CORPORATE DECISION MAKING FOR PUBLICLY TRADED INSURERS:

CORPORATE GOVERNANCE STRINGENCY AND ENTERPRISE RISK

MANAGEMENT ADOPTION

by

STEVEN MICHAEL MILLER

(Under the Direction of Robert Hoyt)

ABSTRACT

In my dissertation, I study corporate decision making for publicly traded insurers, by examining the relation between line specialization and corporate governance stringency and the adoption of Enterprise Risk Management (ERM). I examine the incremental impact of corporate governance mechanisms in mitigating managerial discretion costs after controlling for the incentive alignment of managerial ownership. I achieve this through extending the managerial discretion hypothesis to predict that, for firms with the same set of governance tools, those firms that utilize these tools more stringently to control agency costs will command greater contracting cost advantages, leading them to specialize in conducting business that requires higher levels of managerial discretion. Consistent with my hypotheses, I find a significant positive relationship between the stringency of governance controls and the level of managerial discretion for a sample of 72 publicly-traded property-casualty insurers from 1994 to 2006.

I also test the hypothesis that practicing Enterprise Risk Management (ERM) reduces firms' marginal cost of risk reduction. Adoption of ERM represents a radical paradigm shift from the traditional method of managing risks individually to managing risks collectively, in a portfolio. This formation and management of a portfolio of risks allows ERM-adopting firms to better recognize natural hedges, prioritize hedging activities towards the risks that contribute most to the total risk of the firm, and optimize the evaluation and selection of available hedging instruments. I hypothesize that these advantages allow ERM-adopting firms to produce greater risk reduction per dollar spent. The resulting lower marginal cost of risk reduction provides economic incentive for profit-maximizing firms to reduce risk until the marginal cost of risk reduction equals the marginal benefits. Therefore, my hypothesis predicts that, after implementing ERM, firms experience profit maximizing incentives to lower risk. Consistent with this hypothesis, I find that firms adopting ERM experience a reduction in stock return volatility. Due to the costs and complexity of ERM implementation, I also find that the reduction in return volatility for ERM-adopting firms becomes stronger over time. Further, I find that operating profits per unit of risk (ROA/return volatility) increase post ERM adoption.

INDEX WORDS: Corporate governance, Enterprise Risk Management, Managerial discretion, Risk management

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CHAPTER 1

MANAGERIAL DISCRETION AND CORPORATE GOVERNANCE

1.1. Introduction

In this paper, we examine the incremental impact of corporate governance controls in mitigating managerial discretion costs after controlling for the incentive alignment of managerial ownership. To accomplish this, we extend the managerial discretion hypothesis (MDH) of Mayers and Smith (1981, 1988, and 1994) by examining cross-sectional variation in governance controls across levels of managerial discretion for publicly-traded, property-liability insurance companies. Mayers and Smith (1981) develop the managerial discretion hypothesis to explain the co-existence of alternative ownership structures within the insurance industry. The insurance industry is complex and unique. Multiple ownership structures (e.g. stock, mutuals, Lloyds associations, and reciprocals) co-exist. Additionally, the industry generates revenue through the sale of distinct types (i.e. lines) of insurance, which can differ substantially from one another in the amount of managerial discretion required. For example, medical malpractice insurance faces substantial uncertainty in pricing, underwriting, claim settlement and reserving; hence managerial discretion significantly impacts the success of these functions. In contrast, auto-physical damage insurance, being short-tailed and more static in nature, requires far less managerial discretion to conduct the same business functions. Mayers and Smith recognize that alternative ownership structures have different sets of governance tools to mitigate agency costs. Specifically, stock insurers have governance tools, such as managerial ownership, stock-based compensation packages, external blockholders and the takeover market, which are not available to other ownership structures (e.g. mutuals). This leads Mayers and Smith (1981, p.427) to argue that firms with varying abilities to manage agency costs should experience competitive advantages in different lines of insurance: "… if the cost of controlling management in mutual insurance companies is higher than in stock firms, then mutuals should be more prevalent in lines of insurance where management exercises little discretion…" Thus, the MDH predicts line specialization across ownership structures.

Our study extends the MDH to explore whether, within a single ownership structure, variation in stringency of corporate governance systems generates similar comparative advantages and line specialization. Specifically, Mayers and Smith predict that firms with a more robust set of corporate governance tools will specialize in high managerial discretion business. In contrast, we extend their theory to predict that, for firms with the *same* set of governance tools, those that utilize these tools more stringently to control agency costs will command greater contracting cost advantages, leading them to specialize in lines of insurance that require higher levels of managerial discretion.

This extension is important because by focusing on stock insurers, these results may be applicable to publicly-traded companies outside the insurance industry. In addition, the focus on a single ownership structure allows us to gain a deeper understanding of firms' business and governance decisions. A firm's business environment is dynamic, whereas its ownership structure is relatively static. Once a firm is incorporated, it is costly to switch to another ownership structure. Thus, firms need to rely more on governance controls (e.g. executive compensation and board structure) than ownership structure to control agency costs.

The root cause of agency costs due to managerial discretion is separation of ownership and control. Indeed, scholars sometimes equate agency costs of managerial discretion to agency costs due to separation of ownership and control.[1] In our study, we make a subtle, but significant distinction between the two. We will employ a strict definition of agency costs due to separation of ownership and control, which we will measure with the proportion of equity owned by managers. In the spirit of the MDH, we define agency costs of managerial discretion as latitude in action that an agent is authorized to exercise[2], measured with percent of business in long tailed lines.[3] This allows us to view managerial discretion as an incremental cost of agency conflict, a 'lever' that works to exacerbate or mitigate the potential for owner-manager conflict, even after controlling for the level of managerial ownership. To summarize, for the single ownership structure of stock insurers, the MDH predicts that firms with more stringent governance controls should specialize in lines of insurance with higher levels of managerial discretion, holding managerial ownership constant.

We collect board and compensation data for publicly-traded property-casualty insurance companies from 1994 to 2006. Consistent with the MDH, we find that firms

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[1] For example, Colquitt, Sommer, and Godwin (1999, p.406) state: "Agency costs of equity, also known as agency costs of managerial discretion, arise when the interests of owners differ from the interests of managers."

[2] For example, see Mayers and Smith (1981, abstract): "We argue that incentive conflicts arise when discretionary action is authorized…" Also see Mayers and Smith (1988, p.353): "… the more discretion an agent is authorized to have, the larger is the potential for that agent to operate in his own self-interest at the expense of the other parties to the contract."

[3] Weiss (1991, pg. 462) describes long-tailed lines as, "'Long-tail lines' refers to business for which a considerable time lag may exist between premium receipt and loss payments." By focusing on the lag between premium receipts and loss payments, our measure captures the dimensions of managerial discretion related to agency costs of free cash flow (i.e. holding onto customers' assets for longer periods of time).

with more stringent governance controls specialize in lines of insurance that require higher levels of managerial discretion. Consistent with the agency theory, firms with higher level of CEO ownership are more likely to engage in lines of insurance with higher levels of managerial discretion. However, this positive relation weakens as CEO ownership increases, consistent with the entrenchment effect and the risk-aversion theory. Further, these relations hold after we control for regulatory stringency, charter provisions, capital structure, payout policy, and monitoring by outside blockholders. Our findings are also robust to various robustness checks including using the estimation methods of instrumental variables and the simultaneous-equation model to address potential endogeneity concerns.

Our paper makes several important contributions to the literature. Our study is the first to find evidence supporting the MDH within a single ownership structure. The insurance literature has produced abundant evidence on variation in governance controls and line specialization across ownership structures in support of the MDH.[4] However, to the best of our knowledge, no study has tested the MDH within a single ownership structure. Therefore, important research questions remain unanswered. For example, will we observe similar relations between line specialization and governance controls within a single ownership structure? If such relations exist, how do firms choose among various governance controls to maximize their contracting efficiency? We find that the MDH holds within the single ownership structure of stock insurers. Further, *we find evidence of governance controls acting as compliments as well as substitutes.*.

To our knowledge, our paper is the first to find evidence of the incremental impact of corporate governance systems on managerial discretion, after controlling for

[4] See Section 2, Related Literature, for a summary of this literature.

the degree of separation between ownership and control. Agency costs of managerial discretion has been generally treated as agency costs due to separation of ownership and control, because it is difficult to empirically measure managerial discretion. Exploring the unique nature of insurance data, we are able to employ a direct measure of managerial discretion and find that firms with more stringent governance controls specialize in lines of insurance with high level of managerial discretion.

Thus, we view our study as a complement to the strand of the finance literature that focus on the role of financing policies in mitigating agency costs of managerial discretion (also known as agency costs of free cash flow). This literature is based on the pioneer work of Jensen (1986) and Stulz (1990), which argue that firms should reduce free cash flow under the discretionary control of managers so that they have fewer opportunities to undertake unprofitable investments. Ample studies have tested this theory in the context of asset distribution (e.g., Lang, Poulsen, and Stulz (1995) and Bates (2005) on asset sales, Allen and McConnell (1998) on equity carve-outs, and Nohel and Tarhan (1998) on share repurchases). Our results suggest that, in addition to forced cash payout, firms utilize corporate governance to mitigate agency costs of managerial discretion.

The rest of the paper is organized as follows: Section 2 reviews related literature, Section 3 develops hypotheses, Section 4 describes data collection and the sample, Section 5 discusses research design, Section 6 explains empirical results and Section 7 concludes.

1.2. Related Literature

In this section, we review the literature on managerial discretion. Managerial discretion lies at the heart of the agency theory, since it describes managers' propensity to pursue their own objectives instead of maximizing shareholder wealth when they are authorized discretionary actions. Consequently, the literature on the managerial discretion hypothesis (MDH) is enormous. As the literature review quickly shows, the literature on MDH can be categorized into two strains, the insurance literature based on Mayers and Smith (1981) and the finance literature based on Jensen (1986) and Stulz (1995).

Taking note of the assortment of ownership structures in the insurance industry, Mayers and Smith (1981) develop a positive theory of the managerial discretion hypothesis to explain the co-existence of the various ownership structures. The MDH of Mayers and Smith (1981) predict that firms choose the ownership structure best suited to control the incentive conflicts that they face. Therefore, the subsequent insurance studies that aim to test Mayers and Smith (1981) primarily focus on producing empirical evidence to explain systematic variation in activity and governance choices across ownership structures.

In contract, Jensen (1986) and Stulz (1990) develop theories to explain how stock companies can use financing policies to curb the agency cost of managerial discretion by influencing resources under the management's control. Therefore, the finance literature that aim to test Jensen (1986) and Stulz (1990) primarily focus on investigating the financing policies such as assets sales, equity carve-outs and share repurchase.

Given that the focus of our paper is to test the MDH of Mayers and Smith (1981) within the publicly-traded property-casualty insurance industry, we devote more attention to the first line of literature.

1.2.1. The Positive Theory of the Managerial Discretion Hypothesis

Mayers and Smith (1981) develop a positive theory of insurance contracting, namely the managerial discretion hypothesis (MDH), to explain the systematic variation in incentive controls across lines of insurance. Mayers and Smith note that, when discretionary action is authorized, incentive conflicts arise. Assuming the survivorship principal of Alchian (1950) and Stigler (1958), namely the invisible hand of the pricing mechanism ensures only the fittest survive in competitive markets, predictable relations exist between incentive conflicts and contractual provisions. It is because contracts are costly. For any costly contracts to persist in time and scope in competitive markets, they must confer corresponding benefits in solving incentive conflicts. Based on this insight, Mayers and Smith develop a positive theory that explains the variation in claim settlement provisions (including deductibles, minimums, upper limits on coverage, and coinsurance provisions), group versus individual policies, and the distribution of ownership structures across insurance firms. Relevant to our study, Mayers and Smith argue that the cost of controlling management in mutual insurance companies is higher than in stock firms. Therefore, the positive theory of the MDH predicts that mutuals should be more prevalent in lines of insurance where management exercises little discretion.

Jensen (1986) develops the free cash flow theory. He defines free cash flow as "cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant costs capital." Jensen argues that, because managers value control and firm size, they have incentive to keep free cash flow within the firm and spend it on low-return projects or waste it. Therefore, debt plays an important monitoring role by reducing the free cash flow available for spending at the discretion of managers.

Stulz (1990) develop a theoretical model to illustrate how financing policies can be used to restrict management's ability to pursue its own objective when atomistic shareholders do not observe cash flows or management's investment decisions. Stulz assume that it is costly for shareholders to act collectively once cash flow has accrued, so they cannot force management *ex post* to pay out cash. The managers value investment because their perquisites increase with investment even when the firm invests in negative net present value (NPV) projects. Consequently, when cash flow is high, they invest in negative NPV projects rather than pay out cash, the free cash flow problem as described in Jensen (1986).

Since management always claims that cash flow is too low to fund all positive net present value projects, its claim is not credible when cash flow is truly low. Consequently, management is forced to invest too little when cash flow is low and chooses to invest too much when it is high. Debt payments force managers to pay out cash flow and hence reduce investment in all states of the world. Consequently, debt payments affect shareholder wealth both positively, by reducing investment when it would otherwise be too high, and negatively, by inhibiting advantageous investment in other states of the world. The tradeoff between the cost and the benefit of debt implies that there is a debt payment that maximizes firm value.

Stulz shows that the firm's optimal debt-equity ratio is a function of the probability distribution of cash flow and the firm's investment opportunities. In particular, shareholders of a firm with negative expected free cash flow but poor investment opportunities may want the firm to issue debt so that management will control even fewer resources, whereas shareholders of a firm with positive expected free cash flow but good investment opportunities may want management to raise more funds to decrease the probability that some positive NPV investment opportunities will be left unexploited.

1.2.2. Empirical Evidence from the Insurance Literature

1.2.2.1. Activity Choices across Ownership Structures

This section summarizes empirical evidence on the systematic differences in activity choices across ownership structures. As the sub-sections show, the empirical evidence in support of the MDH of Mayers and Smith (1981) is very strong and comes from both the property-casualty insurance industry (Mayers and Smith (1988), Lamm-Tennant and Starks (1993) and the life-health insurance industry (Pottier and Sommer (1997), Colquitt and Hoyt (1997)).

Mayers and Smith (1988) formally test the positive theory of managerial discretion hypothesis developed in Mayers and Smith (1981). Prior to Mayers and Smith (1988), MDH has received little empirical verification. Using 1981 A. M. Best line-of-business file, Mayers and Smith compiled a property & casualty insurer sample that consists of 1,058 common stock insurance companies, 319 mutual insurance companies, 60 reciprocal associations, and 42 Lloyds associations.

Consistent with the MDH, Mayers and Smith find systematic difference in geographic concentration and concentration by line of business. Examining geographic concentration (measured as the number of state licensed), they find that, controlling for firm size, stock insurers are less concentrated geographically than mutuals and reciprocals. Controlling for size, Lloyds associations are geographically more concentrated than stock insurance companies, but the difference appears insignificant (probably due to the small sample size of Lloyds). Without controlling for size, Lloyds and reciprocals are more concentrated by line-of-business than stock firms, and mutuals appear least concentrated of all. When size is controlled for, reciprocals are significantly more concentrated than stock firms; stock firms and mutuals appear indistinguishable; and (contrary to the prediction of MDH) stock firms appear more concentrated than Lloyds of similar size.

Lamm-Tennant and Starks (1993) conduct empirical tests of the risk differences between stock firms and mutuals in the property-liability line of insurance. They test three alternative hypotheses: the agency and adverse selection theories (Mayers and Smith (1981), Fama and Jensen (1983), Smith and Stutzer (1990)) predict that the mutual insurer should be associated with less risky activities than the stock company, while the efficient risk-sharing argument (Doherty and Dionne (1992) and Doherty (1991)) implies that the mutual insurer should be involved in insuring more risky clients. They obtain data from A. M. Best data tapes for 1980-1987. To more accurately capture the ownership structure of the total firm, they include only group insurers and independent insurers in their sample. Their final sample consists of 79 stock insurers and 91 mutual insurers. They use logistic regression to estimate the determinants of ownership structure as a function of firm size and a firm's total risk (proxied by the variance of the loss ratio).

$$logit\left[prob(mutual = 1) / (1 - prob(mutual = 1))\right] = \alpha + \beta_1 firm\_size + \beta_2 risk$$

Consistent with the MDH, Lamm-Tennant and Starks find that stock insurers have more risk than mutuals ($\beta_2 < 0$). Comparing the concentration of premiums earned in the 26 lines of business, they find significant difference in line domination by stock firms versus mutuals in ten out of the 26 lines. For these ten lines, the medians of the standard deviations of the loss ratios is more than twice as high for the lines dominated by stock firms than for those dominated by mutuals. This result holds when all lines are considered. Examining the average percentage of a firm's premiums written in a state, they find that stock firms (mutuals) have significantly higher concentration of business in 13 (15) of the 50 states and five American territories than mutuals (stock firms). For these 28 states and territories, those areas dominated by stock firms have significantly greater risk (measured as median standard deviation of loss ratio) than those dominated by mutuals. Lamm-Tennant and Starks also examine geographic concentration by regulatory process. They classify 50 states plus the District of Columbia into eight regulatory classes, three of which are defined as the competitive class, five as the non-competitive class. States with competitive rate regulatory laws basically allow the market forces associated with supply and demand to determine the equilibrium level of rates. They find that stock firms tend to be more concentrated in the competitive regulatory environments.

Although Mayers and Smith (1988) and Lamm-Tennant, Starks (1993) find strong evidence in support of Mayers and Smith (1981), differences in regulation and taxes across ownership structures could potentially drive the results. Mayers and Smith (1994) address this potential identification problem by exploiting variation in ownership structures within the population of common stock insurers. Mayers and Smith (1994) use the same sample as Mayers and Smith (1988), but employ detailed ownership data by distinguishing among widely-held, closely-held, and mutual-owned and association-owned stock companies. To test the MDH, they examine activity choices of insurers by these different ownership classes, since the MDH predicts that ownership class is distinguishable by business activities. An alternative explanation for the observed structure of ownership is the life-cycle hypothesis, which suggests that the optimal ownership structure of the firm changes over time. Therefore, Mayers and Smith (1994) examine the activity choice of insurers by ownership class, controlling for firm size. Using estimates from seemingly unrelated regressions, they compare production allocation across ownership structures using a distance measure. They define a firm's production allocation as percentage of direct business in 26 lines of insurance and the distance measure as the sum across the 25 lines of the squared differences between assessed mean levels of business activity for pairs of ownership structures. They find that the production allocation patterns of the alternative ownership classes are statistically distinguishable. The production allocation of stock firms owned by mutuals are more like those of mutuals than widely-held stock firms, and the allocations of closely-held stock firms are more differentiated from the allocations of mutuals than are those of widely-held stock firms. The production allocations of association-owned stock firms and Lloyd's associations are more differentiated from the allocations of mutuals than any other ownership except the closely-held stock firms. Mayers and Smith conclude that this relative distance ordering is consistent with the MDH. Using a multinomial logistic regression, they study the determinants of ownership structures as a function of line-of-business specialization (a Herfindahl index of business concentration), geographic concentration (a Herfindahl index constructed using direct business written by state), log of total admitted assets, and the allocations of business in nine rebundled lines of insurance. They find significant coefficient for the log of total admitted assets, and five of the nine rebundled lines of insurance. Lastly, they test the relationship between expected loss-to-premium ratios and ownership classes. Consistent with the MDH, the Lloyd's associations has the smallest ratios, followed by closely-held stock firms, widely-held stock firms, mutual-owned stock firms, association-owned stock firms, and finally mutuals. They find no evidence of a life cycle in ownership structure.

Cummins, Weiss, and Zi (1999) use the cross-frontier analysis to estimate the relative efficiency of alternative organizational forms in the property-liability insurance industry. Cross-frontier analysis measures the relative efficiency of each organizational form by computing the efficiency of each stock (mutual) firm relative to a reference set consisting of all mutual (stock) firms. They test agency-theoretic hypotheses about organizational form, including the managerial discretion and expense preference hypotheses. They find that stock firms and mutuals are operating on separate production and cost frontiers and thus represent distinct technologies. Consistent with the MDH, the stock technology dominates the mutual technology for producing stock outputs and the mutual technology dominates the stock technology for producing mutual outputs. However, consistent with the expense preference hypothesis, the stock cost frontier dominates the mutual cost frontier.

Pottier and Sommer (1997) is the first paper that applies the insights of the agency theory to analyze stock versus mutual ownership structure in the life-health insurance industry. Prior to their study, empirical evidence in support of the MDH comes from the property-liabilities insurers (Mayers and Smith (1988, 1994), Lamm-Tennant, Starks (1993)). They use only stock and mutual life insurers on the NAIC tapes that were rated by A. M. Best in 1991 and have positive direct and net premiums written. Their final sample consists of 829 stock firms and 160 mutuals. Similarly to Mayers and Smith (1994) and Lamm-Tennant, Starks (1993), they use logistic regression to estimate the determinants of ownership structures, controlling for potential effects of regulation and taxes, age, insurer size, financial quality, and the grouping structure of insurers:

$$logit\left[prob(mutual=1)/(1-prob(mutual=1))\right]=\alpha+\beta_1 line\_specialization+\beta_2 GEO\_concentration+$$
$$\beta_3 group\_direct\_premium+\beta_4 life\_direct\_premium+\beta_5 annuity\_direct\_premium+$$
$$\beta_6 separate\_account\_assets+\beta_7 permanent\_life\_insurance\_in\_force+\beta_8 best\_rating+$$
$$\beta_9 \log(total\_admitted\_assets)+\beta_{10} firm\_age+\beta_{11} group\_affiliation\_dummy+$$
$$\beta_{12} NY\_licensed\_dummy+state\_dummies$$

Like Mayers and Smith (1994), they fail to find significant results for line-of-business concentration or geographic concentration; β_1 and β_2 are insignificant. Firm size, annuity direct premiums written, and permanent life insurance in force are also insignificant. However, consistent with the MDH, they find significant evidence that mutuals are more likely to be licensed in New York, stock firms are more likely to be organized as groups, mutuals are more likely to have high A. M. Best ratings, and older insurers are more likely to be mutuals.

Colquitt and Hoyt (1997) test the theoretical arguments for corporate hedging behavior using the analysis of futures and options trading by life insurers. As they need to collect hedging data from statutory annual statements, their sample is restricted to firms licensed in the state of Georgia. Their final sample consists of 571 life insurers in 1992. They estimate probit model to study a firm's decision to hedge:[5]

$$
\begin{aligned}
&probit\left[prob(hedge=1)/(1-prob(hedge=1))\right]=\alpha+\beta_1 firm\_size+\beta_2 leverage+\\
&\quad \beta_3 duration\_mismatch\_asset+\beta_4 duration\_mismatch\_liab+\beta_5 reinsurance+\\
&\quad \beta_6 stock+\beta_7 stock*firm\_size+\beta_8\log(separate\_account\_asset/total\_assets)+\beta_9 tax\_dummy
\end{aligned}
$$

Consistent with the argument of economics of scale and the hypothesis of informational economies, they find larger firms (proxy by the log of net premiums written) are more likely to hedge. Consistent with the bankruptcy costs and underinvestment hypotheses, they find that levered firms (proxied by the ratio of total liabilities to the sum of surplus, common capital stock, and preferred capital stock) are more likely to hedge. *duration_mismatch_asset* enters the regression with a positive and significant sign, suggesting that an insurer's matching of asset and liability durations (on-balance-sheet hedging) serves as a substitute for hedging with futures and options (off-balance-sheet hedging). They also find the reinsurance variables, calculated as the ratio of reinsurance ceded to total direct premium plus reinsurance assumed, to be positive and significant, suggesting that the use of reinsurance serves as a signal of a firm's predisposition to hedge. Consistent with the MDH, stock firms are more likely to hedge than mutuals. However, the interaction term between organization form and firm size (*stock*firm_size*) is negative and significant, suggesting that, as stock firms become large, they behave more like mutuals. Lastly, they find significant and positive result for the variable that proxy for separate accounts activity. Colquitt and Hoyt (1997) also study

[5] *duration_mismatch_asset* is the difference between long-term assets and long-term liabilities, scaled by total assets (only if a positive value is found, otherwise *duration_mismatch_liab*); *duration_mismatch_liab* is the difference between long-term assets and long-term liabilities, scaled by total assets (the absolute value only if a negative value is found, otherwise *duration_mismatch_asset*). These two variables proxy for mismatch of asset and liability durations.

the extent of a firm's hedging, using Heckman's two-step selection correction. They find that extent of hedging is not significantly related to firm size, suggesting that informational economies, rather than economies of scale, are the reason that primarily larger firms engage in hedging with futures and options. Stock insurers exhibit greater extent of hedging, providing further support for the MDH.

1.2.2.2. Governance Choices across Ownership Structures

This section summarizes empirical evidence on systematic differences in governance choices across ownership structures. As of now, the evidence mainly comes from the life insurance industry with the exception of He and Sommer (2010). We provide more detailed summary (e.g. data sources, variables, methodologies) for this section than for the previous section on activities choices across ownership structure, because the focus of our paper is about a firm's governance choice.

