate-on-line, calculated as the premium-to-coverage ratio, and ln_ROL, the log of the Rate-on-line. We hypothesize that both measures should be negatively related to the first year return and positively to the first year risk.
In Panel B we evaluate simultaneously the impact of price per unit of coverage on the firms' stock market return in the first year following the IPO. The dependent variables are the first year total return and the first year idiosyncratic risk. The two main variables of interest are Rate-on-line, calculated as the premium-to-coverage ratio, and ln_ROL, the log of the Rate-on-line. We hypothesize that both measures should be negatively related to the first year return and positively to idiosyncratic risk.
FirstDayReturn is our control variable for underpricing and is computed as the first day return on the close of the first trading day. MarketRet, RiskFree, SMB and HML are the one year total returns of the Canadian market portfolio, the risk free rate and the two Fama–French size and growth portfolios respectively. Mkt1Year is the market return during the first year of the IPO. LnMVE_IPO is the log of the firm's market value of equity at the time of the IPO (issue price multiplied by number of outstanding shares). IPOfeerat is the ratio of the IPO fees paid per million dollar of market value of equity. Float is computed as the ratio of the number of shares issued over the total number of shares outstanding. ITCE is a dummy variable equal to 1 if the firm is an income trust. US_Sales is the percentage of sales carried out in the US. Independence is the proportion of board members that are classified as independent. Duality is equal to 1 if the CEO is also the Chairman of the board and zero otherwise. Growth is the market value of equity plus the book value of liability, divided by the book value of assets. DebtRatio is the ratio of total liabilities to the market value of equity at the time of the IPO. Risky_Industry is an indicator variable equal to one if the company operated in one of the industries classified as risky

in Bajaj et al. (2000). Age is the number of years separating inception from the announcement of the IPO. Blockholder is a dummy variable equal to one if a shareholder holds 10% or more of the firm's stock. Big5 is a dummy variable equal to 1 when one of the top-5 Canadian Banks was the lead underwriter. Hard is a dummy variable equal to one in the years where the D&O insurance market is expensive. IMR is the inverse-Mills ratio of the probit regression explaining the purchase of insurance (Model 2 of Table 4).
The first stage regression from which the inverse-Mills ratio is calculated is drawn from Model 2 in Table 4. In none of the regression models presented in this table can we reject the hypothesis that the equations are independent.
Coefficients are reported with their standard deviation in parentheses.
* Indicate significance at the 10% levels.
** Indicate significance at the 5% levels.
*** Indicate significance at the 1% levels.

contracts' rate-on-line. This suggests that insurers who offer D&O insurance protection are able to process information at the time of the IPO that investors should find valuable.

6. Discussion and conclusion

The primary objective of this paper is to examine whether insurers that provide firms and their managers with protection against the event of costly litigation are able to effectively process information that could be valuable to investors at the time of the firms' initial public offering. More precisely, firms that seek to protect their managers against costly liability lawsuits may purchase protection from insurers that examine each firm's governance structure, organizational processes and its "character and culture" to arrive at a premium that reflects the firm's risk of lawsuits. Even though this audit is performed prior to the IPO date, investors only learn this information much later, in the proxy statement, which is typically released a few months after the end of the first fiscal year.

Whenever insurers decide to provide coverage to any policyholder, they assess the probability and severity of claims they could potentially be asked to cover. D&O insurance claims are generally related to lawsuits brought against the firm's managers by shareholders or other stakeholders. Lawsuits are more frequent when the stock has performed poorly, and a lawsuit's severity is greater when volatility is higher. Consequently, insurers that sell D&O insurance must use an audit technology (known as risk underwriting in the insurance industry) that yields a higher price of insurance when the expected loss is greater, whether this is due to a higher frequency of losses (i.e. lower stock returns) or a higher severity of lawsuits (higher stock volatility). The main results of this paper confirm this view of the D&O insurance world. We find that firms that pay a high price for their directors' and officers' liability insurance coverage tend to underperform in their first year since they are more likely to have a lower stock return and a higher volatility. Our results connect the premium paid before the IPO with the volatility post IPO, and thus provide a missing link in the literature. Our findings reconcile economic theory with empirical evidence as insurers charge more *ex ante* to firms that are risker *ex post*. Chalmers et al. (2002) found the opposite result, which was surprising.