Mayers and Smith (1992) study compensation contract of stock and mutual executives in the life insurance industry. According to the MDH, stock firms have a comparative advantage over mutuals in business activities requiring more managerial discretion. Since the value of the marginal product of stock insurer executives is higher than that of mutual insurer executives, the MDH hypothesis predicts that stock executives should be pay more and receive more incentive pay than mutual executives. But mutual executives are not subjected to the same disciplining forces from the market for corporate control as are stock executives. If mutual executives more successfully insulate themselves from competitive market forces than do stock executives, mutual executives' compensation should be higher. To test these competing hypotheses, Mayers and Smith obtain 1985 CEO compensation data on 379 life insurance companies from the Ohio Department of Insurance, and estimate pooled time-series, cross sectional regressions of the following specification:[6]

$$\begin{aligned}\log(CEO\_pay) = \alpha + \gamma_1 mutual + \gamma_2 subsidiary + \gamma_3 MGT\_control + \gamma_4 outside\_control + \\ \gamma_5 mutual\_owned + \gamma_6 affiliated\_CEO + \gamma_7 board\_indep + \\ \beta_1 \log(admitted\_assets) + \beta_2 \log(net\_premium\_written) + \beta_3 num\_subsidiaries + \\ \beta_4 num\_state\_licensed + \beta_5 CEO\_age + \beta_6 CEO\_tenure + \beta_7 performance\end{aligned}$$

CEO_pay	The salary portion of executive pay; does not include other forms of pay such as bonus, option, restricted stock etc
mutual	Dummy variable taking the value of one, if a mutual
subsidiary	Dummy variable taking the value of one, if more than 90% of the firm's outstanding shares is held by the parent
MGT_control	Dummy variable taking the value of one, if the managers collectively control more than 50% of the shares outstanding
outside_control	Dummy variable taking the value of one, if a single outsider controls more than 50% of the shares outstanding (and the firm is not a subsidiary)
mutual_owned	Dummy variable taking the value of one, if the firm is a mutual-owned stock
affiliated_CEO	Dummy variable taking the value of one, if the CEO is an executive of either an affiliated company or of the parent company
board_indep	%non-officer directors on the board
admitted_assets	Total admitted assets (in thousands of dollars)
net_premium_written	Net premiums written (in thousands of dollars)
num_subsidiaries	The number of subsidiary companies (insurance or otherwise) listed in *Best's* (1986)
num_state_licensed	The number of states licensed, including foreign geographic areas licensed
CEO_age	CEO age, obtained from *Who's Who* and from correspondence with the companies
CEO_tenure	The number of years the executive has been the CEO
performance	The ratio of income from operations (income before taxes and dividends to policyholders) to total revenues

Consistent with the MD hypothesis, they find that the compensation of mutual CEOs is significantly lower than that of non-subsidiary stock executives ($\gamma_1 < 0$). The compensation of mutual-subsidiary CEOs is significantly lower than that of stock subsidiary CEOs ($\gamma_5 < 0$).

[6] Model specification varies based on whether the test is performed using the full sample or sub-samples.

To test the responsiveness of pay to performance, Mayers and Smith obtain CEO pay data from the Insurance Forum for 1974-88. The final sample covers executive compensation from 21 mutuals and 27 stock firms. They estimate pooled time-series, cross sectional regressions relating the growth rate in CEO pay to ownership structures and control variables including growth in net premium written and growth in total revenue. Consistent with the MD hypothesis, they find that the compensation of mutual executives is significantly less responsive to form performance than that of stock executives.

Mayers, Shivdasani, and Smith (1997) investigate the role of outside directors in the corporate-control process by exploiting variation in ownership structure within the insurance industry. In mutuals, ownership rights are not transferable. This inalienability restricts the effectiveness of control mechanisms like external takeovers, thus increasing the importance of monitoring by outside directors. Mutual ownership, however, does not preclude the use of outside members on the board of directors. Williamson (1983) hypothesizes that the composition of a firm's board will depend on the relative importance of alternate governance mechanisms, suggesting a substitution hypothesis that mutuals should have more independent boards than stock firms.

Mayers, Shivdasani, and Smith obtain data from Best’s Insurance Reports: Life-Health (1986), which contains financial and organizational-status data as of year-end 1985. They exclude from this initial sample stock firms with group affiliation or subsidiary status to increase comparability between the mutuals and stock firms. Their final sample contains 120 mutual and 225 stock life insurers. They estimate the following OLS to test the substitution hypothesis of Williamson (1983):

$$\%non\_fam\_outsider = \alpha + \gamma_1 mutual + \beta_1 \log(admitted\_assets) + \beta_2 num\_state\_licensed + \beta_3 BUS\_concentration + \beta_3 life + \beta_5 Term + \beta_6 Credit + \beta_7 Group + \beta_8 MGT\_control + \beta_9 outside\_control + \beta_{10} Founder \quad \text{... Eq. 4.2.1}$$

%non_fam_outsider	The percent of non-officer, nonfamily directors on the board
mutual	Dummy variable taking the value of one, if a mutual
admitted_assets	Total admitted assets (in thousands of dollars)
num_state_licensed	The number of states in which the firm is licensed
BUS_concentration	a Herfindahl concentration index calculated across the lines of business
life	The percentage of total new business in the life line of business[7]
Term	The percentage of total new business in the term line of business
Credit	The percentage of total new business in the credit line of business
Group	The percentage of total new business in the group line of business
MGT_control	Dummy variable taking the value of one, if the managers collectively control more than 50% of the shares outstanding
outside_control	Dummy variable taking the value of one, if a single outsider (nonmanager) controls more than 50% of the shares outstanding
Founder	Dummy variable taking the value of one, if the current CEO, president, or chairman of the board helped organize the company

They find that mutuals employ more outside directors than stock insurers ($\gamma_1 > 0$), supporting the substitution hypothesis of Williamson (1983) that mutual insurers rely on board monitoring to offset the absence of control mechanisms such as stock-based pay, the takeover market, and outside blockholders. Firms with more of their business in term, credit, or group life insurance have a larger fraction of outside directors, suggesting these lines require more outside expertise. When a stock company's managers have control, the firm has significantly fewer outside directors on the board. They find no significant influence for the firm size, *num_state_licensed*, or *BUS_concentration* variables.

Mayers, Shivdasani, and Smith also run the same OLS regression with board size as the dependent variable, where *Board_size* is the number of directors on the board:

$$Board\_size = \alpha + \gamma_1 mutual + \beta_1 \log(admitted\_assets) + \beta_2 num\_state\_licensed + \beta_3 BUS\_concentration + \beta_3 life + \beta_5 Term + \beta_6 Credit + \beta_7 Group + \beta_8 MGT\_control + \beta_9 outside\_control + \beta_{10} Founder$$

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[7] *Best's* reports five lines of business for life insurance companies: life (whole), term, credit, group, and industrial.

They only find significant result for the firm size, *MGT_control* and *outside_control* variables. Larger firms are more likely to have larger boards. Both *MGT_control* and *outside_control* are negatively related to board size.

Mayers, Shivdasani, and Smith also study change in board composition during the mutualization process. From *Best's Insurance Reports: Life-Health*, they obtained data for 28 life insurers that have complete data of board composition three years prior to the announcement of conversion and three years after the completion of the process since 1914. From *Best's Insurance Reports: Property-Casualty*, they obtained data for 50 P&C insurers that have complete data of board composition three years prior to the announcement of conversion and three years after the completion of the process since 1920. They find that firms that switch between stock and mutual charters make corresponding changes in board composition; mutuals use outside directors more extensively than stock firms.

Mayers, Shivdasani, and Smith also examine two constraints that potentially influence board composition – regulation and corporate bylaws. Their sample firms are domiciled in 49 different states. In 13 states, no specific regulatory restrictions exist regarding the composition of insurance company boards. Another 28 states have requirements that specify minimum or maximum numbers of directors that are the same for mutual and stock companies. Of the remaining eight states, one requires a minimum total number of directors that is larger for stock companies; seven require a larger minimum for mutual companies. They re-run Eq. 4.2.1, controlling for the potential effect of regulation using dummy variables to identify observations where the minimum requirements are potentially binding or where the company is domiciled in a state with differential requirements for stock and mutual companies. Their results are unaffected.

Corporate bylaws are internal to a firm. If outside directors play a more important monitoring role in mutuals due to restricted managerial-control technologies in those firms, bylaws provide a mechanism to bond the continuing participation of outside directors on the boards of mutuals. Mayers, Shivdasani, and Smith obtain bylaws from 37 mutuals and 28 stock firms by corresponding with individual companies. They find dramatic differences in bylaw provisions regarding board composition across stock firms and mutuals. In 19 of 37 mutuals, the bylaws stipulate a majority of outside directors either for the board or for one of the board's standing committees (e.g. executive, nomination, and audit committees). In four mutuals, the bylaws require a majority of outside directors on the board. In the remaining 15 cases, the restrictions specify a majority of outsiders on standing committees. In contrast, only two stock firms limit board composition, and one of these stock firms is a former mutual.

Lastly, Mayers, Shivdasani, and Smith examine expenditures on salaries and wages to test whether outside board members play an important role in controlling owner-manager conflicts. If outside directors perform a significant governance role, firms with higher fractions of outsiders should suffer lower wealth expropriation by managers in the form of salary, wage, and rent expenditures. They estimate the following OLS regression to test this hypothesis:

$$Log(CEO\_pay) = \alpha + \gamma_1 mutual + \gamma_2 \%non\_fam\_outsider + \gamma_3 \%non\_fam\_outsider * mutual + \beta_1 \log(admitted\_assets) + \beta_2 \log(direct\_premium) + \beta_3 num\_state\_licensed + \beta_4 BUS\_concentration + \beta_5 life + \beta_6 Term + \beta_7 Credit + \beta_8 Group + \beta_9 Agency + \beta_{10} Branch + \beta_{11} Mail + \beta_{12} Broker + \beta_{13} MGT\_control + \beta_{14} outside\_control + \beta_{15} Founder + \beta_{16} firm\_age + \beta_{17} (firm\_age)^2$$

Variables not used in Eq. 4.2.1:

CEO_pay	The sum the first eight items listed under general insurance expense in the annual statement filed by insurance companies with state insurance departments. These items include rent, salaries, and wages; contributions for benefit plans for employees; contributions for benefit plans for agents; payments to employees under nonfunded benefit plans; payments to agents under nonfunded benefit plans; other employee welfare; and other agent welfare. (Also listed under general insurance expense are other items such as legal fees and expenses, advertising, printing and stationery, group service and administration fees, etc.)
Direct_premium	Direct premium written
Agency	Dummy variable taking the value of one, if use agency distribution system
Branch	Dummy variable taking the value of one, if use branch distribution system
Mail	Dummy variable taking the value of one, if use mail distribution system
Broker	Dummy variable taking the value of one, if use broker distribution system
firm_age	The number of years since the firm was incorporated.

They find that mutuals with more outside directors make lower expenditures on salaries, wages, and rent ($\gamma_3 < 0$).

He and Sommer (2010) investigate the implications of separation of ownership and control for board composition over a spectrum of ownership structures present in the US property-liability insurance industry. They hypothesize that agency costs associated with manager-owner conflicts increase with the degree of separation of ownership and control. Greater agency costs imply a greater need for monitoring by outside directors on the board. Therefore, use of outside directors is expected to increase as the separation of ownership and control gets larger.

They collect the information on corporate management and boards from the Best's Insurance Reports Property/Casualty Edition published annually by the A. M. Best Company. Their final sample consists of 7,305 firm-years observations for stock firms (or 1,008 unique stock firms) and 2,901 firm-years observations for mutuals (or 380 unique mutuals) for the period 1995-2004. Of these 1,008 stock insurers, they have 141 unique mutual-owned insurers, 672 unique widely held insurers, 31 unique insurers closely held by others, and 164 unique insurers closely held by management.

He and Sommer find supporting evidence for their hypothesis from estimating the following regression:

$$\%non\_officer = \alpha + \gamma_1 ownership\_type\_dummies + \text{controls}$$

%non_officer	The percent of non-officer directors on the board
controls	• Firm size, natural log of firm's total admitted assets • Firm age, the number of years since the firm's inception • Firm diversification, line of business Herfindahl index and geographic Herfindahl index • Firm growth opportunities, growth in direct premiums written from year t-1 to year t • Firm risk, fraction of business from long tail lines • Number of group affiliates • Board size • Year dummies

Mayers and Smith (2005) examine the role of corporate charter and bylaw provisions in controlling incentive conflict. They test three hypotheses:

H1. If mutuals have a comparative advantage in lines of insurance requiring less managerial discretion, mutual charters and bylaws should be more likely than those of stock firms to include provisions restricting operating policies.

H2. The lack of discipline from the takeover market suggests mutual governance documents should employ internal control mechanisms more extensively than those of stock companies. However, the MDH suggests that mutuals operate in lines requiring less discretion, thus lowering the derived demand for monitoring. Which effect dominates is an empirical issue.

H3. Restrictions on investment, financing, and dividend policy limit managerial discretion, thereby controlling both owner-manager and owner-customer incentive conflicts. Since the marginal benefit of such provisions may be greater within stock companies -- given their focus on lines of insurance with more managerial discretion -- the relative frequency of such provisions in stock versus mutual charters and bylaws is an empirical issue.

Mayers and Smith obtained data from the Spectator Company's (1911) Charters of American Life Insurance Companies. Their final sample consists of 33 mutuals and 36 stock firms from the life insurance industry whose incorporation ranges from 1759 to 1910. They group provisions into four major classes: (1) organizational form, (2) operating policy, (3) internal control, and (4) investment, financing, and dividend policies.

Consistent with H1, univariate tests show that mutual charters are more likely than stock charters to limit the company to a single line of business: life insurance. Mutual charters are also more likely than stock charters to specify upper limit on coverage.

When examining provisions regarding internal controls, Mayers and Smith find that mutual governance provisions are more likely than those of stock firms to require a staggered board structure, whereas governance provisions of stock firms are more likely than those of mutuals to prohibit staggered board. This finding is consistent with the argument that mutuals have a comparative advantage in insurance contracts with a longer duration and, thus, are more likely adopt policies such as staggered boards that encourage more focus on the longer-term consequences of business choices.

When examining restrictions on investment, financing, and dividend policies, Mayers and Smith find that mutuals are more likely than stock firms to have restriction on real estate investment. Because real estate is more heterogeneous than most assets in which an insurer might invest, this finding is consistent with the MDH. They also find that mutuals are more likely than stock firms to have geographic restriction, limiting investment within a particular class to be within the state of incorporation. They also find mutuals with capital stock also are more likely to be limited by dividend policy provisions than are stock companies, although the effective sample sizes are small. They do not find significance for provisions regarding financing policies.

One study is worth mentioning here, although it does not test the MDH across ownership structures. Grace (2004) studies the level and the structure of CEO pay for publicly-traded, property-casualty insurance companies. She examines a fairly comprehensive set of governance characteristics, which includes CEO ownership, ownership of outsider directors, and board structure. However, her objective is to study the determinants of executive pay, not to test the MDH.

To summarize, the overall weight of evidence is consistent with the MDH that mutual charters and bylaws are structured in a systematic way to control incentive problems.

1.2.3. Finance Empirical Papers on Managerial Discretion

Lang, Poulsen and Stulz (1995) test the financing hypothesis against the efficient deployment hypothesis by studying assets sales. The efficient deployment hypothesis assumes that management maximizes shareholder wealth and predicts that 1) managers only retain assets for which they have a comparative advantage and sell assets as soon as another party can manage them more efficiently irrespective of their financial situation and that 2) stockholders benefit from asset sales equally of whether managers re-invest the proceeds or pay them out. In contrast, the financing hypothesis assumes that management pursues its own objectives and, more specifically, values control and firm size. Thus, the financing hypothesis predicts that management has little incentive to sell assets unless it needs to raise funds and cannot do so cheaply on capital markets.

Lang, Poulsen and Stulz identify asset sales reported to the SEC in 8K forms through searching the NEXIS database. After excluding firms near financial distress and imposing necessary data requirement, their final sample consists of 93 asset sales taking place from 1984 to 1989. Of those 93 sales, 40 are made by 35 firms with proceeds paid out to credits and/or shareholders and 53 by 43 firms with proceeds retained by the firm. They call the sample of 40 sales the 'payout sample' and the sample of 53 sales the 'reinvest sample.'

Consistent with the financing hypothesis, the descriptive statistics show that a typical sample firms perform poorly before the sale and have high leverage. Further, the typical firm in the 'payout sample' has poorer performance (as measured by net income, operating income, or cumulative net of market returns before the sale) and higher leverage (as measured by long-term plus short-term debt and by interest coverage) than the 'reinvest sample.'

Consistent with the financing hypothesis and contrary to the efficient deployment hypothesis, the cumulative abnormal return of the 'payout sample' is significantly larger than that of the 'reinvest sample. Indeed, the CAR of the latter is negligible from zero.

Lang, Poulsen and Stulz also estimate weighted least squares regression of the following specification to explore the robustness of their univariate and event-study results:

$$CAR = \alpha + (+)\beta_1 payout\_sample\_dummy + \beta_2 proceeds / equity + \beta_3 MGT\_ownership + \beta_4 net\_income + \beta_5 Tobin\_Q + \beta_6 pre-sales\_HPR + \beta_7 leverage$$

CAR	The cumulative abnormal return measured over the day of the announcement and the day before (- l, 0), or over the 11 days overlapping the day of the announcement (- 5, + 5).
payout_sample_dummy	Indicator variable that takes the value of one, if the firm is a ‘payout sample’ firm
proceeds/equity	Proceeds from assets sales over the market value of equity
MGT_ownership	Managerial ownership
pre-sales_HPR	Pre-asset sales holding period return, adjusted for the market. Specifically, it is measured as net of market cumulative returns for the period from day -250 to day -5
leverage	Long-term debt over total assets

Consistent with the financing hypothesis, *payout_sample_dummy* is positive and significant in various model specifications with alternative CAR over different event windows. However, *payout_sample_dummy* becomes insignificant for the longer event window of (-5, +5), when controlling for managerial ownership, pre asset sales holding period return and Tobin’s Q.

Bates (2005) tests the efficiency hypothesis and the agency cost hypothesis of managerial discretion and debt by studying the allocation of cash proceeds following 400 subsidiary sales between 1990 and 1998. Bates identifies subsidiary sales from Securities Data Corporation (SDC). Consistent with the efficiency hypothesis, he finds that retention probabilities are increasing in the divesting firm’s contemporaneous growth opportunities and expected investment.

Retaining firms, however, also systematically overinvest relative to an industry benchmark. Excess investment cannot be attributed to pre-sale financial constraints on retaining firms; in fact, positive net-of-industry investment is most prevalent in the subset of retaining firms that are financially unconstrained. These latter findings are consistent with an agency-based motive for the retention of sale proceeds.

The likelihood of a distribution of sale proceeds to either debt or equity is increasing in the equity ownership of officers and directors. This finding is consistent with the perception that incentive alignment deters retention decisions that might otherwise be costly for shareholders.

Allen and McConnell (1998) proposes a managerial discretion hypothesis of equity carve-outs in which managers value control over assets and are reluctant to carve out subsidiaries. Thus, managers undertake carve-outs only when the firm is capital constrained. They obtain IPOs from the SEC's *Registrations and Offerings* tape for 1978-1985 and from the Investment Dealer's Digest *Directory of Corporate Financing* for 1978-1990. These sources were supplemented with IPOs classified as "spin-offs" in Securities Data Corporation's *New Issues Database* during the years 1980 through 1993. Each candidate carve-out was cross-referenced with the National Register's *Directory of Corporate Affiliations* to ensure that it was a wholly owned subsidiary prior to the IPO. This process identified 282 carve-out candidates. After imposing the necessary data requirement, the final sample included 186 offerings by 159 parent firms for the period 1978-1993.

Consistent with their proposed MDH, univariate results show that firms that carve out subsidiaries exhibit poor operating performance and high leverage prior to carve-outs. Also consistent with the MDH, in carve-outs wherein funds raised are used to pay down debt, the average excess stock return of +6.63% is significantly greater than the average excess stock return of -0.01% for carve-outs wherein funds are retained for investment purposes.

Allen and McConnell also estimate maximum likelihood regression of the following specification to explore the robustness of their univariate and event-study results:

$$CAR = \alpha + (+)\beta_1 payout\_dummy + \beta_2 leverage + \beta_3 pre - carveout\_HPR + \kappa Controls$$

CAR	The cumulative abnormal return measured over three day of the announcement (-1, 1)
payout_ dummy	An indicator variable that takes the value of one, if the primary use of funds raised in the carve-out will be used to repay debt, pay a special dividend to shareholders, or to repurchase shares
leverage	EBDIT over interest or EBDIT over total assets
pre-carveout_HPR	Pre-carveout holding period return. Specifically, it is measured over the -250 to - 5 day interval prior to the earlier of either the press release date or the registration filing data and are calculated using the beta and size-adjusted procedure of Dimson and Marsh (1986).
Controls	• The ratio of the book value of assets of the subsidiary to the book value of assets of the pre-carve-out firm (i.e., relative size); • The fraction of the subsidiary's shares retained by the parent after the carve-out; • The fraction of funds raised that goes to the parent • An indicator variable that takes the value of one, if the second event is an outside acquisition • An indicator variable that takes the value of one, if the parent and subsidiary have the same two-digit SIC code

Consistent with their MDH, Allen and McConnell find that *payout_dummy* is positive and significant in all model specifications.

Nohel and Tarhan (1998) test the information signaling hypothesis against the free cash flow hypothesis by studying tender offer share repurchases. The information signaling hypothesis argues that a company's willingness to pay a premium to purchase its own shares sends a strong signal to lesser-informed outside investors that the company's future prospects are improving. Therefore, the information signaling hypothesis predicts improvement in firm performance post stock repurchase regardless of a firm's investment opportunities set.

In contrast, the free cash flow hypothesis argues that firms with excess cash and a poor portfolio of investment opportunities will face sizeable agency costs if the excess cash is not distributed to shareholders. Barring such a distribution, managers have incentives to invest the excess cash in perquisites, empire building, and other negative net present value projects. Stock repurchases allow a firm to distribute its excess free cash flow, thereby eliminating the incentive for wasteful investment and increasing firm value. Therefore, the free cash flow hypothesis also predicts improvement in firm performance post stock repurchase but only for firms facing poor investment opportunities.

Previous work in this area has focused on announcement period returns. While they also examine announcement returns, Nohel and Tarhan focus on post-repurchase operating performance and its determinants to differentiate between the information signaling hypothesis and the free cash flow hypothesis.

Their sample consists of all tender offer stock repurchases announced between 1978 and 1991. They start with the tender offer database listed in the Appendix of Comment and Jarrell (1991), consisting of 165 tender offers between 1984 and 1989.They fill in the remaining years from the Wall Street Journal Index by utilizing various keywords, including 'securities buybacks' and 're-acquired shares.' They find a total of 282 announcements of both fixed-price and Dutch auction tender offers. After imposing the necessary data requirement, the final sample consists of 242 announcements of tender offers between 1978 and 1991.

They first document improvement in performance post repurchase. They find a significant improvement in the performance (measured as the ratio of EBITDA to the beginning-of-year market value of the assets) of repurchasing firms, relative to a set of control firms (matched on the basis of year -1 performance and other variables), following the repurchase. However, when partition the sample into low-growth (Tobin's Q < 1) and high-growth (Tobin's Q > 1) firms, the improvement in performance is coming entirely from low-growth firms, and stems from a more efficient deployment of repurchasing firms' existing assets rather than from new investment opportunities. Thus, repurchases do not appear to be pure financial transactions meant to change the firm's capital structure but are part of a restructuring package meant to shrink the assets of the firm. Therefore, the evidence is more consistent with the free cash flow hypothesis.

To further investigate how the performance improves, Nohel and Tarhan estimate the regression of the following specification:

$$CFAR_{post} = \alpha + (+)\beta_1 CAPX_{pre} + \beta_2 asset\_sales_{pre} + \beta_3 margin_{post}$$

CFRA	Median paired differences in cash flow return (measured as EBITDA to the beginning-of-year market value of the assets) between the sample firm and its control firm, post-repurchase
CAPX	Median abnormal capital expenditure, as a percentage of assets, of the repurchasing firm in the pre-repurchase period
asset_sales	Median value of excess asset sales from the pre-repurchase period. Excess asset sales is measured as assets(t) minus assets (t-1) minus capital expenditure (t) plus depreciation (t), all over the market value of assets
margin	Median paired difference in the operating margin (measured as EBITDA over sales) between the repurchasing firm and its control firm, post-repurchase

For the full sample, asset sales are positively and significantly related to post-repurchase abnormal performance at the 1% level ($\beta_2 > 0$). Partitioning the sample shows that the full sample results are generated by the low-growth subsample. These subsample results indicate that successful repurchasing firms increase their asset efficiency by disposing of poorly performing assets. The fact that there is no connection between capital expenditures and post-repurchase performance for high-*q* firms, combined with the evidence that performance only improves in the low-*q* firms and that this improvement is positively correlated with asset sales, provides more support for the free cash flow hypothesis than the signaling hypothesis.

To summarize, the insurance literature has produced abundant evidence in support of the MDH across ownership structures. The finance literature has also produced ample evidence for the MDH. But the finance literature has primarily focus on the role of financing policies in mitigating agency costs of managerial discretion (also known as agency costs of free cash flow). Therefore, missing in the literature are studies that test the MDH within a single ownership structure or studies on the interaction among governance controls beyond ownership structure. Our paper aims to fill this void in the literature.

1.3. Hypothesis Development

Mayers and Smith (1981) develop the MDH to explain the co-existence of multiple ownership structures in the insurance industry. Alternative ownership structures offer alternative sets of corporate governance controls, which vary in their ability to mitigate agency conflict. An insurance firm performs three main functions: the management function, the ownership/risk-bearing function, and the customer/policyholder function. Each function requires different levels of managerial discretion and hence gives rise to different levels of agency conflicts. Mayers and Smith argue that firms should specialize in the lines of insurance where their ownership structure provides greatest comparative advantage in controlling agency conflicts. Therefore, the MDH predicts systematic variation in lines of insurance across ownership structures. As described in the literature review, this prediction has fared very well in empirical tests.

In this paper, we extend the MDH to a single ownership structure. We argue that the level of managerial discretion is not homogenous within an ownership structure. Therefore, firms should have the same economic incentives within an ownership structure, as they do across ownership structures, to specialize in the lines of insurance where their governance controls provide comparative advantages, henceforth our first null hypothesis (H1):

H1: Within an ownership structure, systematic cross-sectional variations exist between line specialization and corporate governance controls.

The alternative hypothesis is, of course, no such systematic relationship exists. This may occur if the agency cost of managerial discretion does not vary sufficiently by business lines within an ownership structure. The alternative hypothesis may also hold if different governance controls within an ownership structure do not generate sufficient relative advantages in mitigating agency costs. In other words, if a firm's governance system does not create sufficient economic incentives for firms to specialize in lines of insurance, no systematic relationship should exist between governance system and the level of managerial discretion. Another potential cause for the alternative hypothesis to hold is the impact of regulation. If insurance regulators act as effective surrogate monitors, rendering firms' governance controls as non-binding constraints, then again no systematic relationship will be detected between line specialization and governance controls.

Mayers and Smith (1981) argue that agency conflicts arise whenever discretionary action is authorized. Mayers and Smith (1988, p.353) further posit that "the more discretion an agent is authorized to have, the larger is the potential for that agent to operate in his own self-interest at the expense of the other parties to the contract." Taken together, the MDH predicts that firms with stronger corporate governance controls specialize in lines of insurance that require higher levels of managerial discretion, henceforth our second hypothesis (H2).

H2: Firms with more restrictive governance controls will specialize in lines of insurance with higher levels of managerial discretion.

Publicly-traded stock insurers have a wide range of governance tools available to them. We choose to focus on board structure and executive pay to test our hypothesis because of both their theoretical importance as governance devices and the direct way in which they monitor a manger's latitude of decision making. The board of directors is the apex of the governance system of modern corporations (Fama and Jensen, 1983). They are the only governance branch that has the statutory power to both monitor the managers and oversee the business. The compensation contract provides the most direct mechanism to align executives' interests with shareholders' (Jensen and Murphy, 1990). In addition, board structure and executive pay are dynamic governance tools, which firms can control directly and adjust more frequently than other governance tools such as charter provisions or capital structure.

Corporate governance systems consist of a variety of different mechanisms, which include the board of directors, executive compensation, charter and bylaw provisions, debt and dividend policies, the takeover market, regulation, outsider investors, etc. Scholars have typically classified the various control mechanisms into those internal or external to the firm. Given our objective to study firms' ordinary decisions, the effect of internal controls is our primary research interest. Although the distinction can be blurry at times, scholars have generally viewed the board of directors, executive compensation, capital structure, and charter provisions as internal (Gillan (2006, p. 384)). Although classified as an internal control, charter provisions primarily consist of antitakeover measures, which serve as deterrents to the external takeover market. Thus, charter provisions may proxy for the probability of a takeover threat (Field and Karpoff, 2002). Further, the existing literature has shown that charter/bylaw provisions are very static (Gompers, Ishii and Metrick, 2003). Indeed, only half of our sample firms exhibit any change in charter provisions during the sample period, compared to 100% for board structure and 99% for incentive pay. Thus, compared to board structure or compensation contract, charter provisions are less likely to influence firms' ordinary business decisions. Additionally, the existing theory and empirical evidence establish that dividend policy is very sticky (see e.g. Lintner, 1956). Lastly, debt and payout decisions interface with the external capital market. Thus, they are also proxies for external monitoring, while our research focus is the governance decisions made at the firm-level.

Board structure has three broad dimensions: board composition, board size, and board leadership. The agency theory predicts that directors independent of the managers are more effective monitors (Fama and Jensen, 1983). According to the organization theory, smaller groups face lower communication and coordination costs and fewer free-rider problems in decision making than larger groups (Jensen, 1993). Therefore, absent of other confounding effects, the MDH predicts that firms with smaller and more independent boards should realize greater competitive advantages when specializing in lines of insurance with high levels of managerial discretion. Holmstrom (1979) argues that, when information asymmetry is high, incentive pay is more cost effective to induce managers to take value-maximizing actions. Smith and Watts (1992) make similar arguments that firms should use more incentive pay when marginal impact of managerial discretion is large. Therefore, absent of other confounding effects, the MDH predicts a positive relation between incentive pay and the level of managerial discretion.

In practice, corporate governance is a system of interdependent controls, which may serve as complement or substitute to each other. Therefore, although the MDH poses unambiguous predictions regarding the aggregate effect of governance controls on managerial discretion, the individual effect of any single governance control is less clear. Williamson (1983 and 1988) argues that varying contractual relations have comparative governing competence and costs, suggesting a substitution effect among incentive controls. For example, Williamson (1983) suggests that board monitoring acts as a substitute to alternative governance controls such as organizational form, ownership structure, and competition in the capital market. In stark contrast to these theoretical predictions, the empirical evidence suggests a complementary effect between board structure and executive compensation. Mehran (1995) find that firms with more outside directors use more equity-based pay. In addition, Yermack (1996) finds that CEO pay-performance sensitivity is negatively related to board size. Both of these studies are consistent with the notion that a well-functioning board is more likely to negotiate executive compensation contract in favor of shareholders than a weak board. Therefore, we view the potential complementary or substitution interactions between the effects of the compensation contract and the three board attributes as an empirical question.

1.4. Sample Description

1.4.1. Sample Construction

We start the sample collection process with all publicly-traded property-casualty insurers that file with the National Association of Insurance Commissioners (NAIC) and have CEO compensation data in the EXECUCOMP database.[8] We collect data on board size and the percent of independent directors on the board from the RiskMetric database (formerly known as IRRC). When such information is missing, we manually collect data from corporate proxy statements, which are available online through SEC Edgar (49 such cases).[9] We manually collect data used to code *Indep_chair* from proxy statements. (RiskMetric only has sufficient information for us to code whether the CEO is the Chairman of the Board, instead of whether the Chairman of the Board is independent.) Data on CEO age and tenure along with all ownership data are also manually collected

[8] EXECUCOMP consists of S&P1500 firms.
[9] http://www.sec.gov/edgar/searchedgar/companysearch.html

from proxy statements except for institutional ownership, which comes from Thomson Financial.[10] Data used to compute the market-to-book ratio (*MTB*), net income over total book assets (*ROA*), leverage (long-term debt over total debt, *Debt ratio*) and the payout ratio (the sum of common and preferred stock dividends plus repurchases over earnings before interest and taxes, *Payout ratio*) comes from COMPUSTAT. Stock return data comes from CRSP. We collect firm age, which is defined as years since inception, from various sources, including proxy statements, corporate websites, Yahoo finance, etc. We obtain insurance regulatory data from the 1997 Report of State Market Analysis for Property-Casualty Insurance, published by Coning & Co. The final sample consists of 526 firm years from 1994 to 2006 or 72 unique firms. Please see Appendix A, B, and C for a list of sample firms, a frequency distribution of the standard industry classification codes of the sample firms, and a breakdown of sample firms by sample years.[11]

1.4.2. Sample Description

Table 1 describes the operating, governance and ownership characteristics for the sample. Percent of total net premium written in long-tailed lines is 53%. Mean and median total assets are $11,432 and $3,893 (in millions). Those numbers are similar to those (50%, 9,730 and 3,434, respectively) reported in Eckles, Halek, He, Sommer and Zhang (2007), whose sample is also based upon EXECUCOMP firms. The average firm age is 66, which is considerably longer than that of a typical industrial firm. Linck,

[10] For ten observations, we have RiskMetric and EXECUCOMP data, but cannot find proxy statements. In those cases, we use CEO ownership reported in EXECUCOMP.
[11] Our sample is consistent in size with other studies examining executive compensation data for publicly-traded property-casualty insurers. For example, Eckles, Halek, He, Sommer, and Zhang (2007) study the impact of executive compensation and board monitoring on earnings management using publicly-traded property-casualty insurance companies in the EXECUCOMP database. Their sample consists of 218 firm years from 1992 to 2000.

Netter, and Yang (2008) report eleven for the average firm in the CRSP database. Additionally, the median G-index is eight, compared to nine for the rest of the firms in the Gompers, Ishii, and Metrick database (*p*-value for the *t*-test is 0.009). The characteristics of long firm history and fewer anti-takeover provisions, when compared to industrial firms, are indicative of the unique nature of the insurance industry. Regulation plays a pivotal role in the insurance industry. In the interest of social welfare, insurance companies are under tight regulatory scrutiny to promote solvency. Therefore, active regulatory intervention may reduce the role of the takeover market, resulting in fewer anti-takeover provisions. This result underlines the importance of controlling for potential regulatory effects in our analysis.

Mean and median CEO ownership is 6.28% and 0.90%, respectively. The highly skewed distribution results from the presence of founder-family firms. Seventeen of the 72 sample firms are founder-family firms (25% of the firm-year observations). We define a firm as founder-family firm, if the current CEO, Chairman of the Board, or their ancestors help found the company.[12]

The average CEO ownership in founder firms is 19%, compared to just 1.8% for non-founder firms. In Table 2, we compare other characteristics between founder firms and non-founder firms. As Table 2 shows, founder firms differ significantly from non-founder firms in terms of operating and governance characteristics. Founder firms are more likely to engage in long-tailed lines. They also have older and longer tenured CEOs. Their boards are smaller and less independent. They borrow less, use less incentive pay

[12] This definition is in line with the one used in Mayers, Shivdasani and Smith (1997). They define a firm as founder firm if "the current CEO, president, or chairman of the board helped organize the company." The percent of family firms in our sample of insurance companies is similar to what has been reported for industrial firms. Anderson and Reeb (2003) find that family firms constitute over 35% of the S&P 500 industrial firms.

and have fewer anti-takeover provisions. All these differences are statistically significant at 1% level. Thus, we will control for the effect of founder families in our regression analysis.

1.5. Research Design

1.5.1. Model Specification and Variable Definition

We use the following model specification to test hypotheses one and two:

$$\log(\%long\_tail_{i,t}) = \gamma gov\_controls_{i,t-1} + \beta_1 CEO\_Own_{i,t-1} + \beta_2 CEO\_Own_{i,t-1}\text{^}2 + \\ \beta_3 CEO\_Own_{i,t-1} * founder_{i,t} + \beta_4 \left(CEO\_Own_{i,t-1}\text{^}2\right) * founder_{i,t} + \beta_5 founder_i + \\ \beta_6 firm\_size_{i,t} + \beta_7 FTE_{i,t} + \beta_8 surety + \beta_9 group_{i,t} + year\_dummies \quad ... \quad (1)$$

Table 3 Panel A summarizes variable definitions and predicted signs for the key variables. The dependent variable (log*%long-tail*) is the log of the percent of total net premium written in long-tailed lines of insurance. We use *%long-tail* to proxy for the level of managerial discretion required in lines of insurance, because the existing literature establishes that longer-tailed lines allow the insurer more discretion than shorter-tailed lines. According to Weiss (1991, pg. 462) and Cummins, Weiss, and Zi (1999), the designation of long-tail and short-term lines refers to the length of the time lag between premium receipt and loss payments. This lag allows managers greater discretion in the functions of claim settlement and reserving. Consistent with Weiss (1991), our measure of long-tailed lines includes accident, health and disability lines such as workers' compensation and lines of insurance that provide primarily liability coverage, such as automobile liability, general liability, and medical malpractice. Short-tail lines are comprised of the other lines (e.g., fire, homeowners' peril, and automobile physical damage). Because of the considerable time gap between premium receipt and loss payments, the existing literature has found that long-tail lines are associated with higher underwriting risk and higher cost of capital. For example, Cummins, Phillips, and Smith (2001) find that long tail lines are associated with higher loss volatility. Cummins and Lamm-Tennant (1994) find that the cost of equity is higher for firms writing long-tail commercial lines such as general liability and workers' compensation. Higher risk or greater variability in performance usually requires greater managerial discretion. For example, Mayers and Smith (1994) argue that managerial discretion should be more important when more loss data is available and variance is lower. Smith and Watts (1992) also argue that high-growth firms require greater managerial discretion.

Consistent with this notion that long-tailed lines require greater managerial discretion, Beaver, McNichols, and Nelson (2000) find that firms that primarily write long-tailed lines of business have more discretionary loss reserve accruals than insurers that primarily write short-tailed lines of business, using 11,460 firm-year observations from the property-casualty insurance industry. He and Sommer（2010) use %long-tail to proxy for the degree of information asymmetry for property-casualty insurers and use it as one of the determinants that drives a firm to have more independent boards. Eckles, Halek, He, Sommer and Zhang (2007) use %long-tail to investigate the effects of executive compensation and corporate governance on firms' earnings management behaviors for a sample of publicly-held insurance companies (218 firm-year observation) for 1992-2000.

Gov_controls stands for the four governance variables that we use to proxy for the strength of a firm's corporate governance system. For easy interpretation of the aggregate effect, each governance variable is defined such that a higher value indicates more stringent monitoring. Our four governance variables are: 1) the percentage of independent directors on the board (*%outsider*); 2) negative one multiplied by the log of the number of directors on the board (*b_size*); 3) a categorical variable that takes the value of zero if the CEO is the Chairman of the Board, two if an independent director is the Chairman of the Board, and one otherwise (*indep_chair*); and 4) the percent of CEO total pay that is bonus or equity (*%incentive*).[13] Following Hermalin and Weisbach (1991, pg. 106), we lag governance and ownership variables in our effort to mitigate endogeneity concerns, which we will discuss in more detail in Section 6.3. Based on our hypotheses, we expect these four governance variables be jointly and positively related to log(*%long-tail)*. Specifically, H1 predicts $\gamma \neq 0$, and H2 predicts $\gamma > 0$.

We include CEO ownership (*CEO_own)* to control for the incentive alignment effect and squared CEO ownership (*CEO_own ^2*) to capture the effects of managerial entrenchment and risk aversion. According to the agency theory, managers' incentives are more aligned with shareholders' when managers own equity in the firm. Therefore, firms with higher levels of CEO ownership should realize greater savings in contracting costs when specializing in lines that require higher levels of managerial discretion than firms with lower levels of CEO ownership. However, as managerial ownership rises, CEOs face increased firm-specific risk in terms of both personal wealth and human capital. As CEOs are unable to perfectly hedge firm-specific risk, firms with high levels of CEO ownership may write less long-tail business due to CEO risk aversion. The entrenchment theory predicts that as the level of managerial ownership increases, managers may gain sufficient influence to insulate themselves from monitoring by the

[13] We obtain similar results if we use alternative definitions of incentive pay, which include the percent of CEO total pay that is equity or a change in the value of CEO stock and option holdings with regards to one percent change in stock price as defined in Core and Guy (2002, p. 629).

corporate governance system. Thus, the entrenchment and risk aversion theories suggest that the reduction of agency costs from the increase of managerial ownership may not only diminish in magnitude but may also reverse in sign.[14]

As we discussed earlier, founder-family firms consist of a sizable portion of our sample. Thus, we include a *founder* dummy to control for the possibility that those firms behave differently than other firms. Following the same logic, we also interact *founder* with *CEO_Own* and *CEO_Own^2*.[15] We include the log of total admitted assets (*firm_size*) to control for the economies of scale and scope. Mayers and Smith (1994) and Pottier and Sommer (1997) argue that firm size determines economies of scale and scope, which impact business activities. To proxy for regulatory stringency, we include FTE, the total number of full-time equivalent employees in a state's insurance department over the total number of domestic and foreign insurers of all types in the state.[16] We have eight firms that write zero long-tail lines for all years in our sample. All are surety firms. Hence, we also include an indicator variable for surety firms to control for the potential that they may be systematically different from other insurance firms. We include an

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[14] For research on the non-linear effects of equity ownership, see Morck, Shliefer, and Vishny (1988), McConnell and Servaes (1990), and Shleifer and Vishny (1997).

[15] Morck, Shleifer, and Vishny (1988), Villalonga and Amit (2006) and Pérez-González (2006) find that family ownership are associated with higher firm value when the founder is the CEO. However, value is destroyed when descendants become CEOs. Morch and Yeung (2003) argue that family firms are less likely to be innovative if the new technology will destroy the old capital owned by the family. Anderson, Mansi, and Reeb (2003a) find that founder-family firms have lower cost of debt than non-founder-family firms. Anddersen and Reeb (2003b) find that family firms are less likely to engage in value-reducing diversification. Therefore, the weight of evidence is that family firms enjoy competitive advantages due to concentrated ownership and family concern for firms' reputation and long-term survival. However, family firms also suffer from inherit weaknesses including entrenchment, cronyism, and limited managerial pool. Efficacy of family ownership and control aside, it is apparent from the existing literature that family firms are a distinct class of modern corporations. Therefore, we control for founder family effects in our regression analysis.

[16] We obtain similar results if we replace FTE with the External Climate Index (ECI). Our governance variables come in with the same sign and significance. ECI generally has the same sign and significance level as FTE, except that ECI is more significantly, positively related to log(*%long-tail)* in the random-effect estimation of Equation 1 and in the simultaneous-equation estimation. We obtain the measures, FTE and ECI, from the 1997 Report of State Market Analysis for Property-Casualty Insurance, published by Coning & Co. Firm.

indicator variable for whether an insurer belongs to a group (*Group*) to control for any unobserved group effects. Lastly, we include year dummies to control for any potential time effects. Our sample period spans 1994 to 2006. Some significant events have occurred during this period, which could substantially impact board structure and incentive pay, including the Sarbanes-Oxley Act of 2002.[17]

1.5.2. Estimation Method

We choose random effects (RE) as our primary estimation method. The fixed effect (FE) model is generally preferred to the random-effect model for unbalanced panel data (Wooldridge, 2002, p. 330). However, the RE specification is more appropriate for use with our data for the following reasons. First, when we use both RE and FE models to estimate Eq. 1, the Hausman specification test fails to reject that there is any systematic differences between the coefficient estimates obtained from the two models (*p*-value=0.156). Applied researchers have chosen RE over FE in this situation (Cornwell and Rupert, 1997). Second, fixed effects may lead to imprecise estimation when an independent variable does not vary much over time (Wooldrige, 2002, p.286). Some of our variables, including one of the governance variables, lack substantial variation over time. For example, only 28 of our 72 firms exhibit any change in the status of board leadership (*indep_chair*) over the sample period. This is not surprising given that the typical firm in our sample has seven years of data, while the tenure of their CEO averages 11 years. Further, firms frequently award the CEO the Chairman title. Therefore, even

[17] In 2002, the Congress passed the Sarbanes-Oxley Act (SOX), which represents the most significant reform to securities laws since 1930s. Linck, Netter, and Yang (2008b) find that SOX has a significant impact on board structure. Dew-Becker (2008) argues that there has been a trend of increased regulatory scrutiny on CEO pay beginning early 1990s. Further, those regulatory policies have affected the composition of executive pay, rather than the level.

when a CEO is replaced, the status of *indep_chair* may not change due to this dual title practice. Considering these factors, we choose the random-effects model as our primary estimation method. However, we do estimate fixed-effects models as a robustness check.

1.6. Empirical Results

In this section, we test our hypotheses, specifically whether our proxy for the degree of managerial discretion is systematically related to our proxies for governance stringency. We use four variables to measure governance stringency: the percent of independent directors on the board, board size, board leadership, and the incentive portion of CEO pay. Based on the existing literature, we expect greater proportion of independent directors on the board, smaller boards, more independent board leadership, and greater incentive pay to proxy for more stringent governance and, thus, be positively related to our proxy for managerial discretion (the percent of total net premium written in long-tailed lines of insurance). (Please see Hermalin and Weisbach (2003) for a survey on the literature on the board of directors and Core, Guay and Larcker (2003) for a survey on the literature on incentive pay.)

However, corporate governance is an intricate system, which consists of multiple interdependent controls that work in concert to mitigate incentive conflicts. Some controls may complement one another, while others may substitute for one other. For example, Yermack (1996) finds that CEO pay-performance sensitivity is negatively related to board size, suggesting a complementary relation between smaller boards and incentive pay. Linck, Netter and Yang (2008) find a positive relation between board size and the percent of independent directors on the board, suggesting a substitution effect between smaller boards and more independent boards. Therefore, our empirical tests focus on the joint significance of and the directional relationship between our proxy for managerial discretion and our four measures of governance stringency.

1.6.1. The Impact of Board Structure and Compensation Contract on Managerial Discretion

Column I of Table 4 reports regression results from estimating Eq. 1 using the random effect model. *%long-tail* is negative and significantly related to *%outside* and is positive and significantly related to board size (*b_size*). Coefficients of the dummy for independent chair (*indep_chair*) and percent of incentive pay (*%incentive*) are positive but insignificant. To test H1, we perform the Wald test to evaluate the joint significance of the four governance variables. The *p*-value of the Wald test is 0.028, rejecting the null that the coefficients of *%outside*, *b_size*, *indep_chair*, and *%incentive* are jointly insignificant. Therefore, our results support H1.

H2 predicts that the joint effect is positive. Given that the four governance variables are measured in different units, we cannot simply add together their coefficients to assess the directional impact of their aggregate effect. Therefore, we calculate beta coefficients, which allow us to interpret the effect of the governance variables in the common unit of standard deviation.[18] The sum of the beta coefficients of the four governance variables is 0.039, suggesting that one standard deviation increase in those variables increases log(*%long tail*) by 0.039. Therefore, our results support H2, namely

[18] To calculate beta coefficient, we multiply the regression coefficients from the RE estimation by the standard deviation of the respective governance variable over the standard deviation of the dependant variable (log(*%long tail*)) specifically $\beta_i^{beta} = \hat{\beta}_i^{RE}(s_i / s_y)$, where *s* stands for standard deviation, *i* denotes the four governance variables and *y* denotes the dependent variable.

firms with more stringent corporate governance controls specialize in lines of insurance that require higher level of managerial discretion.

Percent of long-tailed lines is positively related to CEO ownership, but is negatively related to CEO ownership squared. Both relations are significant at 1% level. These findings confirm our prior and are consistent with the agency theory. As a CEO owns more equity in the firm, his or her incentives become more aligned with shareholders'. Consequently, the contracting costs decrease and the firm develops a comparative advantage in specializing in business lines that exhibit a high level of managerial discretion. However, as CEO ownership continues to increase, a firm's contracting advantage diminishes, because the CEO becomes entrenched and/or more risk averse. Our data suggests that not only does the contracting advantage diminish as CEO ownership increases, but it also reverses in sign. Within our sample, this inflection point occurs at the ownership level of 7.75%.[19]

The dummy for founder family firms is positive, albeit insignificant. The positive sign is consistent with the univariate results reported in Table 2. It also confirms the idea that founder families are better incentivized to operate in highly discretionary lines. Founder firms have higher CEO ownership than non-founder firm. According to the MDH theory, firms with high managerial ownership face lower contracting costs and hence have comparative advantages to specialize in highly discretionary lines. The coefficient of *CEO_Own*Founder* is negative, while positive for *CEO_Own^2*Founder*. Both are significant at 1% level. These results again suggest that founder firms behave differently than non-founder firms.

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[19] The inflection point is where the second derivative of CEO ownership with respective to percent of long-tailed lines is zero, alternatively where $\beta_1 + 2\beta_2 CEO\_Own = 0$. Hence, $\frac{\beta_1}{2\beta_2} = -\frac{0.018}{2*(-0.001)} = 7.75\%$

We find that large firms are more likely to engage in highly discretionary lines, which is consistent with the argument of economies of scale and scope. Long-tail lines involve greater uncertainty and require greater operational expertise. Large firms with greater resources and more established organizational structure are better equipped than small firms to meet those challenges. The dummy variable for surety firms is negative and significant, which is not surprising given that all the surety firms in our sample write zero long-tailed insurance.

As we discussed earlier, the RE model is our preferred estimation method. But we also estimate the FE model for robustness. These results are reported in Column II of Table 4. We test our data for heteroskedasticity. The Breusch-Pagan test fails to reject the homoscedasticity assumption (*p*-value=0.302). Nonetheless, we run the RE model using Huber-White robust standard errors for robustness check and report the results in Column III of Table 4. In case surety firms are not representative of our sample, we estimate Eq. 1 excluding surety firms, whose results are reported in Column IV of Table 4. Considering that our dependent variable is bounded by zero and one, we also estimate Eq. 1 using Tobit model. We report the results in Column V of Table 4. As Table 4 shows, our results hold regardless of the alternative specifications.

1.6.2. The Impact of Other Governance Controls

Corporate governance is a system of interrelated controls. In this section, we test whether the effects of board structure and executive compensation hold when we control for other governance mechanisms. We focus on charter provisions, outside blockholders, leverage, and the payout ratio.