Our results lend support to the hypothesis that D&O liability insurers have material information about the internal structure of soon-to-be public firms that other investors do not have.[14] Given that the main determinant of the premium is the assessment of deep corporate governance (Baker and Griffith, 2007a), our study provides support for the idea that D&O insurance information could be a potential substitute to commercial governance indices. Further research to formally test this hypothesis is on our research agenda. For American investors, the information related to the purchase of D&O insurance is usually not available in the United States (see Griffith, 2006). Even in cases where some information is available, as in the state of New York (see Linck et al., 2009), only the premium information is provided, which is insufficient to draw any reasonable conclusion on the firm's risk.

The use of D&O insurance information as a tool to assess stock return and volatility falls within the recent push to find a way to properly account for a firm's governance structure (see Rose, 2007; Bebchuk and Hamdani, 2009; Bebchuk and Weisbach, 2010; Adams et al., 2010, and Larcker and Tayan, 2013, *inter alia*). As many governance factors are not properly specified or are completely unavailable to the general investor (see Baker and Griffith, 2007a), one has to wonder how much of the internal structure of the firm remains unknown to market participants. That is why Holderness (1990), O'Sullivan (1997), Core (2000) and Boyer and Stern (2012) argue that D&O insurance providers are more likely to be good firm monitors since they have a monetary incentive to price the contract properly although Baker and Griffith (2007b) argue that insurers have not been doing such a good job at this.

The results herein can be seen as a laboratory test that adds weight to calls for disclosure of D&O insurance information (see Griffith, 2006). Mandating the revelation of basic D&O insurance

[14] In unreported results, we find that the predictive power of D&O insurance disappears after the first year. The likely reason is that market participants slowly incorporate in stock prices the information that was only available to insurers at the time of the IPO so that the information advantage of D&O insurers is dissipated.

information (premium and coverage) could potentially be valuable to investors since it would provide them with an unbiased signal about a firm's risk of litigation against its directors and officers, perhaps because of some managerial mishaps or accidental incompetence. Since the vast majority of Canadian and American corporations purchase liability insurance on behalf of their directors and officers, it would seem efficient to have access to this risk measure.

Further research is necessary in order to specifically assess the welfare implications of mandating such disclosure. Particular attention should be paid to the fact that the interests of existing and new shareholders do not necessarily converge with respect to the disclosure of D&O insurance information.[15] Furthermore, the generalization to large U.S. listed firms is uncertain since our results relate to the case of new Canadian firms that became public through an IPO. These caveats notwithstanding, the questions we raise in this paper are relevant and timely given the time and energy that investors and regulators devote to governance issues.

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Appendix A

See Appendix A.

Appendix B. Examples

Two examples of how the information related to the D&O insurance contract is release and appears in management proxies to illustrate the timing of D&O insurance purchase.

"Associated Brands (IPO on November 15th 2002): the management proxy dated May 5th 2003 states that "directors and officers ... are covered under a directors' and officers' insurance policy that provides aggregate coverage to the insured individuals of $15 million, subject to a $150,000 deductible on securities claims and a $75,000 deductible on other claims. The premium paid by the Fund for this coverage for the period from November 1, 2002 to October 31, 2003 was $180,965."