Charter provisions reflect the power balance between the manager and the shareholders (Gompers, Ishii, and Metrick, 2003; Kahan and Rock, 2003). Gompers, Ishii, and Metrick (2003) construct a governance index (G-index), which is the sum of 24 charter provisions, to proxy for this power balance. Since most of the provisions in the G-index are anti-takeover defenses, Gompers et al. argue that the higher the G-index, the more entrenched the managers. Consistent with the argument that entrenched managers pursue self interest instead of the interest of shareholders, Gompers et al. find that firms with high G-index perform poorly. However, counter-arguments also exist that antitakeover provisions protect shareholder value, because they enables the mangers to focus on the long-term strategies and survival of the firm. Particularly relevant for our study, Giammarino, Heinkel, and Hollifield (1997) build a model where antitakeover provisions can mitigate agency problems of free cash flow.

Shleifer and Vishny (1986, 1997) argue that large blockholders have the economic incentive to actively monitor the managers. Denis, Denis, and Sarin (1997) find that executive turnover is higher and more sensitive to firm performance when outside blockholders are present. Jensen (1986) highlights the importance of debt payments and dividend payout in curbing the agency costs of free cash flow. By taking excess resources away from managers, firms limit the potential of managers to invest in negative NPV projects. Consistent with this view, Fenn and Liang (2001) find higher payout ratios for firms that are more likely to face higher agency costs of free cash flows, namely firms with low managerial ownership and few investment opportunities.

Table 5 reports estimation results of Eq. 1, controlling for charter provisions, outside blockholder ownership, leverage and the payout ratio. As Table 5 shows, our results remain unchanged when controlling for these additional incentive controls. In all cases, *%outside*, *b_size*, *indep_chair*, and *%incentive* are jointly and positively significant. In addition, we find that outside block ownership is positive and significantly related to the level of managerial discretion, consistent with the existing literature that outside blockholders play an important monitoring role. We also find a significant and negative relation between debt and managerial discretion. Therefore, our results do not support the argument of agency costs of free cash flow, but they are consistent with the argument of agency costs of debt. Firms that engage in high managerial discretionary lines likely face greater operational risk (Lamm-Tennant, and Starks, 1993). Therefore, levered firms may be less likely to engage in high discretionary lines to save on agency costs of over-investment or under-investment due to debt. We did not find any significant relation for the payout ratio.[20]

1.6.3. Endogeneity, IV and Simultaneous Equations

We recognize the potential endogeneity between a firm's corporate governance system and line of business specialization. We believe that, in practice, especially in short term, there is sufficient independence between these decisions to justify treating the corporate governance decisions as exogenous to a firm's decisions about which lines of business the firm plans to generate revenue from in a given budget cycle. However, we do take several steps to directly mitigate endogeneity concerns related to causality. As we

[20] As descriptive statistics shows, we have extreme values for the payout ratio. To mitigate the influence of outliers, we include only those observations that have payout ratios between zero and one (about 1% truncation at either tail), when estimating models that include the payout ratio. We obtain similarly results without such restriction. Specifically, for Model IV, the *p*-value of the joint test of the four governance variables is .033 with the sum of the beta coefficients equals 0.035. For Model V, the *p*-value of the joint test of the four governance variables is .014 with the sum of the beta coefficients equals 0.030. Additionally, the payout is also insignificant in both models when there is no truncation.

have already illustrated, we lag governance controls and ownership variables by one year to reduce the potential contemporaneous relations between these variables and the level of managerial discretion. We also address endogeneity concerns through the use the methods of instrumental variables (IV) and simultaneous equations (SEM) . The results using these two methods are discussed in 6.3.1 and 6.3.2, respectively.

1.6.3.1 Estimation using Instrumental Variables

To get valid inference from IV estimation, we need to find instruments that are uncorrelated with the disturbance term but are correlated with our governance variables. Therefore, we choose the following as our instruments: the log of firm age, the log of CEO tenure, the market-to-book ratio (MTB), and percent of institutional ownership. Existing literature shows that these variables are important determinants of board structure and CEO pay. For example, Lehn, Patro, and Zhao (2009), Boone, Field, Karpoff, and Raheja (2006), Coles, Daniel, and Naveen (2008) and Linck, Netter, and Yang (2008) find that firm age, growth opportunities, CEO tenure and ownership structure are important determinants of board structure. Smith and Watts (1992) and Gaver and Gaver (1993) find that firms with greater growth opportunities employ more incentive pay. Anecdotal and academic evidence both underscore that institutional investors have a significant impact on CEO pay (e.g. Gillan and Starks, 2000; Hartzel and Starks, 2003).

We also believe those factors are likely to be exogenous. Firm age and holdings by institutional investors are externalities that are beyond the control of the current management. In theory, a CEO can influence his tenure by quitting the job. He can also influence firm's growth opportunities through business planning. However, given the costs of leaving an executive post and given that the MTB ratio represents market valuation of firm's future growth potential, we believe it is reasonable to assume those two variables are also exogenous. In support of our conjecture, the F-tests for the first stage regressions all have *p*-value at better than 1% level, suggesting that the IVs are well correlated with the governance variables. Further, the Sargan statistics for the overidentification test has a *p*-value of zero, suggesting that our IVs are also orthogonal to the dependent variable (*%long tail*).

We report the regression results from using 2SLS estimating Eq. 1 in Table 6. Note, since the four governance variables are lag values, we also lag our instruments by one year. As Column I of Table 6 shows, we obtain similar results for our governance variables. The coefficient of *%outsider* is negative and significant at 5% level, while the coefficient of board size is positive and significant at 1% level. Consistent with IV being a less efficient estimation method, the *p*-value of the joint test on the four governance variables is marginally significant at 10% level, while the magnitude of the sum of the beta coefficients (0.281) is substantially higher than the one (0.039) obtained using the RE model.

We also test for endogeneity based on the 2SLS estimation. Wooldridge (2002, p.118-119) recommends the Hausman test in the context of IV. We conduct a Wu-Hausman test, which yields a *p*-value of 0.054, suggesting that *%outsider*, *b_size*, *indep_chair*, and *%incentive* are not exogenous. However, we need to interpret this test result with caution. The Hausman test tests for systematic differences between the OLS and the 2SLS estimators. It does not test for systematic differences between the 2SLS and the RE estimator, which is the estimator that we use. Controlling for firm random effects in panel data estimation may have mitigated the endogeneity problem present in the OLS estimation.

1.6.3.2.A. Estimation using Simultaneous-Equations Model – Research Design

In this section, we estimate a simultaneous-equations model (SEM) to control for potential endogeneity. In addition, SEM allows us to investigate the causality between governance controls and the level of managerial discretion and examine the potential complementary or substitution effects among the governance controls. The model specification for the SEM is specified below:

$$\begin{aligned}
&\log(\%long_tail_{i,t}) = \gamma_1 endog_\mathrm{var}_{i,t} + \varpi indep_chair_{i,t-1} + \beta_1 CEO_Own_{i,t} + \beta_2 CEO_Own_{i,t}\text{^}2 + \\
&\quad \beta_3 CEO_Own_{i,t} * founder_{i,t} + \beta_4 \left(CEO_Own_{i,t}\text{^}2\right) * founder_{i,t} + \beta_5 founder_i + \\
&\quad \beta_6 firm_size_{i,t} + \beta_7 FTE_{i,t} + \beta_8 surety + \beta_9 group_{i,t} + year_dummies \\
&\%outsider_{i,t} = \gamma_1 endog_\mathrm{var}_{i,t} + \varpi indep_chair_{i,t-1} + \beta_1 ROA_{i,t} + \beta_2 CEO_tenure_{i,t} + \\
&\quad \beta_3 D\&O_Own_{i,t} + \beta_4 \log(MVE)_{i,t} + \beta_5 founder_i + \beta_6 SOX \\
&b_size_{i,t} = \gamma_1 endog_\mathrm{var}_{i,t} + \varpi indep_chair_{i,t-1} + \beta_1 D\&O_Own_{i,t} + \beta_2 firm_age_{i,t} + \\
&\quad \beta_3 \log(MVE)_{i,t} + \beta_4 founder_i + \beta_5 SOX \\
&\%incentive_{i,t} = \gamma_1 endog_\mathrm{var}_{i,t} + \varpi indep_chair_{i,t-1} + \beta_1 CEO_Own_{i,t} + \beta_2 MTB_{i,t} + \beta_3 RET_{i,t} + \\
&\quad \beta_4 \log(MVE)_{i,t} + \beta_5 ret_volatility + \beta_6 founder_i + year_dummies \qquad \text{...(2)}
\end{aligned}$$

endog_var is the short-hand for the four potentially endogenous variables (namely, *%long_tail*, *%outsider*, *b_size*, and *%incentive*) to be estimated in SEM. We use 3SLS to control for the potential correlation among the error terms across equations.[21] When constructing the SEM, we choose the exogenous variables using the existing

[21] The SEM does not include an equation for *indep_chair* for identification considerations. The three attributes of board structure share common economic determinants (Linck, Netter, and Yang, 2008). However, we do control for the potential effect of *indep_chair*, by including the lag value of *indep_chair* as independent variable in all regressions.

literature as the guide. Our decision in choosing the exogenous variables is also motivated by the need to identify the system.

The first equation is our Eq. 1. For the equation, %outsider, we include return on assets (*ROA*) and the log of CEO tenure to proxy for CEO power (*CEO_tenure*). Hermalin and Weisbach (1998) argue that powerful CEOs have greater negotiation power to nominate insiders to the board. They suggest firm performance and CEO tenure as empirical proxies. Boone, Field, Karpoff, and Raheja (2007) and Linck, Netter, and Yang (2008) find empirical evidence that supports the prediction of Hermalin and Weisbach (1998). The existing literature (e.g. Boone et al. (2007), Linck et al. (2008), Coles et al (2008), and Lehn et al. (2004)) shows that firm size and ownership structure has a significant impact on board composition, board size and board leadership. Therefore, we include the log of market value of equity (*log(MVE)*) and director and officer ownership (*D&O_Own*). For reasons discussed earlier, we also include dummies to control for the founder-family effects and the SOX impact. For the equation, *b_size*, we include D&O ownership and the log of firm age (*firm_age)*) based on the findings in Boone et al. (2007), Linck et al. (2008) and Lehn et al. (2004). Again, we control for the founder-family effects and the SOX effects in this equation.

For the equation, *%incentive*, we include the market-to-book ratio (*MTB*) to proxy for growth opportunities based on Smith and Watts (1992) and Gaver and Gaver (1993). We include stock return (*RET*) given that incentive pay is based on firm performance (Core, Guay, and Larcker, 2002). We include CEO ownership (*CEO_Own*), since CEOs with large equity ownership are more likely to act in the interest of shareholders and hence, should require less incentive pay. Mehran (1995) finds a negative relation between incentive pay and managerial ownership. We include *log(MVE)* as large firms are more complex and harder to monitor hence need to provide more incentive pay (Core, Guay, and Larcker, 2002). We use annualized standard deviation of 12-month stock returns (*RET_volatility*) to proxy for a firm's information asymmetry (Fama and Jensen, 1983). Holmstrom (1979) argue that incentive pay should positively correlate with information asymmetry of the firm. For reasons discussed earlier, we also control for founder-family effects and the presence of a potential time trend by including a founder dummy and year dummies.

1.6.3.2.B. Simultaneous-Equations Model – Support for Hypotheses

The estimation results from the SEM are reported in Table 7. As Column I in Table 7 show, our results retain support for our hypotheses in a SEM framework. *b_size*, *Indep_chair*, and *%incentive* are positively and significantly related to *%long_tail* at 1% significance level, while *%outsider* is negatively and significantly related to *%long_tail* at 5% significance level. Wald test indicates that the four governance variables are jointly significant. The sum of their beta coefficients is positive and economically large. It suggests that a one standard deviation change in the four governance variables results in almost a one standard deviation change (0.776) in *%long_tail*.

1.6.3.2.C. Evidence of Complementary or Substitution Effects Among Corporate Governance Controls

As Column II and III indicate, *b_size* is positively and significantly related to *%outsider*, while *%outsider* is positively and significantly related to *b_size*, suggesting a complementary effect between the two. Further, Column II and Column IV show that no significant relation exists between *%incentive* and *%outsider*. Collectively, there results, together with %outsider being negative in Column I, support the argument that governance controls act as compliments as well as substitutes. Firms have limited resources and monitoring is costly. The existing literature shows that firms usually increase board independence by adding outsiders instead of removing insiders, resulting in larger boards (Linck, Netter, and Yang, 2009). Firms that specialize in long-tailed business face greater uncertainty, and their independent directors incur greater information gathering, dissemination, and communication costs. Therefore, firms with more long-tailed business may have greater economic incentives to have smaller boards rather than place more outside directors on the board. Our results are also consistent with Coles, Daniel, and Naveen (2008), who find that high growth firms with smaller and less independent boards have greater firm value. Further, our results are consistent with the information asymmetry argument made in Holmstrom (1979). Holmstrom argues that when firms face high degrees of information asymmetry, complete monitoring may be ideal, but would likely be too costly. Thus, Holmstrom contends incentive pay is the next best solution to propel the manager to make value-maximizing decisions.

Column III and Column IV also suggest substitution effects between small boards and incentive pay, which again confirms the transaction cost theory and resource scarcity argument discussed earlier. Our results differ from the findings in Yermack (1996), which unveils a positive relation between small board and CEO pay-performance sensitivity. This difference probably arises from the differences in model specifications and estimation methods. Yermack use the OLS method and the OLS regression does not control for any firm characteristics.

The relations between our four governance variables and other firm characteristics are generally consistent with the existing literature, lending us confidence that our SEM is correctly specified. We find that firms with independent chairman are more likely to have larger and independent boards, which is consistent with the existing evidence (Linck, Netter, and Yang, 2008). In line with Boone, Field, Karpoff, and Raheja (2007), Lehn, Patro, and Zhao (2009), and Linck, Netter, and Yang (2008), we find that large firms have larger boards, SOX significantly increases board independence and board size, and lower D&O ownership is associated with less independent and smaller boards. Consistent with our earlier results, founder family firms have smaller and less independent boards. Consistent with Smith and Watts (1992) and Gaver and Gaver (1993), we find that growth firms are more likely to use incentive pay.

1.7. Conclusion

In this paper, we examine the incremental impact of corporate governance controls in mitigating managerial discretion costs after controlling for the incentive alignment of managerial ownership. We achieve this through extending the managerial discretion hypothesis (MDH) of Mayers and Smith (1981) to publicly-traded, property-casualty insurers. To date, the existing evidence supports the theory that firms with different sets of corporate governance tools (i.e. different ownership structures) will experience comparative advantages in addressing managerial discretion costs. We argue that the same economic principals of relative advantages should apply within a single ownership structure. Thus, we hypothesize that publicly traded insurers that employ more stringent corporate governance systems will enjoy contracting advantages in mitigating agency costs and specialize in lines of insurance with high level of managerial discretion.

Consistent with our hypotheses, we find a significant positive relationship between the stringency of governance controls and the level of managerial discretion for a sample of 72 publicly-traded property-casualty insurers from 1994 to 2006. We measure the stringency of a firm's governance system as percent of independent directors on the board, small board size, whether an independent director is the Chairman of the Board, and the percent of CEO pay that is incentive based. We find evidence of complementary effects between board size and board independence. In addition, we find evidence of substitution effects between board size and incentive pay.

Our results hold after controlling for CEO ownership, highlighting the incremental importance of corporate governance in mitigating managerial discretion costs. Our findings also hold when we control for the impact of regulation and the potential influence of other governance mechanisms, such as charter provisions, outside blockholders, capital structure and distribution policy. Our findings are robust to alternative estimation methods including instrumental variables and simultaneous equations.

Our results raise important questions for future research. Will the relations between managerial discretion and governance controls also hold for industrial firms? The universe of industrial firms is larger and more diverse. A study of industrial firms could potentially yield additional findings. Secondly, consistent with theory posed by Williamson (1983), we find that board monitoring and CEO compensation packages serve as substitutes. In contrast, some empirical evidence suggests a complementary relation between the two (Mehran, 1995; Yermack, 1996; Mishra and Nielsen, 2000). Williamson (1988) argues that alternative governance controls have comparative competency and costs when performing alternative governance tasks, suggesting that comparative advantages of the same governance controls may change when governance tasks change. If this line of reasoning is true, it explains the different findings between our study and some of the existing studies. Future work is needed to investigate whether and how comparative advantages of governance controls change with respect to different governance tasks and how firms respond to such changes.

CHPATER 2

ENTERPRISE RISK MANAGEMENT AND RISK REDUCTION

2.1. Introduction

Managing risk is important for publicly-traded corporations. The theory of corporate risk management argues that firms with smooth cash flows have lower expected tax liabilities, financial distress costs and contracting costs, suggesting that managing risk adds value (Mayers and Smith (1982), Smith and Stulz (1985) and Froot, Scharfstein, and Stein (1993)). Consistent with this theory, 92% world's largest companies in 2003 report using derivatives (Smithson and Simkins (2005)). Empirical evidence also shows that risk management enhances shareholder value (Allayannis and Weston (2001), Carter, Rogers and Simins (2006), Hoyt and Liebenberg (2009), and Phillips, Cummins and Allen (1998)). To the extent that risk management reduces earnings and cash flow volatilities, it also facilitates investors and regulators to evaluate and monitor firm performance and solvency risk. The 2008 financial crisis highlight that risk management is not only important to corporations but also to regulators and global economy as a whole.

In recent years, growing number of firms have adopted enterprise risk management (ERM) to improve risk management. Some risk management professionals argue that the 2008 financial crisis results from a system-wide failure to embrace ERM and that adopting ERM may prevent the history from repeating itself.[22] According to

[22] *Risk management*, April, 1 2009, "The New DNA: Examining the Building Blocks of Risk."

Nocco and Stulz, ERM is a process that identifies, assesses and manages individual risks (e.g. currency risk, interest rate risk, reputational risk, legal risk, etc.) within a coordinated and strategic framework. Therefore, ERM represents a radical paradigm shift from the traditional method of managing risks individually to managing risk holistically. In other words, ERM emphasizes managing risks as a portfolio (risk-portfolio) as opposed to managing individual risk separately. It is this aspect of ERM that forms the premise of this paper.

We hypothesize that ERM lowers the marginal cost (MC) of reducing risk, which creates incentives for profit-maximizing firms to reduce total risk while increasing firm value. By combining the firm's risks into a risk-portfolio, an ERM-adopting firm is able to better recognize the benefits of natural hedging, prioritize hedging activities towards the risks that contribute most to the total risk of the firm, and optimize the evaluation and selection of available hedging instruments. By so doing, the ERM-adopting firm realizes a greater reduction of risk per dollar spent. This reduction in MC of managing risk incentivizes profit-maximizing firms to further reduce risk until the marginal cost of risk management equals the marginal benefits. Consistent with this hypothesis, we find that firms adopting ERM experience a reduction in stock return volatility. Due to the costs and complexity of ERM implementation, we also find that the reduction in return volatility for ERM-adopting firms becomes stronger over time. Further, we find that operating profits per unit of risk (ROA/return volatility) increase post ERM adoption.

This paper makes several contributions to the literature. It adds to the fledging literature on ERM. Compared to the vast literature on risk management, studies on ERM are sparse. On February 27, 2010, a key word search of "Enterprise Risk Management" in the Social Science Research Network (SSRN) database yields 57 hits compared to 1,000 hits if use "Risk Management." The first article in Factiva with "Enterprise Risk Management" appears in 1996. Of the limited research on ERM, the evidence on whether ERM creates value for the firm is mixed. Hoyt and Liebenberg (2009) find a large valuation premium (as measured by Tobin's Q) for ERM adopters, whereas Beasley, Pagach and Warr (2008) find insignificant, negative announcement returns for ERM adoption. We find that, after adopting ERM, firm risk decreases and accounting performance increases for a given unit of risk. Therefore, our results complement the findings in Hoyt and Liebenberg (2009), which are based on market valuation of firm performance. Our analysis also has policy implications, as our results lend support for the recent pressure from regulators, rating agencies and institutional investors on firms to adopt ERM.[23]

The remaining of the paper is organized as follows: Section 2 reviews related literature, Section 3 develops hypotheses, Section 4 describes the research design, Section 5 summarizes the sample selection process and describes the sample, Section 6 presents empirical findings and Section 7 concludes.

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[23] A.M Best began to implement its Enterprise Risk Model for US insurers in late 2001 (A.M. Best Special Report - A.M. Best's Enterprise Risk Model, A Holistic Approach to Measuring Capital Adequacy, July, 2001). Standard and Poor's has introduced ERM analysis into its global corporate credit rating process for financial and insurance companies starting 2005 and for non-financial companies starting 2008 (Analysis of Enterprise Risk Management in S&P Ratings of Non-Financial Corporations, Standard and Poor's Presentation to the International Developments Subcommittee of American Bar Association, 18 November 2008). Kleffner, Lee and McGannon (2003) report that many countries, including Canada, the United States, the United Kingdom, Australia, and New Zealand, are pressing firms to adopt more integrated and comprehensive risk management system, propelling more firms to adopt ERM. Indeed, 37% of their surveyed Canadian firms cite compliance with Toronto Stock Exchange guidelines as reason to adopt ERM.

2.2. Related Literature

The theory of corporate risk management is well established and empirical studies analyzing corporate risk management policy are vast. In contrast, the literature on ERM is still in its infancy and much of the existing evidence comes from survey and case studies. In this section, we first summarize the literature on corporate risk management and then review the research on ERM. Given the purpose of this study, we perform a much more exhaustive review of the latter, paying attention to only the more representative papers of the former that are relevant to this paper.

2.2.1. The Literature on Corporate Risk Management

The theory of corporate risk management is developed as an extension of corporate financing policy. Under the Modigliani-Miller paradigm, with fixed investment policy and with no contracting costs and taxes, corporate financing policy is irrelevant. Following this line of reasoning, the theory of corporate risk management uses taxes, contracting costs, and the impact of risk management on corporate investment policies to explain the firm's risk management decision (Mayers and Smith (1982), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993)).

Empirical research on corporate risk management develops after 1994, when Financial Accounting Standards Board (FASB) starts to mandate that US firms disclose information on notional values of derivative contracts in annual reports. Prior to this change, empirical evidence on corporate risk management comes primarily from survey or case studies. Therefore, we focus on empirical studies after 1994 and classify them into two broad categories based upon the question they aim to answer. First, why firm manage risk? Second, what is the impact of risk management on firm value?

Geczy, Minton and Schrand (1997) study the use of foreign currency derivatives for 372 of the *Fortune 500* non-financial firms in 1990 and find that firms with greater growth opportunities and tighter financial constraints are more likely to use currency derivatives, consistent with the argument that hedging mitigates the underinvestment problem. They also find that firms with extensive foreign exchange-rate exposure and economies of scale in hedging activities are more likely to use currency derivatives. Allayannis and Ofek (2001) examine the use of foreign currency derivatives for S&P500 non-financial firms in 1993 and find similarly results that firms with larger size, R&D expenditures, and exposure to exchange rates hedge more. Gay and Nam (1998) and Deshmukh and Vogt (2005) also find empirical evidence supporting the underinvestment explanation for corporation risk management policy.

Haushalter (2000) studies the use of foreign currency derivatives for oil and gas producers between 1992 and 1994. He finds that more levered firms manage risk more extensively, supporting the argument that financing costs influence the firm’s hedging decisions. He also finds that the likelihood of hedging is related to economies of scale in hedging costs and to the basis risk associated with hedging instruments.

Tufano (1997) studies the gold price hedging behavior for 48 gold miners between 1990 and 1993. He finds that firms whose managers hold more options hedge less, while firms whose managers hold more stock hedge more, which is consistent with the theory of managerial risk aversion (Smith and Stulz (1985) and Stulz (1984)).

Graham and Rogers (2002) find no evidence that firms hedge in response to tax convexity. But they find that firms hedge to increase debt capacity, which is in line with the findings in Haushalter (2000). Mian (1997) examines the use of all hedging instruments for 3,022 non-financial US firms in 1992. He concludes that evidence is inconsistent with the argument of financial distress cost, mixed with respect to the argument of taxes, contracting cost, imperfect capital markets, but strongly supports the argument of economies of scale (i.e., that larger firms hedge more).

In contrast to the number of studies examining the determinants of corporate risk management policy, studies analyzing the valuation impact of risk management are relatively few. Allayannis and Weston (2001) study the use of foreign currency derivatives for 720 non-financial US firms between 1990 and 1995. Using Tobin's Q as a proxy for firm value, they find a positive relation between firm value and the use of foreign currency derivatives, with an average hedging premium of 4.87%. Carter, Rogers and Simkins (2006) study the jet fuel hedging behavior for US airline industry between 1992 and 2003. Using Tobin's Q as a proxy for firm value, they find that the hedging premium could be as large as 10%. Further, they find that the positive relation between hedging and firm value increases in capital investment, and most of the hedging premium is attributable to the interaction of hedging with investment, suggesting that the hedging benefit comes from a reduction of underinvestment costs.

To summarize, the overall weight of empirical evidence supports the theory of corporate risk management. Firms optimize their risk management policy based on the cost-benefit tradeoff and, as a result, managing risk has a positive impact on firm value.

2.2.2. The Literature on ERM

The theory of enterprise risk management is based on the theory of corporate risk management and is best summarized in Nocco and Stulz (2006). Nocco and Stulz (2006) define ERM as an approach under which "all risks (are) viewed together within a coordinated and strategic framework." They argue that ERM creates value, because it strengthens the firm's ability to carry out its strategic plan, by minimizing costs like underinvestment.

Empirical work on ERM is limited and can be classified along three main lines of research – describing the ERM practice, analyzing the determinants of ERM adoption, and assessing the valuation effect of ERM. In view of the purpose of this study, we focus on the latter two lines of literature.[24]

2.2.2.1. Survey Data on ERM Practice

Kleffner, Lee and McGannon (2003) study the deployment of ERM by Canadian companies. They conduct a survey to determine the extent to which ERM is practiced in Canada. They sent out the survey in June 2001 to all companies listed as members in Canadian Risk and Insurance Management Society (RIMS). Surveys are sent to the individual who is primarily responsible for risk management in the company. They find that forces driving firms to adopt ERM include the influence of risk managers, encouragement from the board of directors, and compliance with Toronto Stock

[24] To read about the various development stages of ERM, see e.g. Colquitt, Hoyt, and Lee (1999), Aabo, Fraser and Simkins (2005), Gates (2006), and Calandro, Fuessler and Sansone (2008). For a detailed account of the development of ERM and summary of academic research on this subject, see *Enterprise Risk Management: Today's Leading Research and Best Practices for Tomorrow's Executives*, 2010, Wiley Publishing, Editors: John Fraser and Betty J. Simkins.

Exchange guidelines, while the main deterrence to ERM adoption is organizational inertia.

Beasley, Clune and Hermanson (2008) study organizational factors associated with ERM adoption. They survey chief audit executives who are members of the IIA_s Global Audit Information Network (GAIN) to obtain data related to ERM deployments and other organizational characteristics. They received 175 survey responses, a rate of 10.3%. Fifty-two observations had to be deleted due to incomplete/not applicable data. The final sample is 123 organizations. They find that find the stage of ERM implementation to be positively related to the presence of a chief risk officer, board independence, CEO and CFO apparent support for ERM, the presence of a Big Four auditor, entity size, and entities in the banking, education, and insurance industries. They also find US organizations to have less-developed ERM processes than international organizations.

2.2.2.2. Determinants of ERM Adoption

Liebenberg and Hyot (2003) study the determinants of ERM adoption. They use the appointment of senior risk management positions (Chief Risk Officer (CRO)) as the signal for ERM adoption. They search for the appointment of CRO through Lexis-Nexis, Dow Jones, and PR Newswire for the period 1997-2001. They initially identified 33 announcements of CRO appointments by US firms. After imposing the necessary data requirement, the final sample consists of 26 US firms. They then construct a control sample, which is comprised of firms that do not appoint CRO, come from the same 4-

digit SIC industry, and have total assets closest to the CRO firm in the year preceding the appointment.

To investigate the determinants of ERM adoption, Liebenberg and Hyot (2003) estimate a logistic regression of the following specification:

$$Logit(CRO=1) = \alpha + \beta_1 size + \beta_2 fin\_svc\_dummy + \beta_3 earning\_stdev + \beta_4 price\_stdev + \beta_5 leverage + \beta_6 MTB + \beta_7 inst\_own + \beta_7 overseas\_dummy$$

CRO	Indicator variable that takes the value of one, if the firm announced CRO appointment
size	Average annual total assets reported for three years prior to the appointment year
fin_svc_dummy	Indicator variable that takes the value of one, if the firm is in SIC industry 6000 to 6999
earning_stdev	The coefficient of variation of the firm’s quarterly EBIT for three years (12 quarters) prior to the appointment year
price_stdev	The coefficient of variation of the firm's daily stock price for the year (254 trading days) prior to the appointment year
leverage	Average of the ratio of long-term debt to total firm value for three years prior to the appointment year
MTB	The ratio of market value of assets to book value of assets averaged over the three years prior to the appointment year
inst_own	Average percentage of outstanding shares held by institutional investors for three years prior to the announcement year
overseas_dummy	Indicator variable that takes the value of one, if the firm has a subsidiary located in Canada and/or the United Kingdom in the year immediately preceding the appointment announcement

Liebenberg and Hyot (2003) do not find much significant results except that firms with greater financial leverage are more likely to appoint a CRO. They interpret this finding as consistent with the hypothesis that firms appoint CROs to reduce information asymmetry regarding the firm’s current and expected risk profile. Additionally, smaller firms are more likely to appoint CRO (*p*-value=0.076), which is a counter-intuitive result. They did not offer any explanation for this finding.

2.2.2.3. Impact of ERM Adoption on Firm Value

Hoyt and Liebenberg (2009) measure the extent to which specific firms have implemented ERM programs and assess the value implications of these programs. To control for heterogeneity in regulation and industry condition, they draw their initial sample from the universe of insurance companies (SIC codes between 6311 and 6399) in the merged CRSP/COMPUSTAT database for the period 1995-2005, alternatively 275 insurance firms. To identify ERM activities, they perform a detailed search of financial reports, newswires, and other media using Factiva, Thomson, and other search engines. After imposing necessary data requirement, their final sample consists of 117 firms (687 firm-year observations) for 1998-2005 that adopt or engage in ERM.

To investigate the impact of ERM adoption on firm value, Hoyt and Liebenberg use maximum-likelihood method and estimate a system of two equations of the following specification. By simultaneously modeling the determinants of ERM and the effect of ERM on firm value, they are able to mitigate the potential self-selection bias, namely some of the factors that are correlated with the firm's choice to adopt ERM may also be correlated with observed differences in Q.

$$Eq.1.\quad Q = \alpha + \beta_1 ERM + \beta_2 size + \beta_3 leverage + \beta_4 sales\_growth + \beta_5 ROA + \beta_6 overseas\_dummy + \beta_7 non-insur\_sale\_dummy + \beta_8 dividend\_dummy + \beta_9 insider\_ownPct + \beta_{10} insider\_ownPct^2 + \beta_{11} life + \beta_{12} beta$$

$$Eq.2.\quad ERM = \alpha + \beta_1 size + \beta_2 leverage + \beta_3 overseas\_dummy + \beta_4 non-insur\_sale\_dummy + \beta_5 life + \beta_6 opacity + \beta_7 div\_ins + \beta_8 inst\_ownPct + \beta_9 reinsu + \beta_{10} slack + \beta_{11} CV(EBIT) + \beta_{12} lag(\log(stdev)) + \beta_{13} value\_change$$

Q	(Market value of equity + Book value of liabilities) / Book value of assets
ERM	Indicator variable that takes the value of one, if firm-years >= year of first identifiable ERM activity
size	ln(Book value of assets)
leverage	Book value of liabilities / Market value of equity
Sales_growth	Sales(t) minus sales(t-1) over sales(t-1)
ROA	Net Income / Book value of assets

overseas_dummy	Indicator variable that takes the value of one, if positive sales outside of North America
non-insur_sale_dummy	Indicator variable that takes the value of one, if positive sales in non-insurance SIC codes
dividend_dummy	Indicator variable that takes the value of one, if firm paid dividends in that year
Insider_ownPct	Percentage of outstanding shares owned by insiders
life	Indicator variable that takes the value of one, if life insurer (primary SIC code=6311)
beta	Covariance(firm excess returns, market returns)/Variance(market returns)
opacity	Intangible assets/Book value of assets
div_ins	Herfindahl index of premiums written across all lines of insurance
inst_ownPct	Percentage of outstanding shares owned by institutions
reinsu	Reinsurance ceded / (direct premiums written + reinsurance assumed)
slack	Cash and short-term investments / Book value of assets
CV(EBIT)	Coefficient of variation of earnings before interest and taxes
lag(log(stdev))	Lag(ln(Standard deviation of monthly returns))
value_change	Firm value in year t - firm value in year t-1 / firm value in year t-1

In the valuation equation (Eq. 1), they find a positive relation between firm value and the use of ERM. The ERM premium of 16.5% is statistically and economically significant and is robust to a range of alternative specifications of both the ERM and value equations. In the ERM-choice equation (Eq.2), they find that ERM usage is positively related to firm size, institutional ownership and the *value_change* variable, but is negatively related to reinsurance use, whether the firm has sales outside North America (*overseas_dummy*), leverage and asset opacity.

2.2.2.4. Market Reaction to ERM adoption

Beasley, Pagach and Warr (2008) examine market reactions to announcements of appointments of Chief Risk Officer (CRO). They search for the hiring announcements of senior risk management executives for the period 1992-2003 through LEXIS-NEXIS, following the approach of Liebenberg and Hoyt (2003). They identified 348 announcements through the initial search. They exclude from these 348 announcements, 100 made by private corporations, 36 by foreign companies, 46 by public firms that did not have the required security market data, and 46 by public firms that do not have the required financial statement data. The final sample includes 120 observations. Of these 120 observations, 47 come from the financial industry, 15 from the insurance industry, 24 from the energy industry and 34 from other industries.

To calculate CAR, they measure the announcement period as the day of the hiring announcement plus the following day (0, 1). The abnormal return is computed using the Fama-French three-factor market model estimated over the (-255, -46) day window prior to the announcement. The market return is measured as the CRSP equally weighted index. The announcement period return for the entire sample of announcements is -0.001 and is not statistically different from zero.

To examine the cross-sectional relation between CAR and firm-specific characteristics, they estimate regression of the following specification (did not specify the regression method):

$$CAR(0,1) = \alpha + \beta_1 MTB + \beta_2 intanglibles + \beta_3 cash\_ratio + \beta_4 EPS\_stdev + \beta_5 leverage + \beta_6 size + \beta_7 beta\_dif$$

MTB	Market-to-book ratio
Intangibles	Book value of intangible assets divided by total assets measured at the end of the fiscal year prior to the announcement
cash_ratio	The amount of cash as reported at the end of the fiscal year-end prior to the announcement divided by total liabilities measured at the end of the fiscal year prior to the announcement
EPS_stdev	Standard deviation of the change in EPS over the eight quarters prior to the announcement
leverage	Total liabilities divided by market value of equity measured at the end of the fiscal year prior to the announcement
size	The natural logarithm of the firm’s market value of equity as measured at the end of the most recent fiscal quarter prior to the announcement
beta_dif	The beta estimated over the 250 trading days after the appointment less the beta estimated over the 250 trading days prior to the appointment, where the CRSP value weighted return is used as the market proxy

They find that for the full sample, CAR is positively associated to firm size and negatively related to cash ratios. They interpret the results as consistent with the view that larger firms are more likely to benefit from risk management activities than smaller firms. Additionally, firms that have large cash reserves are less likely to suffer financial distress and thus have less need to manage risks related to future financial problems. Hence markets view more negatively the adoption of ERM by firms with financial slack. However, this result is tempered by the positive and insignificant coefficient of the *leverage* variable.

When partition the sample by financial and non-financial firms, they find that CAR is positively related to leverage, but is negatively related to cash balance and beta difference for nonfinancial firms. For non-financial firms, CAR is positively associated to firm size and the volatility of prior periods' earnings, but negatively related to cash ratio and leverage.

To summarize, the literature on ERM is still young and the evidence on the valuation effect of ERM adoption is mixed, reflecting the newness of ERM in practice.[25]

2.3. Hypothesis Development

Traditionally firms have managed risk by segmenting and delegating risks to various departments with specific expertise in managing their assigned risks: Employee risks are managed by the human resources department; hazard risks are managed by the insurance department; financial risks are managed by the finance department; and operational risks are managed by their respective profit centers, etc. Recognizing the

[25] Farmers started to hedge the price fluctuation of their commodities more than a hundred years ago. ERM emerged as a new approach to manage risks within the past two decades.

importance of managing the total risk of the firm and seeking both greater effectiveness and efficiency in risk management, some firms have adopted an enterprise wide approach to risk management (ERM). Part of the rationale for adopting ERM and/or appointing a Chief Risk Officer (CRO) is to break down the departmental budgetary and political barriers in the identification, evaluation and management of risk, allowing the firm to consolidate its "non-core" risks into a risk-portfolio and hedge the risk-portfolio in a coordinated manner. Thus, central to the implementation of an ERM process is the notion that risks should be combined and managed together as a 'risk-portfolio.'

Modern Portfolio Theory predicts that combining assets (e.g., risks) into a portfolio will reduce the risk of the portfolio so long as some of the assets are less than perfectly, positively correlated (Markowitz (1952)). Thus, the total risk of the portfolio is less than the sum of the individual risks. A firm using the traditional 'siloed' approach to risk management would not be cognizant of all the correlations and interdependencies amongst its risks and thus, the Pre-ERM firm would not be in a position to reap the full benefits of natural hedges. In addition, Meulbroek (2002, pg.19) notes, that "by focusing narrowly on one specific risk, the (Pre-ERM) manager may create or exacerbate other types of risk for the company. Such interactions between risks are not always obvious, especially when they occur among unrelated businesses within the firm." One such example was documented in The Economist (1996, pg.16). Lufthansa ordered airplanes from Boeing creating an exposure to loss should the US dollar increase in value relative to the Deutschmark. In response, Lufthansa hedged the currency risk associated with the purchase, not realizing that its overall operating performance was positively correlated to the value of the dollar, providing a natural hedge. However, once a firm adopts ERM, the

Post-ERM firm becomes ‘aware’ of its portfolio and is able to recognize the full potential of natural hedges within its risk-portfolio and achieve cost savings in reaching its desired level of risk by eliminating the purchase of hedging contracts that erode (or even offset) the natural hedging occurring within the risk-portfolio. So when a firm chooses to adopt an ERM program and combines its individual risks into a risk-portfolio, we expect that the ERM-adopting firm experiences savings in the cost of managing its risks. This clear, straightforward application of the Modern Portfolio Theory should lead to greater firm value so long as the savings exceed the ERM implementation costs and is supported by the empirical findings of Hoyt and Liebenberg (2009).

Yet this result leads us to consider additional questions: What does the firm do with their cost savings? Will the Post-ERM firm use its cost savings to further reduce risk? Alternatively, the Post-ERM firm might consider that it has a comparative advantage in bearing risk and seek to leverage this advantage by taking on more risk.

These questions lead us to consider more closely how firms manage risks within a portfolio. Doherty (2000, pg.548) notes that we are able to draw upon the analytical techniques used to manage asset portfolios, and argues “we can use similar techniques to choose an ‘efficient portfolio’ of hedging instruments for a firm.” In addition, managing a combination of risks allows us to consider contracts that hedge combinations of risks and more efficiently reduce risk. Doherty (2000, pg.531) illustrates this point through an example using integrated insurance products and shows that for “the same cost, the firm was able to transfer more risk with the combined hedge than with the separate hedges.” The above arguments, taken in combination with the fact that ERM adopting firms consolidate their risks into a portfolio and manage those risks in a coordinated manner, suggest that ERM adopting firms should be able to lower their MC of reducing risk. We will expand upon this point to motivate our hypotheses.

ERM adoption leads to a decrease in the firm's marginal cost to reduce risk, which generates incentives for a profit-maximizing firm to lower its optimal risk level. Specifically, adoption of ERM takes a portfolio approach to managing risk. This portfolio approach of risk management enables the Post-ERM firm to optimize which risks to hedge and which hedging instruments to purchase and, as a result, the Post-ERM firm will realize a greater amount of risk reduction for each dollar spent on hedging than the Pre-ERM firm.

ERM adoption reduces MC of risk reduction, because it enables the Post-ERM firm to better recognize natural hedges and optimize which risks to hedge. The Pre-ERM firm, not having created a risk-portfolio, is ignorant of each risk's contribution to the risk-portfolio's variance. In addition, the 'siloed' departments within the Pre-ERM firm, unaware of the correlation between risks across departments, will not be able to recognize some natural hedges (i.e. less than perfectly, positively correlated risks). Thus, the Pre-ERM firm will inefficiently select which risks to hedge and lose some of the risk reduction that would result from natural hedges. In contrast, the Post-ERM firm, through consolidating and analyzing the firm's risks in a portfolio, is able to identify the contribution of each individual risk to total firm risk and make better decisions in terms of which risks to hedge. Consequently, the Post-ERM firm will generate greater reduction in firm risk per dollar spent on risk management.

Even if we were to assume that no natural hedging was available (i.e., all of the firm's risks are perfectly and positively correlated), individual risks will vary in their distributions and therefore differ in their contribution to the variance of the firm's risk-portfolio. Thus, even in the extreme, improbable scenario that all risks are perfectly, positively correlated and no natural hedge exists, the Post-ERM firm would still experience a lower MC of risk reduction through the ability to analyze which risks contribute most to the variance of the firm's risk-portfolio and focus their risk management efforts towards those individual risks.

In a similar fashion, managing risks in a portfolio allows ERM-adopting firms to lower the MC of risk reduction through optimization of which hedging instruments to purchase. The Pre-ERM firm, not having created a risk-portfolio, is not able to evaluate the impact of each hedging contract's impact on the firm's risk. Traditionally, each 'siloed' department would evaluate their need to hedge the risks within their purview and generate a set of hedges the department deems appropriate for managing those risks. There are two potential problems with this traditional approach. First, each department may constrain themselves to a limited set of hedging instruments with which the department has familiarity (e.g., insurance contracts for the insurance department, contractual risk transfers for the legal department, market traded securities for the finance department, etc.). Second, even if we were to assume that each department was likely to evaluate a complete set of potential hedging instruments for their risks, the Pre-ERM firm still has no ability to evaluate each hedging instrument's risk-reducing power in relation to firm's risk-portfolio. Specifically, without having created a risk-portfolio, the Pre-ERM firm cannot analyze how much each hedging contract reduces the total variance of the risk-portfolio per dollar spent. In contrast, the Post-ERM firm, by creating and analyzing both the firm's risk-portfolio and the complete set of hedging instruments available to the firm, is able to identify which hedging instruments are most cost effective at reducing the variance of the firm's risk-portfolio.

While not explicitly stated above, it is important to note that the Post-ERM firm is also capable of expanding the set of evaluated hedging contracts and consider hedging instruments likely ignored by the Pre-ERM firm. The Post-ERM firm faces a different optimization problem than the Pre-ERM firm, namely optimizing risk reduction at the firm level as opposed to the department level. To illustrate, employing the traditional approach to risk management, the departments within the Pre-ERM firm will seek to identify hedging contracts that are highly negatively correlated with the individual risks (or 'siloed' groups of risks) they seek to hedge. In contrast, the Post-ERM firm's focus is not tied to hedging individual risks. Imagine if there existed a hedging contract that exhibited not only low contracting costs, but it was also perfectly, negatively correlated with the firm's risk-portfolio. Only the Post-ERM firm would realize this hedging instrument's risk reduction power, because only the Post-ERM firm has the advantage of having created, and thus, being able to hedge directly, the firm's risk-portfolio.

Therefore, the above argument leads us to put forth our first hypothesis that the adoption of ERM reduces the marginal cost of risk reduction. This change in MC will create incentives for profit maximizing firms to further reduce risk until the marginal costs once again equal the marginal benefits.[26] Hence we predict that ERM adoption will lead to a reduction in firm risk.

H1: Firms adopting ERM will exhibit a reduction in risk.

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[26] The marginal benefits of risk reduction are based upon the theory presented by Mayers and Smith (1982), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993). These theoretical benefits of risk reduction (e.g. lower corporate taxes, lower cost of capital and lower contracting costs) are exogenous to the firm's decision to implement an ERM program. Thus, we do not expect the adoption of ERM to impact the functions of the marginal benefits of risk reduction.

We make no prediction on the form or the extent of hedging (i.e., type of hedging contracts purchased or total dollars spent on reducing risk) by the ERM-adopting firm. As discussed above, an ERM-adopting firm may be able to achieve risk reduction by hedging more efficiently. Thus, it is not apparent that the Post-ERM firm must increase hedging volume or expenditures to achieve a lower risk level.

Due to the complexity and costs associated with ERM implementation (e.g. acquiring the understanding of a firm's risks and their correlations) as well as the fact that significant time may be required to optimally adjust a firm's hedges, the effect of ERM on firm risk may take time prior to reaching its full effect. As an example, Aabo, Fraser and Simkins (2005) analyze the implementation of ERM over a five-year period at Hydro One. (Hydro One is one of the ten largest electricity delivery companies in North America and is the pioneer of ERM practice.) Management first attempted to implement ERM at Hydro One by using external consultants. When no lasting benefits resulted from this initiative, Hydro One created a new position of Chief Risk Officer and a Corporate Risk Management Group. The board of directors approved the blueprint for ERM in 2000 after a pilot study had been successfully conducted. This case study highlights that ERM adoption is a gradual, learning process. Therefore, we predict that the risk reduction post ERM adoption will be lagged (and/or become stronger over time).

H2: Risk reductions post ERM adoption will be lagged (and/or become stronger over time).

Thus far, we have argued that ERM adoption lowers the MC of risk reduction and that this reduction of MC creates economic incentives for profit-maximizing firms to further reduce risk. This same logic also predicts that ERM-adopting firms will simultaneously increase profits while lowering risk. Hence, finding evidence of lower firm risk post ERM-adoption is necessary, but not sufficient support for our argument. To illustrate, one could argue that a reduction in firm risk post-ERM adoption may simply result from agency costs associated with political pressure within the firm to demonstrate that the ERM implementation was successful. For example, a CRO might deploy excess corporate resources to reduce risk in order to justify his/her position or higher pay, even when the costs of reducing risk exceed the benefits of reducing risk. The ultimate purpose of ERM should be creating firm value through better management of risk. Thus, to properly test whether ERM adoption leads to an impact on MC, we need to examine both firm risk and profits post-ERM adoption.

To test the simultaneous impact of ERM implementation on firm risk and profits, we relate ERM adoption to operating profits scaled by firm risk. This approach utilizes a well-understood concept, namely the reward-to-risk ratio, to test whether the risk reduction post ERM-adoption is associated with greater risk-adjusted profits; henceforth our Hypothesis 3:

H3: Risk reduction post ERM-adoption is associated with increasing risk-adjusted profits as evidenced by an increase in the ratio of ROA to firm risk post ERM adoption.

2.4. Research Design

To test our first hypothesis (H1), we need to specify a model with firms' risk as the dependent variable and ERM adoption and other controls that potentially influence firms' risk as the independent variables:

$$firm\_risk = intercept + \gamma * ERM\_adoption + \beta * controls \qquad ... \quad Eq.1$$

A finding of $\gamma < 0$ will be in support of H1. One potential concern in estimating *Eq. 1* is the self-selection problem. To mitigate this form of omitted-variable bias, we employ the Heckman two-step procedure to estimate the impact of ERM adoption on firm risk. Specifically, we first use a *Probit* model to estimate the probability of a firm adopting ERM to get the predicted probability for each firm (*prob(ERM)*). We then use this predicted probability (*prob(ERM)*) to compute the inverse Mills ratio (*IML*), which is the probability density function of *prob(ERM)* over the cumulative probability density function of *prob(ERM)*. In other words, the inverse Mills ratio captures the selection hazard. We then estimate *Eq. 1* including the inverse Mill ratio in addition to other control variables.

To predict the probability of ERM adoption, we control for firm size and operation complexity by using the log of total assets (*size*), the log of the number of business segments (*BUSSEG*), and a dummy variable that takes the value of one if a firm generates revenue from international operation (*INTL*). We argue that the more complex and the more myriad risks that a firm faces, the greater benefit a firm can realize by taking a portfolio approach to manage risk. Further, existing literature (see, e.g. Mian (1997)) finds that corporate hedging activities are a function of economic of scale and operation complexity. Towers Perrin's 2008 ERM survey also finds that larger firms are significantly more advanced in ERM implementation.[27] We use the percent of institutional ownership (*Instit_own*) to capture the potential pressure from institutional investors to adopt ERM (Hoyt and Liebenberg (2009)). We include a lagged measure of firm risk, the log of annualized standard deviation of daily stock returns over the previous three years (*volt*), to control for the potential relation that riskier firms have greater incentive to hedge (see, e.g. Smith and Stulz (1985)). Following Hoyt and Liebenberg (2009), we use a dummy for life insurers (*Life*) to control for the potential heterogeneity in ERM adoption across different lines of business.