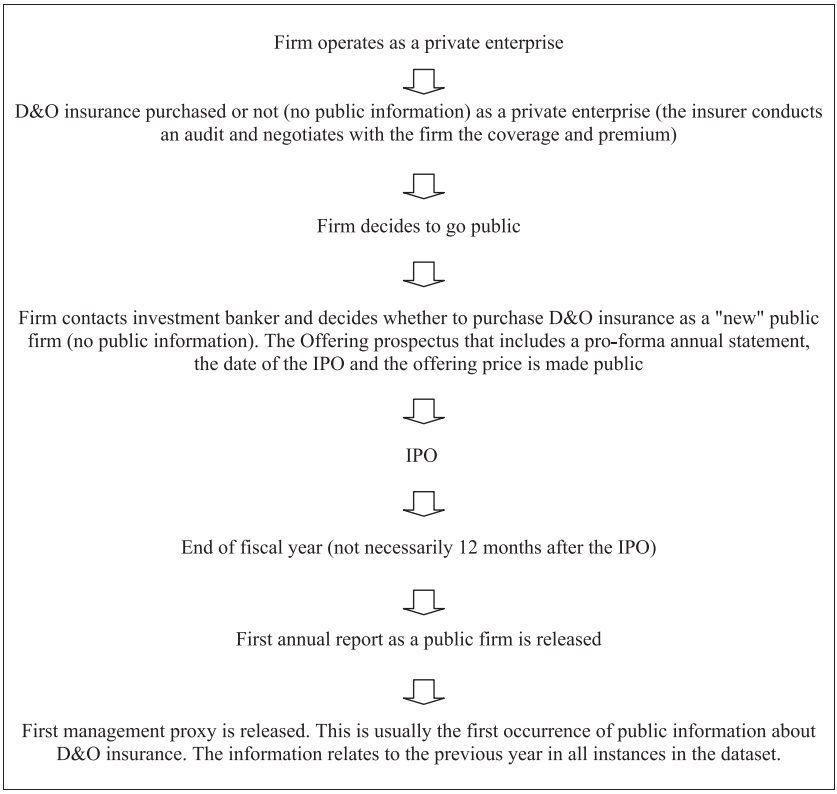
"Bridgewater Systems Corporation (IPO on December 14th 2007): the management proxy dated May 13th 2008 states that "The Corporation maintains directors' and officers' liability insurance coverage with a deductible of $25,000 for each non-securities claim and $50,000 for each securities claim with a $10 million limit in aggregate. Coverage includes errors, omissions or breach of fiduciary duty by the directors and officers during the discharge of their legal duties. The Corporation's annual premium is $73,576 (plus tax) which covers a twelve month period from December 1, 2007 to December 1, 2008."

Appendix C

See Appendix C.

[15] We thank a referee for pointing out this distinction.

Appendix A
Timeline of the D&O insurance acquisition and information release.



Appendix D. Definition of control variables

Unless noted otherwise, all independent variables are measured using accounting information available in the firms' first annual report post-IPO.

Financial variables

We use *FirstDayReturn* as a control variable to account for the possible underpricing of IPO shares on the first day of trading to attract risk-averse investors (for a more thorough discussion, see Ritter, 1987, *inter alia*). This variable is computed as the price at the end of the first day divided by the offer price.[16] *MarketRet* is the one-year post-IPO return of the stock market as calculated by the total return of Canada's main stock index. It should be positively correlated with the stock market return. *RiskFree*, *SMB* and *HML* are the risk free rate, and the two Canadian Fama–French size and growth portfolios (available until 2009 only) respectively.

We measure firm size by the log of the firm's market value of equity at the time of the IPO (*lnMVE_IPO*). Large firms should be less volatile and have less idiosyncratic risk, and have higher

[16] For 16 firms, we do not have the price on the first day post-IPO (but only 3 of those have an IPO completion date post 1996, and only 1 gives us the information to calculate the rate-on-line). Instead of dropping the observation from our analysis, we decided to first assign a value of 0 for the first day return, and second to use the impute command in Stata using the first year return, the market return and the firm's industry to impute the return on the first day.

returns because more investors will scrutinize the activities of larger firms. We use a firm's market value of equity at the time of the IPO to make sure that this measure of size is not confounded with stock market returns. The *lnMVE_IPO* variable is calculated as the log of the product of the offer price by the number of shares outstanding on the day of the IPO. $Growth = \frac{\text{market value of equity at time of IPO+book value of liabilities}}{\text{book value of assets}}$ (see Core, 1997) measures a firm's growth opportunities. A firm with a high growth ratio should be more profitable if the growth options turn out to be in the money. Consequently, we expect high growth firms to have higher first year returns on average. We also expect firms experiencing higher growth to have more volatile returns. *ROA* is the return on assets computed as $\frac{\text{NetIncome}}{\text{Total Assets}}$. We expect firms with a higher ROA to have a better stock market performance.