Towards the end of 2001, A. M. Best began to implement its new Enterprise Risk Model[28]. In 2002, Congress enacted the Sarbanes-Oxley Act (SOX), which represents the most significant securities legislation since the Great Depression. Although ERM is not a stated objective of SOX, the Act has served as a catalyst for ERM adoption by providing the necessary infrastructure. According to a study conducted by the Conference Board, SOX's mandates on corporate responsibility and financial reporting have forced firms to conduct the internal control process at the enterprise level and in a coordinated framework. Therefore, as a result of the mandated effort to comply with SOX, companies have a platform on which to build their ERM infrastructure. To capture these external shocks to a firm's decision to implement ERM, we use a dummy variable (*BestSOX dummy*) that takes the value of one if 2002 and zero otherwise.[29]

[27] *Embedding ERM - A Tough Nut to Crack*, a Towers Perrin global survey of the insurance industry on the topic of ERM (2008).
[28] A.M. Best Special Report - A.M. Best's Enterprise Risk Model, A Holistic Approach to Measuring Capital Adequacy (July, 2001).
[29] "Emerging Governance Practices in Enterprise Risk Management," Research Report (R-1398-07-WG) by the Conference Board, Hhttp://papers.ssrn.com/sol3/papers.cfm?abstract_id=963221

Starting in 2005, Standard & Poor's began incorporating ERM analysis into their credit-rating process for insurance companies. According to the 2006 Towers Perrin Tillinghast survey of executives at 70 North American life insurance companies, a majority of respondents indicate that their firms have planned to set up an ERM infrastructure or decided to improve their current ERM program based on comments received from major rating agencies such as S&P and Moody's. Thus, we also include a dummy variable (*S&P dummy*) that takes the value of one for year 2005 and zero otherwise to control for this external push for ERM adoption.[30]

The dependent variable in this *Probit* model is a dummy variable (*ERM*) that takes the value of one if a firm practices ERM in that year.[31] Therefore, we have the following equation for the first-stage regression of the two-step Heckman procedure.

$$\begin{aligned} Probit(ERM_{i,t}=1) &= intercept + \beta_1 size_{i,t} + \beta_2 Instit\_own_{i,t} + \beta_3 BUSSEG_{i,t} + \beta_4 INTL_{i,t} + \beta_5 volt_{i,[t-3,t-1]} \\ &+ \beta_6 Life_{1,0} + \beta_7 BestSOX\_dummy + \beta_8 S\&P\_dummy + \varepsilon_{i,t} \qquad \ldots \quad Eq.2.1 \end{aligned}$$

For the second stage, we estimate an *OLS* model of the following specification to investigate the impact of ERM adoption on firm risk.

$$\begin{aligned} volt_{i,t} &= intercept + \beta_1 ERM\_firm_{1,0} + \beta_2 ERM\_firm_{1,0} * ERM\_implem\_dummy_{i,t} + \beta_3 IMR_{i,t} \\ &+ \beta_4 size_{i,t} + \beta_5 firm\_age_{i,t} + \beta_6 MTB_{i,t} + \beta_7 debt_{i,t} + \beta_8 Instit\_own_{i,t} + \beta_9 BUSSEG_{i,t} \\ &+ \beta_{10} INTL_{i,t} + \beta_{11} Life_{1,0} + \beta_{12} S\&P\_volt_t + \varepsilon_{i,t} \qquad \ldots \quad Eq.2.2 \end{aligned}$$

The dependent variable (*volt*) is the log of the annualized standard deviation of daily stock returns. We choose stock return volatility as our proxy for firm risk, because it is a well-establish measure for a firm's total risk. Mayers and Smith (1982) and Smith

[30] Jack Gibson and Hubert Muller, *Life Insurance CFO Survey #13: Enterprise Risk Management*, Towers Perrin Tillinghast, May 2006, p. 2. Respondents primarily included CFOs from large and mid-size North American life insurance companies; 52 percent had assets of $5 billion or more and 21 percent were multinationals

[31] For example, if a firm has data from 1992 to 2005 and it adopted ERM in 2002, then the dependent variable in Eq. 2.1 takes the value of one for 2002-2005 and zero for 1992-2001.

and Stulz (1985) show that, when capital markets are imperfect, firms care about total risk (as opposed to systematic or idiosyncratic risk). Stock return volatility is also preferred to other alternative measures of firm risk such as earnings or cash flow volatility, because stock price data are available on a daily basis whereas earnings and cash flow data are only reported quarterly.

Our variable of interest is the interaction term between a dummy that takes the value of one if a firm has ever adopted ERM during our sample period (*ERM_firm*) and a dummy variable that takes the value of one if a firm practices ERM that year (*ERM_implem_dummy*). Based on our H1, we expect $\beta_2 < 0$. The dummy *ERM_firm* controls for any potential group fixed effects between firms that ever adopted ERM and firms that never adopted ERM during our sample period. An example for this potential group effect is corporate culture. ERM firms may have a more flexible corporate culture than non-ERM firms, which allows them to more quickly learn and implement new technology. Supporting this argument, Kleffner, Lee, and McGannon (2003) find that organizational inertia is a major deterrence preventing firms from adopting ERM. By including both *ERM_firm* and *ERM_firm* ERM_implem_dummy* in the regression, we can then isolate the incremental impact of ERM adoption on firm risk. Adopting ERM is an endogenous decision made by a firm. Our estimation could be biased if ERM adoption coincides with a change in underlying firm characteristics that drive firm risk. We explicitly control for this potential omitted-variable bias by including the inverse Mills ratio (*IMR*) that we compute from *Eq. 2.1*.

We also include in *Eq. 2.2* other variables that the existing literature predicts influence firm risk, such as firm size (the log of total assets, *size*), firm age (the log of the number of years that a firm has stock price data in the CRSP database, *firm_age*), growth opportunities (the log of the market-to-book ratio of assets, *MTB*), firm leverage (long-term debt over total assets, *debt*), institutional ownership (*Instit_own*), and the extent of firm diversification (*BUSSEG*; *INTL*). Larger firms and firms with a long trading history provide the market more information (Barry and Brown (1985). Thus, we expect those firms to be less volatile. Supporting this argument is the findings by Kerins, Smith and Smith (2004), who find that firms' total risk decreases in firm age and size. Debt acts as a lever, magnifying profits and losses, and thus, contributes to higher firm risk (e.g., Lev (1974)). Prior literature (e.g., Del Guercio (1996), Falkenstein (1996), and Gomper and Metrick (2001)) find that institutional investors prefer stocks with low volatility. Other than the common wisdom that diversification is associated with lower firm risk due to imperfect correlation between different lines of business, Amihud and Lev (1981) also argue that self-serving managers pursue diversification through M&A to reduce their employment risk. Including *BUSSEG* and *INTL* in the second-stage regressions also control for the possibility that firms decide to change business mix or other activities in response to a change in firm risk due to ERM adoption.

We include a dummy for life insurers to control for systematic variation in risk across different lines of business. We also include the log of annualized standard deviation of daily S&P500 equally-weighted index returns to filter out changes in firm risk due to changes in market-wide volatility.[32]

[32] Our results remain the same using S&P500 value-weighted return.

To test our second hypothesis (H2), we modify *Eq. 2.2* by adding time lags of ERM implementation (*X* denotes the vector of the control variables):

$$volt_{i,t} = intercept + \kappa ERM\_firm_{1,0} * \sum_{t=1}^{n} ERM\_implem\_lag_{i,t} + \lambda X + \varepsilon_{i,t} \quad ... \quad Eq.3$$

To test our third hypothesis (H3), we follow similar framework as *Eq. 2,* but we replace *volt* with *ROA/volt* in the second-stage of equation. Additionally, we run a median regression instead of an OLS to mitigate extreme outliers.[33] Specifically, we estimate:

$$\begin{aligned} Probit(ERM_{i,t} = 1) = {} & intercept + \beta_1 size_{i,t} + \beta_2 Instit\_own_{i,t} + \beta_3 BUSSEG_{i,t} + \beta_4 INTL_{i,t} + \beta_5 volt_{i,[t-3,t-1]} \\ & + \beta_6 Life_{1,0} + \beta_7 BestSOX\_dummy + \beta_8 S\&P\_dummy + \varepsilon_{i,t} \quad ... \quad Eq.4.1 \end{aligned}$$

$$\begin{aligned} \frac{ROA_{i,t}}{volt_{i,t}} = {} & intercept + \beta_1 ERM\_firm_{1,0} + \beta_2 ERM\_firm_{1,0} * ERM\_implem\_dummy_{i,t} + \beta_3 IMR_{i,t} \\ & + \beta_4 size_{i,t} + \beta_5 firm\_age_{i,t} + \beta_6 MTB_{i,t} + \beta_7 debt_{i,t} + \beta_8 Instit\_own_{i,t} + \beta_9 BUSSEG_{i,t} \\ & + \beta_{10} INTL_{i,t} + \beta_{11} Life_{1,0} + \beta_{12} S\&P\_volt_t + \varepsilon_{i,t} \quad ... \quad Eq.4.2 \end{aligned}$$

For all our regressions, except for the median regression, we control for firm-level clustering following Petersen (2009).

2.5. Sample Description

2.5.1. Sample Selection and ERM Identification

We start our sample selection process with all publicly-traded insurance companies in the US in the merged CRSP/COMPUSTAT database (i.e. firms with Standard Industry Classification Code between 6311 and 6399). We focus on one industry to control for heterogeneity in regulatory and industry effects. We select

[33] OLS models the relationship between one or more covariates X and the conditional mean of a response variable Y given X. In contrast, median regression models the relationship between X and the conditional median of Y given X. It is a very useful technique when the data has extreme outliers and is widely used in the literature like CEO compensation (see, e.g. Aggrawal and Samwick (1999)) where the distribution of CEO pay can be extremely, positively skewed.

insurance companies, because, compared to other firms, insurance companies are in the business of managing risk and should be better positioned to recognize the benefits of ERM and successfully implement it. We focus on publicly-traded insurers in this study so that we can utilize stock return data and more easily identify ERM implementation through public filings and media coverage. There are 354 public insurers in the merged CRSP/COMPUSTAT database that have data on total assets, stock prices and institutional ownership from 1990 to 2008.[34]

Firms are not required to disclose information about ERM implementation. Therefore, we follow Hoyt and Liebenberg (2009) to identify ERM adoption for the above-mentioned 354 insurers. Specifically, we search Factiva, LexisNexis, Thomson and Edgar, using key words of “Chief Risk Officer,” “Enterprise Risk Management,” “Enterprise Risk Officer,” “Strategic Risk Management,” “Integrated Risk Management,” “Holistic Risk Management” and “Consolidated Risk Management.” Once we find an article using any of these key words, we then read the article carefully to determine whether it documents an ERM adoption event. We record the date of publication of the document that first provides evidence of ERM adoption as our event date. Our search yields 69 unique firms that adopted ERM between 1995 and 2008. Figure 1 depicts the unique ERM adoption events that we identify from 1990 to 2008.

[34] We choose 1990 as the starting point because according to Beasley, Pagach and Warr (2008) and Hoyt and Liebenberg (2009), insurers start to adopt ERM in the 1990s. At this time, 2008 is the latest available date for financial data in WRDS.

2.5.2. Data Sources and Variable Description

We collect financial data from COMOPUSTAT, stock price data from CRSP and institutional ownership from Compact Disclosure. See Appendix D for a detailed description of variable construction and related data sources.

2.5.3. Sample Description

Table 8 reports the number of total sample firms and the number of firms that adopt ERM by year for the period 1992-2008. We choose 1992 as the start of our sample period (i.e. three years prior to the first ERM adoption event) to examine the impact of ERM adoption on firm risk over time. As Figure 1 and Table 8 show, although insurers start to adopt ERM in the mid 1990s, this practice does not become widespread until the 2000s. By 2008, 43% of US publicly-traded insurers had implemented ERM.

Table 9 reports key operating characteristics for the sample firms. For more in-depth illustration, we partition the sample by whether a firm implemented ERM between 1992 and 2007 (hereafter ERM firms) or never adopted ERM within the same period (hereafter non-ERM firms). Panel A reports the descriptive statistics partitioned by ERM practice (Panel A.T-test displays a two-sample t-test comparing the mean differences of the variables). We also partition the sample by whether a firm exhibits stock return volatility greater than the sample median. Panel B reports the descriptive statistics partitioned by firm risk. As Panel A shows, ERM firms are generally less volatile, significantly larger, more diversified and levered, and have higher institutional ownership. Thus, descriptive statistics confirm our prior that ERM firms could be systematically different from non-ERM firms, highlighting the importance of controlling for the group fixed effect in our empirical tests. As Panel B shows, less volatile firms are larger and more diversified, and have longer stock return history and higher institutional ownership. These relations between firm risk and other firm characteristics are consistent with the findings from the existing literature.

2.6. Empirical results

2.6.1. The Impact of ERM Adoption on Firm Risk

Table 10 reports the regressions results for *Eq. 2*. We exclude 2008 from the test to mitigate noise introduced into estimation due to the global financial crisis. The financial crisis, which began with the burst of the subprime mortgage bubble in the US in the mid 2007, developed into a full blown global economic crisis in 2008 and caused unprecedented volatility in that year. (Appendix E provides more details on the extreme volatilities that our sample firms experienced in 2008. We do run additional robustness checks including 2008 data. We discuss those results at the end of 6.1.)

Table 10 Column (1) reports regression results for *Eq. 2.1*. Consistent with the argument of economies of scale, larger firms are more likely to adopt ERM (Geczy, Minton and Schrand (1997) and Allayannis and Ofek (2001)). We find that less-diversified firms are more likely to adopt ERM, while the dummy for international operations is positive and insignificant. These results are counter intuitive, because we expect firms with more dispersed operations to have more complex risks and benefit more from ERM. It may be that less diversified firms are riskier and hence have greater incentive to adopt ERM. Consistent with this argument, the Pearson correlation between *BUSSEG* and $volt_{[t-3,\ t-1]}$ is negative with coefficient of 0.088 and 1% significance; the two-sample *t*-test of $volt_{[t-3,\ t-1]}$ between firms with international operations and firms without is also significant at 1%.

Consistent with the clientele argument, institutional ownership is positively and significantly related to the probability of ERM adoption (Hoyt and Liebenberg (2009)). The positive and significant coefficient of past stock return volatility is an interesting result, given that earlier univariate statistics show that ERM firms are less volatile; but the finding is consistent with the argument that riskier firms engage in greater hedging activities to reduce contracting costs (Smith and Stulz (1985)). The external push from credit ratings agencies like A. M. Best and S&P and from the passage of SOX also have a positive effect on a firm's decision to adopt ERM. Pseudo *R*-squared for the *Probit* model is 0.378, suggesting that our empirical specification for the determinants of ERM adoption fit our data reasonably well.

Table 10 Column (2) reports regression results for *Eq. 2.2*. Consistent with H1, we find that the interaction term (*ERM_firm* ERM_implem_dummy*) is significantly and negatively related to firm risk, indicating that ERM firms reduce risk post ERM-adoption. Since our dependent variable is the log form of firm risk, the negative coefficient of 0.149 on the interaction term implies that, on average, ERM-adopting firms reduce risk by 13.9% ($1-e^{-0.149}$=13.9%). The dummy variable for ERM firms is significant and positively related to firm risk, suggesting that ERM adopters are systematically riskier than non-ERM firms, which is consistent with the results of our first-stage *Probit* model. The inverse Mills ratio also enters the regression with significance, suggesting that it is important to control for self-selection bias. Results on our other control variables are consistent with the existing literature. For example, we find that larger firms, more mature firms and firms with higher institutional ownership are less volatile.

Table 10 Column (3) reports the regression results for *Eq. 2.2*, omitting proxies for institutional ownership, business segments, and the presence of international operations. Our two-equation model can be considered an instrumental-variable approach. Since we only exclude two explanatory variables (the BestSOX dummy and the S&P dummy) in the first equation from the second-stage estimation, a collinear problem potentially exists for Eq. 2.2. However, addressing collinear concerns by dropping additional first-stage variables from the equation does not change our results.

2.6.1.1. Additional Robustness Check: Incorporating 2008

Due to the global financial crisis, the entire equity market experienced record volatility in 2008. The annualized standard deviation of equally-weighted S&P500 indices nearly tripled in 2008 compared to the year before. Our sample firms exhibit similar trends. As Appendix E Panel B shows, from 1992 to 2007, only 25% of our sample firms have annualized standard deviation exceeding 45.50%. In 2008, 75% of sample firms have annualized standard deviation greater than 58.04%. Therefore, including 2008 likely introduces substantial noise into our estimation. On the other hand, we also notice increased ERM adoption in the latter part of our sample period. To test our H2, we require time series post ERM adoption. Therefore, to balance between maximizing time series and minimizing estimation noise, we conduct two robustness checks using firm-year observations from 1992 to 2008, restricting the sample to those observations with annualized standard deviation less than 152% and 115% (i.e. truncating the sample by 1.5% and 3% at the top). An advantage of this approach is that it applies equally to all firm years (i.e. there is no systematic discrimination against one particular year). By doing so, we likely also exclude firms experiencing extreme situations (e.g. firms near bankruptcy, delisting or being acquired).

As Table 11 shows, all our results hold. Particularly, the interaction term (*ERM_firm* ERM_implem_dummy*) is significant and negatively related to firm risk, albeit of lower magnitude. The smaller coefficient is consistent with our conjecture that including 2008 introduces estimation noise.[35]

2.6.2. The impact of ERM on Firm Risk Over Time

Table 12 reports the regression results from estimation *Eq. 3*. To test our second hypothesis (H2), we estimate four model specifications using different time lags post ERM adoption. Consistent with H2, we find that the risk reduction post ERM-adoption grows stronger over time. Specifically, based on Table 12 Column 3, firms realize 12.3% ($1-e^{-0.131}$) risk reduction during the year ERM is implemented (year=0). The risk reduction increases to 17.5% ($1-e^{-0.192}$) two years after the firm adopts ERM. Therefore, our results are consistent with the argument and anecdotal evidence that implementing ERM is a complicated process and that the full benefits from ERM adoption are realized over time.

[35] Our results hold if we try alternative cutoff points like 5%. If we use the entire sample without any truncation, the interaction term between *ERM_firm* and *ERM_implem_dummy* still have the predicted negative sign but will no longer be significant (*p*-value=0.308).

2.6.3. The Impact of ERM Adoption on Profits per Unit of Risk

Table 13 reports regression results that test our H3. Our variable of interest is the interaction term (*ERM_firm*ERM_implem_dummy*). Consistent with our hypothesis, the estimated coefficient of this interaction is positive and statistically significant at 1% level. The magnitude of 0.020 suggests that adopting ERM increases the ratio of ROA over annualized standard deviation of stock returns by 2.00%, which is a non-trivial increase when considering firms as an on-going concern (i.e. generating perpetual cash flows). Therefore, our results are consistent with Hoyt and Liebenberg (2009), who find a valuation premium of 16.5% (as measured by Tobin's Q) for US public insurers that adopt ERM from 1998 to 2005.

Interestingly, the dummy for ERM firms is no longer significant in the second-stage regression, suggesting that ERM adopting firms are not systematically more profitable per unit of risk than non-ERM firms. Coefficient estimates of our other controls are consistent with the conventional knowledge. For example, we find that older firms, firms with greater growth opportunities, and firms with high institutional ownership are more profitable relative to their risk.

We also use alternative definition of profits, including return on book value of common equity and return on market value of common equity, and in both cases, the interaction term between ERM firm and ERM implementation dummy (*ERM_firm*ERM_implem_dummy*) is positive and significant at 1% level. These results are reported in Appendix F.

In Section 6.2, we find that ERM has a lagged effect on risk reduction, consistent with the argument that ERM implementation is a complex process and its effects may take time to manifest. This argument could also apply to the effect of ERM adoption on profits scaled by risk. To investigate this lagged effect, we estimate a similar set of regressions as in Table 12. In this case, we use profit per unit of risk as the dependent variable and examine the impact of ERM adoption over various time lags. Results are reported in Table 14. We find some evidence in support of a lagged effect. Specifically, based on Table 14 Column 4, firms realize 2.1% ($e^{0.021}$-1) increase in ROA over stock return volatility during the year ERM is implemented (year=0). This ratio increases to 2.7% ($e^{0.027}$-1) three years after the firm adopts ERM.

2.6.4. Additional Robustness Check – Using the sub-period of 2000-2007

We also conduct all the tests using the sub-sample period of 2000-2007, as opposed to the full sample period of 1992-2007, since more than 95% of our ERM adoptions occur after 2000. Our results remain qualitatively unchanged. Adopting ERM significantly reduces firm risk as measured by the annualized standard deviation of daily stock returns. Further, the risk reduction appears to be lagged, consistent with the notion that implementing ERM is a complex process. Lastly, adopting ERM significantly increases the ratio of firm profits over firm risk, regardless of whether we use ROA or ROE as the proxy for firm profit.

While still statistically significant, the results using the sub-sample period of 2000-2007 are generally weaker than if using the full sample period of 1992-2007. For example, the effect of adopting of ERM using the sub-sample has a *p*-value of 4.2% compared to less than 1% when using the full sample. The reduced statistical significance probably arises from a smaller sample and a shorter time series. The sub-sample consists of 1,083 observations, compared to 2,401 observations in the full sample, a 55% reduction in sample size.

2.7. Conclusion

In this paper, we test the hypothesis that the impact of ERM adoption on the MC of reducing risk. This hypothesis is based on the premise that firms adopting ERM are better able to recognize the benefits of natural hedging, prioritize hedging activities towards the risks that contribute most to the total risk of the firm, and optimize the evaluation and selection of available hedging instruments. Therefore, ERM-adopting firms are able to produce a greater reduction of risk per dollar spent. The resulting lower marginal cost of risk reduction provides economic incentive for profit-maximizing firms to further reduce risk until the marginal cost of risk reduction equals the marginal benefits. Consequently, after implementing ERM, firms experience lower risk and higher profits, simultaneously. Consistent with our hypotheses, we find that firms adopting ERM experience a reduction in stock return volatility. Due to the costs and complexity of ERM implementation, the reduction in return volatility for ERM-adopting firms is gradual and becomes stronger over time. Lastly, we find that returns per unit of risk (ROA/return volatility) increase post ERM adoption.

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APPENDIX A: LIST OF THE 72 SAMPLE FIRMS

1	ACE LTD	37	LEUCADIA NATIONAL CORP
2	AETNA INC	38	LINCOLN NATIONAL CORP
3	ALLIED GROUP INC	39	LOEWS CORP
4	ALLSTATE CORP	40	MBIA INC
5	AMBAC FINANCIAL GP	41	MERCURY GENERAL CORP
6	AMERICAN BANKERS INS GROUP	42	METLIFE INC
7	AMERICAN FINANCIAL GROUP INC	43	MGIC INVESTMENT CORP/WI
8	AMERICAN GENERAL CORP	44	NAC RE CORP
9	AMERICAN INTERNATIONAL GROUP	45	NATIONWIDE FINL SVCS -CL A
10	AON CORP	46	OHIO CASUALTY CORP
11	AXA FINANCIAL INC	47	OLD REPUBLIC INTL CORP
12	BERKLEY (W R) CORP	48	ORION CAPITAL CORP
13	BERKSHIRE HATHAWAY	49	PACIFICARE HEALTH SYSTEMS
14	CAPITAL RE CORP	50	PHILADELPHIA CONS HLDG CORP
15	CHRYSLER CORP	51	PMI GROUP INC
16	CHUBB CORP	52	PREPAID LEGAL SERVICES INC
17	CIGNA CORP	53	PROASSURANCE CORP
18	CINCINNATI FINANCIAL CORP	54	PROGRESSIVE CORP-OHIO
19	CITIGROUP INC	55	PROTECTIVE LIFE CORP
20	DELPHI FINANCIAL GRP -CL A	56	PROVIDIAN FINANCIAL CORP
21	ENHANCE FINANCIAL SVCS GRP	57	PRUDENTIAL FINANCIAL INC
22	EVEREST RE GROUP LTD	58	RADIAN GROUP INC
23	FIDELITY NATIONAL FINL INC	59	RLI CORP
24	FOUNDATION HEALTH CORP	60	SAFECO CORP
25	FREMONT GENERAL CORP	61	SCPIE HOLDINGS INC
26	FRONTIER INSURANCE GROUP INC	62	SELECTIVE INS GROUP INC
27	GENERAL ELECTRIC CO	63	SIERRA HEALTH SERVICES
28	GENERAL MOTORS CORP	64	TRANSAMERICA CORP
29	GENERAL RE CORP	65	TRENWICK GROUP LTD
30	HANOVER INSURANCE GROUP INC	66	UICI
31	HARTFORD FINANCIAL SERVICES	67	UNITED FIRE & CAS CO
32	HCC INSURANCE HOLDINGS INC	68	UNITRIN INC
33	HORACE MANN EDUCATORS CORP	69	USF&G CORP
34	HSB GROUP INC	70	WELLPOINT INC
35	INFINITY PROPERTY & CAS CORP	71	XL CAPITAL LTD
36	JEFFERSON-PILOT CORP	72	ZENITH NATIONAL INSURANCE CP

APPENDIX B: FREQUENCY DISTRIBUTION OF STANDARD INDUSTRY CLASSIFICATION CODES

This appendix reports the frequency distribution of standard industry classification codes (SIC) of the 72 sample firms.