Finally, the last financial variable we use is the firm's book leverage (or *Debt_Ratio*), which is $\frac{\text{Total Liabilities}}{\text{Total Assets}}$. Stock market volatility and idiosyncratic risk should be lower if debt holders are exercising a greater level of monitoring. On the other hand, the more levered is the firm the higher should be its stock return volatility since it is more at risk of going bankrupt. The net effect is undetermined.

Governance variables

We collected several variables related to governance: CEO and chairman of the board duality, board composition and independence as well as the presence of a blockholder. We also control for the corporate structure.

Duality is an indicator variable taking on the value one if the chairman of the board is also the company's chief executive officer and zero otherwise. This particular feature of a board is usually viewed as an entrenchment red flag. If entrenchment is an issue then *Duality* could be associated with low volatility and a low idiosyncratic risk (because the CEO/COB does not want to risk bankruptcy), and low returns (if firm resources are spent on negative NPV projects). Because *Duality* affects both risk and return in the same direction, we do not expect to see much impact on the Sharpe ratio variables.

Blockholder is an indicator variable equal to one if a shareholder owns 10% or more of the firm's voting shares according to its first proxy statement. Similar to debtholders, blockholders should have more at stake in monitoring the firm. Consequently, *Volatility* and *Idiosyncratic* is expected to be lower when a blockholder is present.

Independence is the percentage of unrelated directors on the board of directors as reported in the firms' proxy statements. The presence of a more independent board could increase returns if it prevents the entrenchment of management and if it reduces the likelihood of cash flow misappropriation.

The *ITCE* variable is an indicator variable equal to one if the company is an income trust and zero otherwise. We include this variable since, Gillen (2005), and Huson and Pazzaglia (2007) argue that income trusts are riskier than stock companies from a governance standpoint. Boyer and Stern (2012) find that firms incorporated as income trusts pay more to protect their directors and officers, *ceteris paribus*. Income trusts are required to pass along more of their operating cash flows to their investors, which reduces volatility as well as returns since earnings are typically not reinvested, which makes capital gains infrequent. *Volatility* and *Idiosyncratic* should also be lower since income trusts distribute more dividends, and are typically older and more mature firms than stock companies. The relationship between *ITCE* and the Sharpe ratio is therefore undetermined as the numerator and the denominator are expected to be lower if the firm is an income trust.

Other variables

Risky_Industry is an indicator variable equal to one if the firm belongs to one of the ten two-digit SIC codes risky industries as identified in Bajaj et al. (2000). Firms that belong to one of these ten risky industries that were deemed riskier based on the number of cases settled as well as the average settlement amount should have more volatile stock returns and risk, and higher returns on average. Firms operating in risky industries should also be more likely to purchase D&O insurance if only because of the higher frequency of lawsuits.

Appendix C

List of all companies in the final sample with the date of the IPO completion. For all the firms in our sample, we present, in alphabetical order, their name at the time of the IPO and the date of their IPO completion.