Primary SIC code	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3711	2	2.78	2	2.78
6020	1	1.39	3	4.17
6162	1	1.39	4	5.56
6199	1	1.39	5	6.94
6211	1	1.39	6	8.33
6311	10	13.89	16	22.22
6321	1	1.39	17	23.61
6324	6	8.33	23	31.94
6331	32	44.44	55	76.39
6351	11	15.28	66	91.67
6361	1	1.39	67	93.06
6399	1	1.39	68	94.44
6411	1	1.39	69	95.83
9997	3	4.17	72	100

APPENDIX C: BREAKDOWN OF THE 72 SAMPLE FIRMS BY SAMPLE YEAR

Year	Number of sample firms
1994	18
1995	21
1996	40
1997	44
1998	48
1999	45
2000	45
2001	42
2002	44
2003	43
2004	46
2005	46
2006	44
Total	526

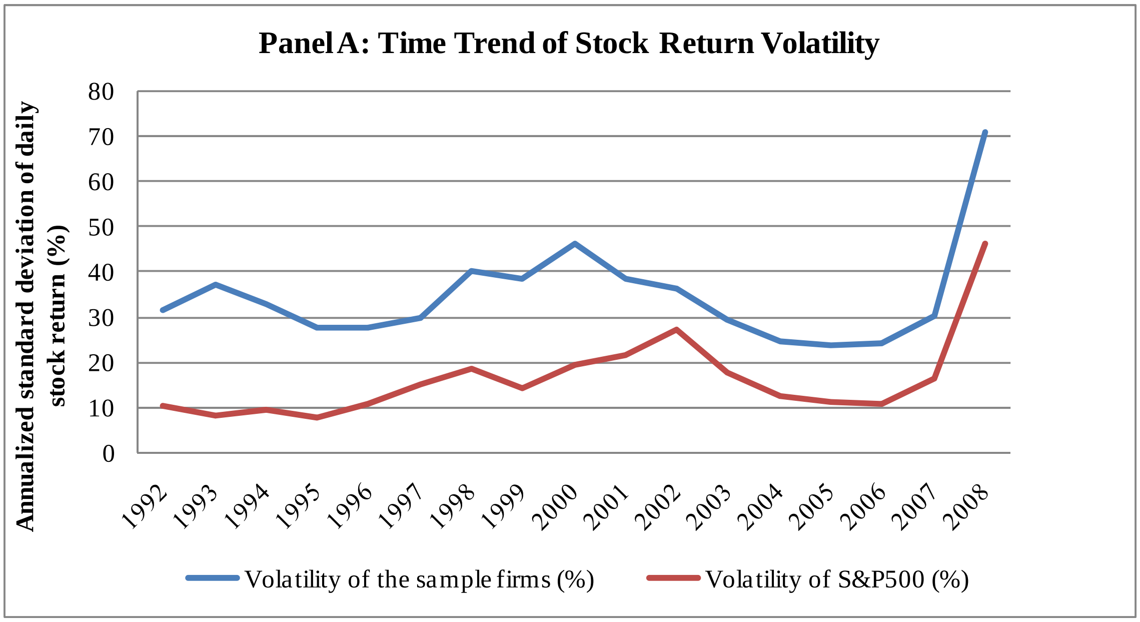
APPENDIX D: VARIABLE DESCRIPTION

This appendix lists the key variables used in the analysis reported in Chapter 2 of this dissertation and, where applicable, corresponding mnemonic, construction method and data sources.

Variable	**Mnemonic**	**Computation**	**Data Source**
Annualized stock return volatility	*Volt*	Annualized standard deviation of daily stock returns	CRSP
Firm age		Number of years that a firm has stock price data in CRSP	CRSP
Long-term debt			COMPUSTAT
Market-to-book ratio	*MTB*	[Closing stock price at the end of the fiscal year * number of shares outstanding + total assets – book value of common equity]/total assets. When shares outstanding is missing, we get the number from the daily stock file in CRSP	COMPUSTAT
Return on assets	*ROA*	Pretax income over total assets	COMPUSTAT
Total assets			COMPUSTAT
Number of business segments	*BUSSEG*	Number of different types of business segments	COMPUSTAT Segment
International operation dummy	*INTL*	A dummy that takes the value of one if a firm generates revenue from international operations (i.e. geographic segment type is designated as three in COMPUSTAT)	COMPUSTAT Segment
Institutional ownership	*Instit_own*		Compact Disclosure
Dummy variable proxy for the effect of the Sarbanes-Oxley Act and the introduction of the Enterprise Risk Model by A. B. Best	*BestSOX dummy*	Dummy variables that takes the value of one if 2002 and zero otherwise	
Dummy variable indicating S&P's initiative of incorporating ERM into their credit rating process for insurance firms	*S&P dummy*	Dummy variables that takes the value of one if 2005 and zero otherwise	
Return on the market-value of equity	*ROMVE*	Pretax income (PI) over market value of equity (prcc_f * csho)	COMPUSTAT
Return on the book-value of equity	*ROBVE*	Pretax income (PI) over book value of equity (CEQ)	COMPUSTAT

APPENDIX E: STOCK RETURN VOLATILITY

Panel A portrays the time trend of annualized standard deviations of daily stock returns for the public insurers in our sample. As benchmark, we also include the time trend of the same measure for S&P500 equally-weighted index.



Panel B provides summary statistics of annualized standard deviation of daily stock return for the public insurers in our sample partitioned by different segments of the sample period to highlight the extreme volatility in 2008.

Panel B:

	n	Mean	Median	Lower quartile	Upper quartile	Min	Max
1992-2007	2,551	39.74	32.50	24.29	45.50	9.66	395.98
2008	129	85.44	71.05	58.04	92.85	31.43	248.26
1992-2008	2,680	41.94	33.52	24.64	47.89	9.66	395.98

APPENDIX F: IMPACT OF ERM ADOPTION ON PROFITS SCALED BY RETURN VOLATILITY– ROBUSTNESS CHECK: USING ALTERNATIVE PROFITS MEASURES

This appendix reports the impact of ERM adoption on profits scaled by return volatility, using alternative measures of profits. We following the same specification as in Table 6, replacing return on assets with return on book value of equity (ROBVE) and return on market value of equity (ROMVE), respectively. The sample period is 1992-2007. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)
First-stage regression - Determinants of ERM adoption	
Dep. Var. = Prob(ERM=1)	
Log(total assets)	0.384 [a]
	(0.000)
%Institutional ownership	0.010 [a]
	(0.007)
Log(#Business segments)	-0.236 [c]
	(0.095)
International dummy	0.096
	(0.664)
Log(stock return volatility [t-1, t-3])	0.445 [b]
	(0.044)
Life insurer dummy	-0.486 [b]
	(0.049)
BestSOX dummy	0.295 [b]
	(0.045)
S&P dummy	1.254 [a]
	(0.000)
#obs	2,401
Pseudo R2	0.378
Wald chi2(8)	280.09
Prob > chi2	0.000

	ROBVE as profit	ROMVE as profit
Second-stage regression - Impact of ERM adoption on profit/volt		
Dep. Var. = ROA/Stock return volatility		
ERM firm	-0.094 [a]	-0.070 [a]
	(0.000)	(0.000)
ERM firm * ERM implementation dummy	0.167 [a]	0.115 [a]
	(0.000)	(0.000)
Inverse-mill ratio (selection harzard)	0.040 [b]	0.031 [c]
	(0.031)	(0.056)
Log(total assets)	0.056 [a]	0.028 [a]
	(0.000)	(0.000)
Log(firm age)	0.026 [a]	0.021 [a]
	(0.002)	(0.005)
Log(market-to-book ratio)	0.763 [a]	-0.109 [a]
	(0.000)	(0.001)
L/T debt over total assets	0.002 [c]	-0.001
	(0.078)	(0.132)
Life insurer dummy	0.001	0.015
	(0.969)	(0.393)
%Institutional ownership	0.003 [a]	0.003 [a]
	(0.000)	(0.000)
#Business segments	-0.032 [b]	-0.014
	(0.017)	(0.229)
International dummy	0.066 [a]	0.018
	(0.001)	(0.306)
#obs	2,400	2,400
Adj R-squared	0.132	0.042

Table 1: Sample Description

This table summarizes firm characteristics for our sample of 72 unique firms from 1994 to 2006. *%long-tail* is the percent of total net premium written in long-tail lines of insurance. We obtain net premium written and *Total admitted assets* from NAIC. *FTE* is the number of full-time employees in the Insurance Department over total number of domestic and foreign insurers of all types in a state. We obtain the FTE ratio from the 1997 Report of State Market Analysis for Property-Casualty Insurance, published by Coning & Co. *Firm age* is the number of years since firm's formation. We obtain firm age from various sources, including proxy statements, corporate website, Yahoo finance, etc. *MTB* is the market-to-book ratio. *ROA* is net income over total book assets. *Debt ratio* is long-term debt over total debt. *Payout ratio* is the sum of common and preferred stock dividends plus repurchases over earnings before interest and taxes. Data used for calculating *Market value of equity, MTB, ROA, debt ratio, and payout ratio* comes from COMPUSTAT and CRSP. *%outsider* is the percent of independent directors on the board of directors. *Board size* is the total number of directors on the board. *D&O ownership* is director and officer ownership. We collect data used to calculate *%outsider* and *Board size* from RiskMetric (formerly IRRC). We collect ownership data from firm proxy statements except for *Institutional ownership*, which comes from Thomson Financial. *%incentive pay* is the sum of CEO bonus and equity pay over total CEO pay. CEO pay data come from EXECUCOMP. *G-index is* the Gompers, Ishii, and Metrick index, which is the sum of 24 governance rules. We obtain the G-index from WRDS.

	n	Mean	Median	Std. Dev.	1st Quartile	3rd Quartile	Min	Max
Firm characteristics								
%long tail	526	53.02%	59.93%	29.56%	39.60%	71.02%	0.00%	100.00%
FTE	526	3.95	4.44	1.03	3.32	4.64	1.52	4.84
Total admitted assets (in millions)	526	$11,432	$3,893	$19,541	$1,112	$10,397	$5	$137,588
Market value of equity (in millions)	521	$22,820	$4,281	$62,781	$1,473	$11,593	$5	$508,329
Firm age	506	66.20	54.00	49.28	26.00	96.00	2.00	208.00
MTB	515	1.24	1.11	0.58	1.03	1.24	0.84	7.76
Stock return	515	16.67%	14.40%	35.53%	-3.42%	34.92%	-96.82%	222.99%
ROA	463	5.96%	4.49%	7.16%	2.51%	7.38%	-13.45%	62.22%
Debt ratio	521	8.51%	5.52%	9.90%	2.71%	10.24%	0.00%	67.52%
Payout ratio	454	16.26%	17.62%	253.78%	7.58%	36.22%	-4885.71%	1191.15%
CEO age	506	57.70	56.50	8.37	52.00	62.00	34.00	85.00
CEO tenure	506	11.42	7.00	11.12	3.00	18.00	0.00	45.00
Governance characteristics								
Board size	506	11.18	11.00	2.98	9.00	13.00	5.00	21.00
%independent directors on the board	506	63.98%	66.67%	18.88%	53.85%	80.00%	12.50%	92.86%
%firms with independent Chairman	506	33.60%	0.00%	60.18%	0.00%	100.00%	0.00%	200.00%
%firms with COB as Chairman	506	73.72%	100.00%	44.06%	0.00%	100.00%	0.00%	100.00%
%incentive pay	513	56.81%	58.09%	23.08%	47.27%	72.79%	0.00%	96.96%
G-index	521	8.47	8.00	2.63	7.00	10.00	3.00	17.00
Ownership structure								
CEO ownership	506	6.28%	0.90%	13.04%	0.27%	5.50%	0.00%	82.47%
D&O ownership	496	11.36%	4.67%	15.59%	1.51%	13.78%	0.00%	83.80%
Ownership by outside blockholders	496	12.74%	10.85%	12.05%	0.00%	19.55%	0.00%	67.90%
Institutional ownership	480	63.07%	64.73%	19.99%	49.56%	78.23%	0.26%	99.71%

Table 2: Founder Family Firms vs. Non-Founder Family Firms

This table compares firm characteristics of founder family firms to non-founder family firms. We define a firm as founder family firm, if the current CEO, Chairman of the Board, or their ancestors help found the company. The test statistics are based on one-tailed *t*-test assuming unequal variance. ** and * denote significance at the 1%, 5%, and 10% level, respectively.

	Founder firms			Non-founder firms				
	n	Mean	Median	n	Mean	Median	*Dif*	
%long tail	129	60.53%	64.08%	378	50.43%	56.85%	10.10%	***
Total admitted assets (in millions)	129	$13,752	$2,247	378	$11,029	$4,456	$2,723	
Debt ratio	128	6.72%	5.56%	376	9.02%	5.38%	-2.30%	***
Firm age	129	49.28	39.00	378	71.97	69.00	-22.69	***
CEO age	129	60.76	59.00	377	56.65	56.00	4.11	***
CEO tenure	129	19.95	20.00	377	8.50	6.00	11.45	***
Board size	129	9.65	9.00	377	11.70	12.00	-2.05	***
%independent directors on the board	129	46.16%	44.44%	377	70.08%	71.43%	-23.92%	***
%firms with independent Chairman	129	21.71%	0.00%	377	37.67%	0.00%	-15.96%	***
%incentive pay	128	47.04%	51.37%	376	60.09%	60.34%	-13.05%	***
G-index	129	7.29	7.00	378	8.88	9.00	-1.59	***
CEO ownership	129	19.35%	9.87%	377	1.80%	0.57%	17.55%	***

Table 3: Variable Definitions

Panel A of this table defines the key variables and provides the shorthand and predicted signs for these variables in the regressions. Panel B of this table defines other variables used in the regressions and the corresponding shorthand.

Panel A: Definition of key variables and their expected relations with the level of managerial discretion

Variables	Predicted signs	Variable definition
gov_control	+ (jointly)	Shorthand for the four governance control variables that collectively measure the strength of corporate governance system: *%outsider*, *b_size*, *indep_chair*, and *%incentive*. • *%outsider*: Percentage of independent directors on the board • *b_size*: Negative one multiplied by the log of the number of directors on the board • *indep_chair*: a categorical variable that takes the value of zero if the CEO is the Chairman of the Board, two if an independent director is the Chairman of the Board, and one otherwise • *%incentive*: the percent of CEO total pay that is bonus or equity
CEO_Own	+	Percent of equity ownership by the CEO
CEO_Own^2	-	Squared term of *CEO_Own*

Panel B: Definition of other variables, in alphabetical order

Variables	Variable definition
%Long Tail	Percent of net written premiums in long-tailed lines of insurance. Long-tailed lines includes accident, health and disability lines such as workers' compensation and lines of insurance that provide primarily liability coverage, such as automobile liability, general liability, and medical malpractice. Short-tail lines are comprised of the other lines (e.g., fire, homeowners' peril, and automobile physical damage).
CEO_tenure	Log of the number of years that a CEO has been in the current post
Debt ratio	Long-term debt over total debt
D&O_Own	Equity ownership by directors and Officers
Founder	Indicator variable for whether it is a founder family firm
firm_size	Log of total admitted assets
firm_age	Log of the number of years since inception
FTE	Full-time Equivalency ratio (FTE), which is the total number of full-time employees in insurance department over the total number of domestic and foreign insurers of all types in a state
G_index	Log of the Gompers, Ishii and Metrick (2003) G-index
Institutional ownership	Equity ownership by institutional investors
MTB	Market-to-book equity
MVE	Market value of Equity
Outsider blockholder ownership	Ownership by investors who are not affiliated with the management and own more than 5% of the equity.
Payout ratio	The sum of common and preferred stock dividends plus repurchases over earnings before interest and taxes
ROA	Net income over total book assets
RET	Stock return
RET_volability	annualized standard deviation of 12-month stock returns
SOX	An indicator variable for 2002, when the Sarbanes-Oxley Act (SOX) is enacted
Surety	Indicator variable for whether it is a surety firm

Table 4: Regression Results for Eq. 1: The Impact of Board Structure and CEO Compensation on Managerial Discretion, Controlling for CEO Ownership

This table reports regression results for an unbalanced panel of 72 firms over 13 years. Model I uses random-effects (RE) methods. Model II uses fixed-effects (FE) model. Model III uses the RE model with Huber-White robust standard errors. Model IV uses the RE model, excluding surety firms. Model IV estimates RE tobit model. Variables are as defined in Table 3. All models include a constant, year dummies, and a dummy for whether a firm belongs to a group. Coefficient estimates on these variables are not reported to conserve space. *p*-value are reported in parentheses below the coefficient estimates. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent variable: Log(%long tail)				
	I	II	III	IV	V
	RE	FE	RE, with robust std. error	RE, without surety firms	Tobit, with RE
(1) %outsider	-0.044 **	-0.040 *	-0.044 **	-0.052 **	-0.044 **
	(0.042)	(0.070)	(0.044)	(0.040)	(0.037)
(2) b_size	0.048 ***	0.040 **	0.048 ***	0.056 ***	0.048 ***
	(0.005)	(0.024)	(0.001)	(0.007)	(0.004)
(3) Indep_chair	0.002	0.002	0.002	0.002	0.002
	(0.761)	(0.784)	(0.744)	(0.743)	(0.755)
(4) %incentive	0.008	0.009	0.008	0.008	0.008
	(0.524)	(0.474)	(0.497)	(0.592)	(0.512)
(5) CEO_Own	0.018 ***	0.017 ***	0.018 ***	0.021 ***	0.019 ***
	(0.001)	(0.002)	(0.001)	(0.000)	(0.000)
(6) CEO_Own^2	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
	(0.001)	(0.003)	(0.004)	(0.001)	(0.001)
(7) CEO_Own*Founder	-0.022 ***	-0.020 ***	-0.022 ***	-0.024 ***	-0.022 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(8) (CEO_Own^2)*Founder	0.001 ***	0.001 ***	0.001 ***	0.001 ***	0.001 ***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.000)
Founder	0.057		0.057	0.056	0.057
	(0.212)		(0.181)	(0.273)	(0.199)
Firm_size	0.007 **	0.007 **	0.007	0.008 **	0.007 **
	(0.021)	(0.030)	(0.373)	(0.019)	(0.017)
FTE	0.007	0.009 *	0.007	0.007	0.007
	(0.124)	(0.064)	(0.196)	(0.138)	(0.115)
Surety	-0.475 ***		-0.475 ***		-0.475 ***
	(0.000)		(0.000)		(0.000)
Sum of beta coeff. of (1), (2), (3) and (4)	0.039	0.032	0.039	0.043	0.039
Wald test for joint significance					
p-value for (1), (2), (3) and (4)	(0.028) **	(0.101) *	(0.021) **	(0.028) **	(0.022) **
p-value for (5) and (6)	(0.003) ***	(0.009) ***	(0.002) ***	(0.002) ***	(0.002) ***
p-value for (5), (6), (7) and (8)	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***
Wald Chi-square value	142.59	F(22,364)= 3.44	438.77	71.76	150.96
#obs	455	455	455	395	455
R-squared	0.543	0.000	0.543	0.023	N/A

Table 5: Impact of Board Structure and CEO Compensation on Managerial Discretion, Controlling for Other Governance Mechanisms

This table reports regression results from estimating RE models. Variables are as defined in Table 3. All models include a constant, year dummies, and a dummy for whether a firm belongs to a group. Coefficient estimates on these variables are not reported to conserve space. For models that include payout ratio, we restrict the sample to have a payout ratio between zero and one to avoid outliers (about 1% truncation at either tail). (The results retain if this restriction is lifted.) *p*-value are reported in parentheses below the coefficient estimates. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent variable: Log(%long tail)				
	I	II	III	IV	V
	RE	RE	RE	RE	RE
(1) %outsider$_{t-1}$	-0.045 **	-0.035 *	-0.040 *	-0.042 **	-0.047 **
	(0.037)	(0.097)	(0.058)	(0.044)	(0.023)
(2) b_size$_{t-1}$	0.050 ***	0.045 ***	0.059 ***	0.051 ***	0.054 ***
	(0.004)	(0.008)	(0.001)	(0.002)	(0.001)
(3) Indep_chair$_{t-1}$	0.002	-0.003	-0.003	-0.005	-0.005
	(0.726)	(0.596)	(0.657)	(0.415)	(0.305)
(4) %incentive$_{t-1}$	0.006	0.005	0.005	0.018	0.016
	(0.637)	(0.696)	(0.685)	(0.194)	(0.240)
(5) CEO_Own$_{t-1}$	0.018 ***	0.016 ***	0.017 ***	0.021 ***	0.020 ***
	(0.001)	(0.003)	(0.001)	(0.000)	(0.000)
(6) CEO_Own$_{t-1}$^2	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
	(0.001)	(0.006)	(0.002)	(0.000)	(0.000)
(7) CEO_Own$_{t-1}$*Founder	-0.022 ***	-0.019 ***	-0.021 ***	-0.025 ***	-0.024 ***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
(8) (CEO_Own$_{t-1}$^2)*Founder	0.001 ***	0.001 ***	0.001 ***	0.002 ***	0.001 ***
	(0.001)	(0.003)	(0.001)	(0.000)	(0.000)
Founder	0.072	0.057	0.050	0.055	0.051
	(0.121)	(0.203)	(0.271)	(0.257)	(0.340)
Firm_size	0.007 **	0.011 ***	0.010 ***	0.007 **	0.007 *
	(0.028)	(0.000)	(0.001)	(0.052)	(0.066)
FTE	0.007	0.004	0.003	0.003	0.005
	(0.135)	(0.425)	(0.453)	(0.533)	(0.321)
Surety	-0.474 ***	-0.468 ***	-0.466 ***	-0.472 ***	-0.456 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
G_index	0.035				0.022
	(0.108)				(0.319)
Outside blockholder ownership		0.001 ***			0.001 **
		(0.009)			(0.024)
Debt ratio			-0.096 **		-0.119 ***
			(0.041)		(0.014)
Payout ratio				-0.016	-0.017
				(0.167)	(0.126)
Sum of beta coeff. of (1), (2), (3) and (4)	0.039	0.026	0.041	0.037	0.032
Wald test for joint significance					
p -value for (1), (2), (3) and (4)	(0.021) **	(0.053) **	(0.008) ***	(0.008) ***	(0.003) ***
p -value for (5) and (6)	(0.003) ***	(0.011) ***	(0.004) ***	(0.000) ***	(0.002) ***
p -value for (5), (6), (7) and (8)	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***	(0.000) ***
Wald Chi-square value	145.78	158.12	152.89	142.34	147.47
#obs	455	432	451	365	352
R-squared	0.5497	0.5488	0.5444	0.5839	0.5760

Table 6: Estimation Results of Eq. 1, Using Instrumental Variables

This table reports estimation results of Eq. 1, using 2SLS. The four IVs used in the first-stage regression are the log of CEO tenure (*CEO_tenure*), the log of firm age (*firm_age*), the market-to-book ratio (*MTB*), and institutional ownership. Please refer to Table 3 for more details on variable definitions. All models include a constant, year dummies, and a dummy for whether a firm belongs to a group. Coefficient estimates on these variables are not reported to conserve space. *p*-value are reported in parentheses below the coefficient estimates. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

	IV (2SLS) Estimation				
	2nd stage regresion	1st stage regression			
	I	II	III	IV	V
	Log(%long tail)	%outsider$_{t-1}$	b_size$_{t-1}$	Indep_chair$_{t-1}$	%incentive$_{t-1}$
(1) %outsider$_{t-1}$	-0.581 **				
	(0.026)				
(2) b_size$_{t-1}$	0.503 ***				
	(0.007)				
(3) Indep_chair$_{t-1}$	-0.038				
	(0.438)				
(4) %incentive$_{t-1}$	0.218				
	(0.285)				
(5) CEO_Own$_{t-1}$	0.013	-0.017 **	0.007	0.073 **	-0.013
	(0.313)	(0.053)	(0.644)	(0.030)	(0.287)
(6) CEO_Own$_{t-1}$^2	-0.001 *	0.002 ***	0.001	-0.005 **	0.001
	(0.104)	(0.007)	(0.243)	(0.029)	(0.164)
(7) CEO_Own$_{t-1}$*Founder	-0.017	0.023 ***	0.020	-0.070 **	-0.006
	(0.162)	(0.009)	(0.202)	(0.042)	(0.635)
(8) (CEO_Own$_{t-1}$^2)*Founder	0.001	-0.002 ***	-0.001	0.005 **	-0.001
	(0.110)	(0.004)	(0.151)	(0.031)	(0.266)
Founder	-0.056	-0.230 ***	-0.037	-0.007	0.096 **
	(0.497)	(0.000)	(0.471)	(0.949)	(0.026)
Firm_size	0.023 ***	-0.013 ***	-0.026 ***	-0.032 *	0.005
	(0.003)	(0.005)	(0.001)	(0.067)	(0.444)
FTE	0.005	0.001	-0.024 *	-0.007	0.004
	(0.693)	(0.882)	(0.060)	(0.799)	(0.726)
Surety	-0.493 ***	0.005	0.067	0.066	-0.023
	(0.000)	(0.850)	(0.145)	(0.524)	(0.544)
CEO_tenure$_{t-1}$		-0.015 *	-0.020	-0.270 ***	-0.032 ***
		(0.085)	(0.209)	(0.000)	(0.014)
Firm age$_{t-1}$		-0.001	-0.063 ***	-0.053	-0.025 *
		(0.927)	(0.000)	(0.152)	(0.068)
MTB$_{t-1}$		-0.101 **	-0.264 ***	0.345 **	0.252 ***
		(0.020)	(0.001)	(0.042)	(0.000)
Institutional ownership$_{t-1}$		0.323 ***	0.214 ***	-0.389 **	0.132 **
		(0.000)	(0.007)	(0.027)	(0.044)
Sum of beta coeff. of (1), (2), (3) and (4)	0.281				
Wald test for joint significance					
p -value for (1), (2), (3) and (4)	(0.100) *				
p -value for (5) and (6)	(0.091) *				
p -value for (5), (6), (7) and (8)	(0.000) ***				
F-test for excluded instruments		14.76 ***	8.60 ***	17.48 ***	5.20 ***
F value	14.48 ***	18.54 ***	9.78 ***	5.18 ***	7.91 ***
#obs	415	415	415	415	415

Table 7: Simultaneous-Equations Estimation Results

This table reports regression results from estimating simultaneous-equations model with 3SLS. All models include a constant. In addition to the constant, Model I also include year dummies and a dummy for whether a firm belongs to a group. Model IV also include year dummies. Coefficient estimates on the constant, year dummies, and group dummy are not reported to conserve space. Variables are as defined in Table 3. *p*-value are reported in parentheses below the coefficient estimates. ***, ** and * denote significance at the 1%, 5%, and 10% level, respectively.