#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)	#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)	#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)
1	5 N Plus Inc.		71	First Uranium Corporation	20070306	141	Oceanex Income Fund	19980106
2	A & W Revenue Royalties Income Fund	20020215	72	Fortress Paper Ltd.	20070911	142	OnX Enterprise Solutions Inc.	20000417
3	ACS Media Income Fund	20030508	73	Franco-Nevada Corporation	20080219	143	Orbit Garant Drilling Inc.	20080908
4	ADF Group Inc.	19990721	74	Freehold Royalty Trust	19961125	144	Osprey Media Income Fund	20040415
5	ATS Alauer Income Fund	20050930	75	Futuremed Healthcare Income Fund	20060106	145	PBB Global Logistics Income Fund	20020515
6	AXXENT Inc.	19991028	76	GENIVAR Income Fund	20060809	146	PDM Royalties Income Fund	20040608
7	Absolute Software Corporation	20000328	77	GMP Capital Corp.	20031209	147	Pantera Drilling Income Trust	20060222
8	Addax Petroleum Corporation	20060216	78	GWR Global Water Resources Corp.	20110215	148	Petrowest Energy Services Trust	20061114
9	Addenda Capital Inc.	20041214	79	Gateway Casinos Income Fund	20021128	149	Philex Gold Inc.	19961028
10	Adherex Technologies Inc.	20010605	80	General Donlee Income Fund	20020503	150	Pizza Pizza Royalty Income Fund	20050706
11	Alexis Nihon REIT	20021220	81	Genesis Worldwide Inc.	20070703	151	Polaris Minerals Corporation	20060110
12	Algonquin Power Income Fund	19971223	82	Genworth MI Canada Inc.	20090923	152	Polyair Inter Pack Inc.	19960220
13	AltaGas Utility Group Inc.	20051117	83	Gienow Windows & Doors Income Fund	20041019	153	Pretium Resources Inc.	20110307
14	Amtelecom Income Fund	20030306	84	Gildan Activewear Inc.	19980624	154	Prime Restaurants Royalty Income Fund	20020722
15	Angle Energy Inc.	20080916	85	Gluskin Sheff + Associates Inc.	20060630	155	Pure Energy Services Ltd.	20060206
16	Armtec Infrastructure Income Fund	20040727	86	Golf Town Income Fund	20041112	156	Q9 Networks Inc.	20040429
17	Arriscraft International Income Fund	20041214	87	Granby Industries Income Fund	20041216	157	Quadra Mining Ltd.	20040408
18	Art In Motion Income Fund	20040803	88	Great Lakes Hydro Income Fund	19991118	158	RO Inc.	20021105
19	Ascalade Communications Inc.	20050627	89	Hardwoods Distribution Income Fund	20040323	159	ROW Entertainment Income Fund	20031104
20	Associated Brands Income Fund	20021115	90	Harvest Energy Trust	20021205	160	Residential Equities REIT	19980216
21	Athabasca Oil Sands Corp.	20100617	91	Heating Oil Partners Income Fund	20020522	161	Resolve Business Outsourcing Income Fund	.
22	Athabasca Potash Inc.	20080304	92	Highpine Oil & Gas Limited	20050405	162	Revett Minerals Inc.	20050216
23	Atrium Biotechnologies Inc.	20050406	93	Homburg Canada REIT	20100809	163	Richards Packaging Income Fund	20040407

24	Aurora Energy Resources Inc.	20060406
25	AutoCanada Income Fund	20060725
26	Axcan Pharma Inc.	19951228
27	BFI Canada Income Fund	20020425
28	Bell Nordiq Income Fund	20020423
29	Bird Construction Income Fund	20060509
30	Bridgewater Systems Corporation	20080227
31	C&C Energia Ltd.	20100811
32	COM DEV International Ltd.	19961210
33	Calpine Natural Gas Trust	20031015
34	Canaccord Capital Inc.	20040630
35	Canada Cartage Diversified Income Fund	20060522
36	Canadian Helicopters Income Fund	20050909
37	Canadian Hotel Income Properties REIT	19970625
38	Canadian Satellite Radio Holdings Inc.	20051212
39	Canexus Income Fund	20050818
40	Capital Power Corporation	20090831
41	Cavell Energy Corporation	19961031
42	Celestica Inc.	19980707
43	Centerra Gold Inc.	20040630
44	Clearwater Seafoods Income Fund	20020731
45	ConjuChem Inc.	20001130
46	Connors Bros. Income Fund	20011108
47	Constellation Software Inc.	20060801
48	Cossette Communication Group Inc.	19990618
49	Countryside Power Income Fund	20040408
50	Coventree Inc.	20070206
51	Crombie Real Estate Investment Trust	20060531
52	Custom Direct Income Fund	20030529
94	Hub International Limited	19990210
95	Hydrogenics Corporation	20001101
96	IAMGOLD Corporation	19960308
97	IAT Air Cargo Facilities Income Fund	19970610
98	IMRIS Inc.	20080115
99	ING Cada Inc.	20041210
100	INSCAPE Corporation	19971209
101	IPC US Real Estate Investment Trust	20011220
102	Impax Energy Services Income Trust	20060822
103	Indigo Books & Music Inc.	19961204
104	Industrial Alliance Insurance	20000210
105	InnVest Real Estate Investment Trust	20020726
106	Innergex Power Income Fund	20030707
107	Innergex Renewable Energy Inc.	
108	Ivanhoe Energy Inc.	19970611
109	KCP Income Fund	20020823
110	KMS Power Income Fund	19970610
111	Karnalyte Resources Inc.	
112	Keyera Facilities Income Fund	20030530
113	Kingsway Fincial Services Inc.	19951218
114	LAB Research Inc.	
115	Legacy Hotels REIT	19971110
116	Leisureworld Senior Care Corporation	
117	Liquor Barn Income Fund	20060802
118	Liquor Stores Income Fund	20040928
119	Lithium Americas Corp.	20100803
120	Livingston International Income Fund	20020211
121	MacDonald Dettwiler and Associates Ltd.	20000713
122	Madacy Entertainment	20050420
164	Ridley Inc.	19970808
165	Royal Host Real Estate Investment Trust	19971031
166	Royal Utilities Income Fund	20060905
167	SCI Income Trust	19971016
168	SFK Pulp Fund	20020801
169	Saputo Inc.	19971009
170	Saxon Financial Inc.	20050707
171	Second Cup Royalty Income Fund	20041202
172	Shoppers Drug Mart Corporation	20011121
173	Sierra Systems Group Inc.	19980421
174	Solium Capital Inc.	20010511
175	Spectra Premium Industries Inc.	19971209
176	Sun Gro Horticulture Income Fund	20020327
177	Sun-Rype Products Ltd.	19961112
178	Sunrise Senior Living REIT	20041223
179	Superior Plus Income Fund	19961008
180	Supremex Income Fund	20060614
181	Synenco Energy Inc.	20051112
182	TECSYS Inc.	19980727
183	TGS North American REIT	20021206
184	TMX Group Inc.	20021112
185	Tahoe Resources Inc.	20100824
186	Telesystem International Wireless Inc.	19970509
187	TeraGo Inc.	20070806
188	Teranet Income Fund	20060829
189	The Brick Group Income Fund	20040720
190	The Consumers Waterheater Income Fund	20021217
191	The Data Group Income Fund	20041221
192	The Keg Royalties Income	20020531

(*continued on next page*)

Appendix C (*continued*)

#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)	#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)	#	Company name at the time of the IPO	Date of IPO completion (yyyymmdd)
				Income Fund			Fund	
53	DALSA Corporation	19960521	123	Mainframe Entertainment Inc.	19970617	193	Tourmaline Oil Corp.	20110208
54	DataMirror Corporation	19961216	124	Manitoba Telecom Services Inc.	19970107	194	TransGlobe Apartment REIT	20100728
55	Davis + Henderson Income Fund	20011220	125	March Networks Corporation	20050427	195	Tree Island Wire Income Fund	20021112
56	Day4 Energy Inc.	20080219	126	Maxxcom Inc.	20000323	196	Tricon Capital Group Inc.	20100803
57	DirectCash Income Fund	20041214	127	Mediagrif Interactive Technologies Inc.	20001003	197	Trimac Income Fund	20050225
58	Dollarama Inc.	20100105	128	Mega Bloks Inc.	20020503	198	UE Waterheater Income Fund	20031219
59	DragonWave Inc.	20070702	129	Menu Foods Income Fund	20020522	199	Universal Energy Group Ltd.	20070424
60	Duke Energy Income Fund	20051220	130	Miranda Technologies Inc.	20051208	200	VCom Inc.	20051114
61	Duvery Oil Corp.	20040203	131	Morneau Sobeco Income Fund	20050930	201	Vincor Intertiol Inc.	19960606
62	Dynetek Iustries Ltd.	20000921	132	Movie Distribution Income Fund	20031015	202	WestJet Airlines Ltd.	20001221
63	E.D. Smith Income Fund	20050603	133	Neurochem Inc.	20000622	203	Western Oil Sas Inc.	19990713
64	EXFO Electro-Optical Engineering Inc.	20000630	134	NewWest Gold Corporation	20061024	204	Whistler Blackcomb Holdings Inc.	20110126
65	Eagle Energy Trust	20110201	135	Noranda Income Fund	20020503	205	Workbrain Corporation	20031211
66	Emerge Oil & Gas Inc.	20100414	136	NorthWest Healthcare Properties REIT	.	206	Xantrex Technology Inc.	20040319
67	Enbridge Income Fund	20030630	137	Northstar Healthcare Inc.	20070731	207	Xenos Group Inc.	19990811
68	ExAlta Energy Inc.	20050510	138	O&Y Real Estate Investment Trust	20010627	208	Yellow Pages Income Fund	20030801
69	FP Newspapers Income Fund	20020528	139	OFI Income Fund	20050901	209	eNGENUITY Technologies Inc.	19990722
70	First National Financial Income Fund	20060829	140	OPTI Canada Inc.	20040415			

Age measures the number of years since the start of the company's operations at the time of the IPO announcement. We expect this variable to have a negative relationship with stock market volatility and idiosyncratic risk since the more mature firms becoming public should have more stable cash flows, everything else equal.

The service offered by the investment banker at the time of the IPO is represented by the variable *IPOfeerat*, which is calculated as the total fees paid at the time of the IPO divided by the product of the offer price and the number of shares issued.[17] We expect firms that purchase a higher level of service to have higher returns in the first year and lower volatility and idiosyncratic risk.

Float is the ratio of the number of shares issued at the IPO on the total number of shares outstanding after the IPO. We expect that firms that have a higher float should have less volatile market returns because more investors are likely to follow the firm, therefore disseminating the appropriate information to the markets.[18] With respect to the decision to purchase D&O insurance or not, *Float* should be positively correlated with the decision to purchase. The reason is that the more shares are issued, the greater the probability of litigation and the greater should be the expected loss conditional on a claim arising (see Gutiérrez, 2003; Boyer, 2003, 2014) since minority shareholders are the most likely originator of lawsuits against managers. At the same time, a greater float means that the "firm's entrepreneur" has gotten rid of a larger portion of the firm, which should be a bad signal to markets. If such adverse selection is present, stock returns should be negatively related to the float.

US_Presence is a dummy variable equal to one if the firm reports any activity in the United States (sales, assets, etc.). The variable was collected by reading annual reports for the year following the IPO. The United States being a more fertile environment for potential litigation (Clarkson and Simunic, 1994; Heys and Berenblut, 2012), we expect this variable to be positively correlated with the decision to purchase D&O insurance. A related measure to *US_Presence* is *US_Sales* that is measured as the ratio of sales that a firm reports doing in the United States to total sales. Sales in the United States should increase stock returns since it is a proxy for the potential growth in sales and profitability of the company.

Hard is a dummy variable equal to one if the year the firm completed its IPO is deemed to be a hard market year by D&O insurance experts, and zero otherwise. A hard market is characterized by lower policy amounts with higher prices. We used the annual premium index available in the Towers Perrin reports to compute the ten year average premium and labeled as 'hard' all years above the ten year average. This resulted in years 2002 through 2006 to be considered a hard market, which is in line with the general consensus of D&O insurance market specialists.

Big5 is a dummy variable equal to one if the lead IPO underwriter is one of the five main investment bankers in Canada. The five largest underwriters represent 70% of the Canadian market. Investment banker reputation is used as a proxy for the level of information asymmetry during the IPO process (see Beatty and Ritter, 1986).

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[17] For 21 firms, we do not have the fee paid. Since we felt that the cost of dropping these observations was too high (10% of our sample), we instead decided to impute a value for the fee ratio. 40% of the firms pay an IPO fee of exactly 6%, and 90% of the firms paid a fee ratio between 4.5% and 7%. We first opted to assign a value of 6% to the missing *IPOfeerat* variable values. We also calculated the predicted fee using the first day return, the log of the market value of the firm at the time of the IPO, whether the firm is incorporated as an income trust and the number of shares issued at the time of the IPO (a regression that has an adjusted R^2 of 78%), and then calculated the *IPOfeerat* variable value using the same aforementioned rule (or assigned value 2% if the imputed value is negative). In all cases, the results are sensibly the same.

[18] It could also be the case that a higher float implies more differences of opinion which would generate more trading and more volatility. In this case, the net effect of *Float* on *Volatility* and *Idiosyncratic* is undetermined. We thank a referee for suggesting this possibility.

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