	Simultaneous-equations estimation (3SLS)			
	I	II	III	IV
	Log(%long tail)	%outsider	b_size	%incentive
Log(%long tail)		-0.017	-0.230 ***	-0.353 ***
		(0.748)	(0.005)	(0.000)
(1) %outsider	-0.354 **		1.088 ***	0.144
	(0.020)		(0.000)	(0.472)
(2) b_size	0.459 ***	0.401 ***		-0.763 ***
	(0.000)	(0.000)		(0.000)
(3) Indep_chair_{t-1}	0.038 ***	0.050 ***	-0.100 ***	-0.067 ***
	(0.008)	(0.000)	(0.000)	(0.003)
(4) %incentive	0.346 ***	-0.006	-0.514 ***	
	(0.001)	(0.943)	(0.000)	
(5) CEO_Own	0.015 *			-0.001
	(0.087)			(0.430)
(6) CEO_Own^2	-0.001 **			
	(0.034)			
(7) CEO_Own*Founder	-0.014			
	(0.119)			
(8) (CEO_Own^2)*Founder	0.001 **			
	(0.050)			
Founder	-0.017	-0.228 ***	0.281 ***	0.035
	(0.733)	(0.000)	(0.000)	(0.554)
Firm_size	0.027 ***			
	(0.000)			
FTE	-0.014 *			
	(0.069)			
Surety	-0.529 ***			
	(0.000)			
ROA		-0.067		
		(0.593)		
CEO_tenure		-0.008		
		(0.252)		
SOX dummy		0.092 ***	-0.107 ***	
		(0.000)	(0.002)	
D&O_Own		-0.004 ***	0.004 ***	
		(0.000)	(0.000)	
Log(MVE)		0.010	-0.051 ***	-0.048 ***
		(0.136)	(0.000)	(0.000)
Firm_age			-0.004	
			(0.751)	
MTB				0.037 **
				(0.069)
RET				0.047
				(0.124)
RET_volatility				0.361
				(0.136)
Sum of beta coeff. of (1), (2), (3) and (4)	0.776			
Wald test for joint significance				
p-value for (1), (2), (3) and (4)	(0.000) ***			
p-value for (5) and (6)	(0.091) *			
p-value for (5), (6), (7) and (8)	(0.000) ***			
Wald Chi-square value	633.37	403.98	239.74	133.43
#obs	389	389	389	389

Table 8: Timelines of the Sample Firms

This table reports the number of sample firms in this study by year from 1992 to 2008. We also report the number of firms that adopt ERM (ERM firms) during our sample period and their percentage relative to the total number of sample firms. To be included in the sample, a firm needs to be a US publicly-traded insurer in the merged CRSP/COMPUSTAT database that has data on total assets, stock prices and institutional ownership.

	Total firms	ERM firms	%ERM firms
1992	120	0	0%
1993	195	0	0%
1994	202	0	0%
1995	192	1	1%
1996	191	1	1%
1997	181	1	1%
1998	171	1	1%
1999	155	3	2%
2000	145	3	2%
2001	142	5	4%
2002	136	13	10%
2003	139	24	17%
2004	141	30	21%
2005	147	39	27%
2006	150	50	33%
2007	144	54	38%
2008	129	55	43%
#Unique firms	354	69	19%
#Firms years	2,680	280	10%

Table 9: Descriptive Statistics

This table reports summary statistics of key operating variable for the sample firms. Panel A reports the descriptive statistics partitioned by whether a firm has ever implemented ERM between 1992 and 2007 (ERM firms) or otherwise non-ERM firms. Panel B reports the descriptive statistics partitioned by whether the sample firm exhibits stock return volatility greater than the sample median, which is 33.516%.

Panel A: Partition the sample by whether a firm has ever implemented ERM between 1992-2007

	n	Mean	Median	Min	Max
ERM firms					
Annualized stock return volatility (%)	716	33.23	28.73	12.55	282.28
Total assets (in millions)	716	81,862	10,137	41	1,916,658
Market value of equity	716	11,067	3,083	3	228,227
Firm age	716	14	11	0	48
#Business segments	716	2.80	3.00	0.00	10.00
Whether a firm has gobal operation (%)	716	0.21	0.00	0.00	1.00
MTB	716	1.09	1.05	0.49	2.15
L/T debt over total assets (%)	716	5.93	3.65	0.00	64.88
ROA (%)	715	3.10	2.48	-25.20	21.84
Stock return (%)	712	13.35	12.54	-80.67	233.33
Institutional ownership (%)	716	52.77	56.36	0.00	100.00
Non-ERM firms					
Annualized stock return volatility (%)	1,835	42.28	34.38	9.66	395.98
Total assets (in millions)	1,835	9,070	1,201	4	458,709
Market value of equity	1,835	1,879	355	1	144,150
Firm age	1,835	13	11	0	68
#Business segments	1,835	2.49	2.00	0.00	10.00
Whether a firm has gobal operation (%)	1,835	0.14	0.00	0.00	1.00
MTB	1,835	1.13	1.04	0.65	8.57
L/T debt over total assets (%)	1,835	4.99	3.36	0.00	50.55
ROA (%)	1,834	3.10	2.84	-289.36	56.78
Stock return (%)	1,807	13.27	9.91	-97.35	400.00
Institutional ownership (%)	1,835	39.03	35.17	0.00	100.00

Panel A.T-test: This table reports a two-sample means test on the descriptive statistics reported in Table A. The data are partitioned by whether a firm has ever implemented ERM between 1992 and 2007 (ERM firms) or otherwise non-ERM firms. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

t-test (1992-2007)

	ERM firms		Non-ERM firms		*dif*	
	n	Mean	n	Mean		
Annualized stock return volatility (%)	716	33.23	1,835	42.28	*-9.04*	a
Total assets (in millions)	716	81,862	1,835	9,070	*72,792*	a
Market value of equity	716	11,067	1,835	1,879	*9,188*	a
Firm age	716	14	1,835	13	*1.10*	b
#Business segments	716	2.80	1,835	2.49	*0.30*	a
Whether a firm has gobal operation (%)	716	0.21	1,835	0.14	*0.08*	a
MTB	716	1.09	1,835	1.13	*-0.04*	a
L/T debt over total assets (%)	716	5.93	1,835	4.99	*0.94*	a
ROA (%)	715	3.10	1,834	3.10	*0.00*	
ROMVE (%)	715	6.85	1,834	-16.23	*23.09*	
ROBVE (%)	715	11.84	1,834	10.46	*1.38*	
Stock return (%)	712	13.35	1,807	13.27	*0.08*	a
Institutional ownership (%)	716	52.77	1,835	39.03	*13.75*	a

Panel B: Partition the sample by median stock return volatility (32.496%)

	n	Mean	Median	Min	Max
Low volatility firms					
Annualized stock return volatility (%)	1,275	23.96	24.29	9.66	32.48
Total assets (in millions)	1,275	41,820	4,722	85	1,916,658
Market value of equity	1,275	6,286	1,467	23	207,431
Firm age	1,275	15	13	0	68
#Business segments	1,275	2.77	3.00	0.00	10.00
Whether a firm has gobal operation (%)	1,275	0.19	0.00	0.00	1.00
MTB	1,275	1.11	1.06	0.71	4.77
L/T debt over total assets (%)	1,275	5.37	3.98	0.00	64.88
ROA (%)	1,275	4.01	3.13	-22.44	42.62
Stock return (%)	1,259	17.23	15.40	-47.31	120.41
Institutional ownership (%)	1,275	52.74	54.48	0.00	100.00
High volatility firms					
Annualized stock return volatility (%)	1,276	55.50	47.89	33.52	395.98
Total assets (in millions)	1,276	17,191	765	4	1,179,017
Market value of equity	1,276	2,631	195	1	228,227
Firm age	1,276	12	9	0	63
#Business segments	1,276	2.39	2.00	0.00	10.00
Whether a firm has gobal operation (%)	1,276	0.13	0.00	0.00	1.00
MTB	1,276	1.12	1.02	0.49	8.57
L/T debt over total assets (%)	1,276	5.13	2.82	0.00	50.55
ROA (%)	1,274	2.19	2.19	-289.36	56.78
Stock return (%)	1,260	9.35	3.25	-97.35	400.00
Institutional ownership (%)	1,276	33.04	27.11	0.00	100.00

Table 10: Impact of ERM Adoption on Firm Risk

This table reports the regression results following a two-stage Heckman procedure. Column (1) reports the regression results from estimating a *Probit* model. We then use the predicted probability from the first stage to compute the inverse Mills ratio, which is the probability density function of the predicted probability over the cumulative probability function of the predicted probability. Column (2) and (3) reports the estimation results from the second-stage OLS regressions. In parenthesis are *p*-values controlling for firm-level clustering. The sample period is 1992-2007. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)
First-stage regression - Determinants of ERM adoption	
Dep. Var. = Prob(ERM=1)	
Log(total assets)	0.384 [a]
	(0.000)
%Institutional ownership	0.010 [a]
	(0.007)
Log(#Business segments)	-0.236 [c]
	(0.095)
International dummy	0.096
	(0.664)
Log(stock return volatility [t-1, t-3])	0.445 [b]
	(0.044)
Life insurer dummy	-0.486 [b]
	(0.049)
Best SOX dummy	0.295 [b]
	(0.045)
S&P dummy	1.254 [a]
	(0.000)
#obs	2,401
Pseudo R2	0.378
Wald chi2(8)	280.09
Prob > chi2	0.000

	(2)	(3)
Second-stage regression - Impact of ERM adoption on volatility		
Dep. Var. = Log(stock return volatility [t])		
ERM firm	0.089 [b]	0.082
	(0.042)	(0.109)
ERM firm * ERM implementation dummy	-0.149 [a]	-0.096 [b]
	(0.001)	(0.030)
Inverse Mills ratio (selection harzard)	-0.191 [a]	0.022
	(0.000)	(0.398)
Log(total assets)	-0.170 [a]	-0.129 [a]
	(0.000)	(0.000)
Log(firm age)	-0.045 [a]	-0.047 [a]
	(0.004)	(0.006)
Log(market-to-book ratio)	-0.162 [c]	-0.249 [b]
	(0.071)	(0.022)
L/T debt over total assets	0.007 [a]	0.006 [a]
	(0.000)	(0.015)
Life insurer dummy	0.188 [a]	0.179 [a]
	(0.000)	(0.000)
Log(S&P500 volatility [t])	0.388 [a]	0.389 [a]
	(0.000)	(0.000)
%Institutional ownership	-0.007 [a]	
	(0.000)	
Log(#Business segments)	0.038	
	(0.170)	
International dummy	0.008	
	(0.804)	
#obs	2,401	2,401
Adj R-squared	0.429	0.353
Model F-value	42.37	42.23
Prob > F	0.000	0.000

Table 11: Impact of ERM Adoption on Firm Risk – Robustness Check: Incorporating 2008

This table reports the regression results following a two-stage Heckman procedure. Column (1) reports the regression results from estimating a *Probit* model. We then use the predicted probability from the first stage to compute the inverse Mills ratio, which is the probability density function of the predicted probability over the cumulative probability function of the predicted probability. Column (2) and (3) reports the regression results from the second-stage OLS estimation. We run the regressions using two sample sizes: 1) firm-year observations from 1992 to 2008 that have annualized standard deviation less than 152% (i.e. 1.5% truncation at the top) and 2) firm-year observations from 1992 to 2008 that have annualized standard deviation less than 115% (i.e. 3% truncation at the top). In parenthesis are *p*-values controlling for firm-level clustering. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)	(2)
	volt < 152%	*volt* < 115%
First-stage regression - Determinants of ERM adoption		
Dep. Var. = Prob(ERM=1)		
Log(total assets)	0.387 [a]	0.391 [a]
	(0.000)	(0.000)
%Institutional ownership	0.009 [a]	0.009 [a]
	(0.013)	(0.009)
Log(#Business segments)	-0.234 [c]	-0.237 [c]
	(0.081)	(0.078)
International dummy	0.017	0.026
	(0.937)	(0.907)
Log(stock return volatility [t-1, t-3])	0.377 [c]	0.372 [c]
	(0.091)	(0.100)
Life insurer dummy	-0.506 [b]	-0.508 [b]
	(0.038)	(0.039)
Best SOX dummy	0.296 [b]	0.307 [b]
	(0.045)	(0.039)
S&P dummy	1.294 [a]	1.282 [a]
	(0.000)	(0.000)
#obs	2,488	2,450
Pseudo R2	0.385	0.383
LR chi2(5)	290.17	286.83
Prob > chi2	0.000	0.000

	(3)	(4)
	volt < 152%	*volt* < 115%
Second-stage regression - Impact of ERM adoption on volatility		
Dep. Var. = Log(stock return volatility [t])		
ERM firm	0.062	0.053
	(0.109)	(0.135)
ERM firm * ERM implementation dummy	-0.061 [c]	-0.061 [c]
	(0.089)	(0.078)
Inverse Mills ratio (selection harzard)	-0.148 [a]	-0.137 [a]
	(0.000)	(0.000)
Log(total assets)	-0.148 [a]	-0.138 [a]
	(0.000)	(0.000)
Log(firm age)	-0.039 [a]	-0.040 [a]
	(0.009)	(0.005)
Log(market-to-book ratio)	-0.147 [c]	-0.101
	(0.079)	(0.206)
L/T debt over total assets	0.006 [a]	0.006 [a]
	(0.001)	(0.001)
Life insurer dummy	0.162 [a]	0.162 [a]
	(0.000)	(0.000)
Log(S&P500 volatility [t])	0.472 [a]	0.469 [a]
	(0.000)	(0.000)
%Institutional ownership	-0.006 [a]	-0.005 [a]
	(0.000)	(0.000)
Log(#Business segments)	0.025	0.033
	(0.343)	(0.187)
International dummy	0.017	0.019
	(0.548)	(0.494)
#obs	2,488	2,450
Adj R-squared	0.439	0.429
Model F-value	66.00	67.24
Prob > F	0.000	0.000

Table 12: Impact of ERM on Firm Risk over Time

This table reports the regression results from the second stage Heckman procedure. We do not report the results from the first-stage estimation to conserve space. (The first-stage regression results can be found in Table 3.) In parenthesis are *p*-values controlling for firm-level clustering. The sample period is 1992-2007. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Second-stage regression - Impact of ERM adoption on volatility				
Dep. Var. = Log(stock return volatility [t])				
ERM firm	0.089 [b]	0.089 [b]	0.089 [b]	0.089 [b]
	(0.042)	(0.042)	(0.042)	(0.042)
ERM firm * ERM implementation (year 0)	-0.130 [a]	-0.131 [a]	-0.131 [a]	-0.131 [a]
	(0.010)	(0.010)	(0.010)	(0.010)
ERM firm * ERM implemention (year > =1)	-0.156 [a]			
	(0.001)			
ERM firm * ERM implemention (year 1)		-0.117 [a]	-0.117 [a]	-0.117 [a]
		(0.010)	(0.010)	(0.010)
ERM firm * ERM implemention (year >= 2)		-0.173 [a]		
		(0.001)		
ERM firm * ERM implemention (year 2)			-0.192 [a]	-0.192 [a]
			(0.001)	(0.001)
ERM firm * ERM implemention (year >= 3)			-0.162 [a]	
			(0.009)	
ERM firm * ERM implemention (year 3)				-0.176 [a]
				(0.011)
ERM firm * ERM implemention (year >= 4)				-0.153 [b]
				(0.037)
Inverse-mill ratio (selection harzard)	-0.192 [a]	-0.192 [a]	-0.192 [a]	-0.192 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
Log(total assets)	-0.170 [a]	-0.170 [a]	-0.170 [a]	-0.170 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
Log(firm age)	-0.045 [a]	-0.045 [a]	-0.045 [a]	-0.046 [a]
	(0.004)	(0.004)	(0.004)	(0.004)
Log(market-to-book ratio)	-0.162 [c]	-0.162 [c]	-0.162 [c]	-0.162 [c]
	(0.071)	(0.071)	(0.071)	(0.072)
L/T debt over total assets	0.007 [a]	0.007 [a]	0.007 [a]	0.007 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
Life insurer dummy	0.188 [a]	0.189 [a]	0.189 [a]	0.189 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
Log(S&P500 volatility [t])	0.387 [a]	0.387 [a]	0.387 [a]	0.387 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
%Institutional ownership	-0.007 [a]	-0.007 [a]	-0.007 [a]	-0.007 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
#Business segments	0.038	0.038	0.038	0.038
	(0.171)	(0.171)	(0.171)	(0.172)
International dummy	0.008	0.007	0.007	0.007
	(0.807)	(0.815)	(0.813)	(0.817)
#obs	2,401	2,401	2,401	2,401
Adj R-squared	0.429	0.430	0.430	0.430
Model F-value	40.15	37.52	35.01	32.88
Prob > F	0.000	0.000	0.000	0.000

Table 13: Impact of ERM Adoption on ROA Scaled by Return Volatility

This table reports the regression results from estimating Eq. 4, which is a two-stage Heckman procedure. Column (1) reports the regression results from estimating a *Probit* model. We then use the predicted probability from the first stage to compute the inverse Mills ratio, which is the probability density function of the predicted probability over the cumulative probability function of the predicted probability. Column (2) reports the estimation results from the second-stage median regression. In parenthesis are *p*-values. The sample period is 1992-2007. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)
First-stage regression - Determinants of ERM adoption	
Dep. Var. = Prob(ERM=1)	
Log(total assets)	0.384 [a]
	(0.000)
%Institutional ownership	0.010 [a]
	(0.007)
Log(#Business segments)	-0.236 [c]
	(0.095)
International dummy	0.096
	(0.664)
Log(stock return volatility [t-1, t-3])	0.445 [b]
	(0.044)
Life insurer dummy	-0.486 [b]
	(0.049)
BestSOX dummy	0.295 [b]
	(0.045)
S&P dummy	1.254 [a]
	(0.000)
#obs	2,401
Pseudo R2	0.378
Wald chi2(8)	280.09
Prob > chi2	0.000

	(2)
Second-stage regression - Impact of ERM adoption on ROA/volt	
Dep. Var. = ROA/Stock return volatility	
ERM firm	-0.007
	(0.165)
ERM firm * ERM implementation dummy	0.020 [a]
	(0.009)
Inverse-mill ratio (selection harzard)	0.013 [a]
	(0.009)
Log(total assets)	0.000
	(0.969)
Log(firm age)	0.009 [a]
	(0.000)
Log(market-to-book ratio)	0.398 [a]
	(0.000)
L/T debt over total assets	0.000
	(0.542)
Life insurer dummy	-0.035 [a]
	(0.000)
%Institutional ownership	0.001 [a]
	(0.000)
#Business segments	-0.015 [a]
	(0.000)
International dummy	0.007
	(0.199)
#obs	2,400
Adj R-squared	0.194

Table 14: Impact of ERM Adoption on ROA Scaled by Return Volatility over Time

This table reports the regression results from the second stage Heckman procedure. We do not report the results from the first-stage estimation to conserve space. Columns (1) through (4) report the estimation results from the second-stage median regression. In parenthesis are *p*-values. The sample period is 1992-2007. [a, b, c] indicates significance level at 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Second-stage regression - Impact of ERM adoption on firm profit/firm risk				
Dep. Var. = ROA/Volt				
ERM firm	-0.006	-0.007	-0.007	-0.007
	(0.186)	(0.160)	(0.128)	(0.124)
ERM firm * ERM implementation (year 0)	0.020	0.020 [c]	0.021 [c]	0.021 [c]
	(0.112)	(0.091)	(0.085)	(0.081)
ERM firm * ERM implemention (year > =1)	0.018 [b]			
	(0.028)			
ERM firm * ERM implemention (year 1)		0.013	0.013	0.013
		(0.297)	(0.293)	(0.284)
ERM firm * ERM implemention (year >= 2)		0.024 [a]		
		(0.009)		
ERM firm * ERM implemention (year 2)			0.017	0.017
			(0.216)	(0.225)
ERM firm * ERM implemention (year >= 3)			0.025 [b]	
			(0.016)	
ERM firm * ERM implemention (year 3)				0.027 [c]
				(0.084)
ERM firm * ERM implemention (year >= 4)				0.022 [c]
				(0.096)
Inverse-mill ratio (selection harzard)	0.012 [a]	0.013 [a]	0.013 [a]	0.013 [a]
	(0.010)	(0.006)	(0.005)	(0.004)
Log(total assets)	0.000	0.000	0.000	0.001
	(0.995)	(0.934)	(0.840)	(0.772)
Log(firm age)	0.009 [a]	0.009 [a]	0.009 [a]	0.009 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
Log(market-to-book ratio)	0.397 [a]	0.399 [a]	0.398 [a]	0.400 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
L/T debt over total assets	0.000	0.000	0.000	0.000
	(0.624)	(0.568)	(0.495)	(0.470)
Life insurer dummy	-0.035 [a]	-0.035 [a]	-0.036 [a]	-0.036 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
%Institutional ownership	0.001 [a]	0.001 [a]	0.001 [a]	0.001 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
#Business segments	-0.015 [a]	-0.014 [a]	-0.014 [a]	-0.014 [a]
	(0.000)	(0.000)	(0.000)	(0.000)
International dummy	0.006	0.006	0.006	0.006
	(0.211)	(0.194)	(0.223)	(0.203)
#obs	2,400	2,400	2,400	2,400
Adj R-squared	0.194	0.195	0.195	0.195

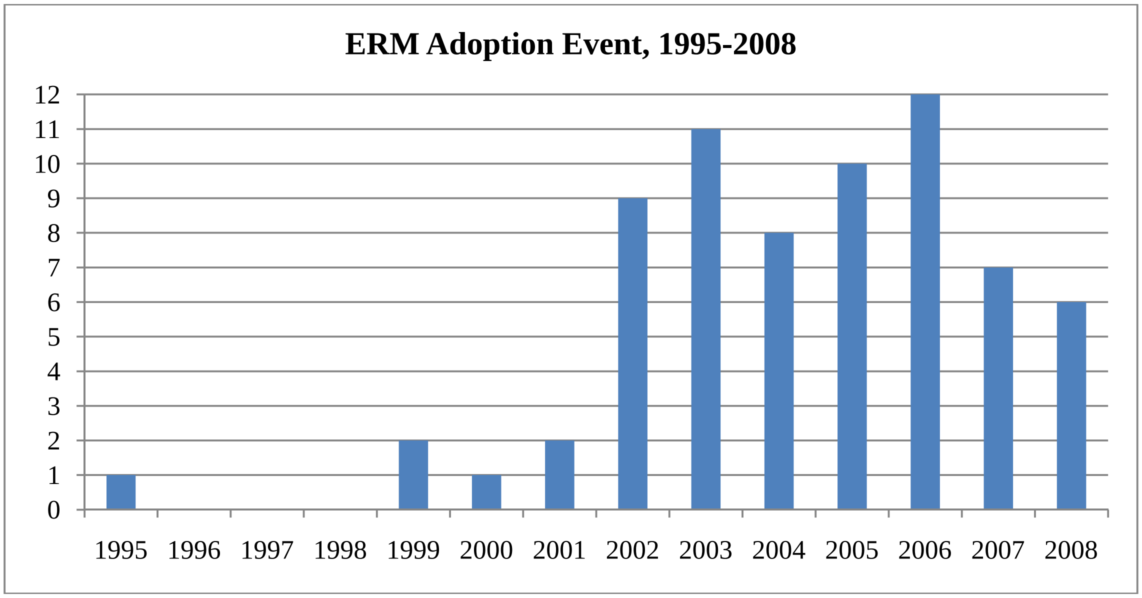


Figure 1: ERM Adoption Events from 1995 to 2008

Figure 1 portrays 69 unqiue ERM adoption events for US public insurers from 1995 to 2008. We search for ERM adoption events using the sample of publicly-traded insurance companies in the US in the merged CRSP/COMPUSTAT database that have data on total assets, stock prices and institutional ownership from 1990 to 2008. We search Factiva, LexisNexis, Thomson and Edgar, using key words of “Chief Risk Officer,” “Enterprise Risk Management,” “Enterprise Risk Officer,” “Strategic Risk Management,” “Integrated Risk Management,” “Holistic Risk Management,” and “Consolidated Risk Management.” Once we find an article using either of these key words, we then read the article carefully to determine whether it documents an ERM adoption event. We record the earliest adoption date as our event date. This search process yields 69 unique firms that adopted ERM between 1995 and 2008.

Academic journal article Journal of Risk and Insurance. Managerial Discretion and Corporate Governance in Publicly Traded Firms: Evidence from the Property-Liability Insurance Industry. By Miller, Steve M. Read preview. Academic journal article Journal of Risk and Insurance.Â We study the incremental impact of corporate governance in mitigating managerial discretion, controlling for incentive alignment of managerial ownership. We extend the managerial discretion hypothesis to predict that for firms with the same set of governance tools, those that utilize governance tools more stringently to control agency costs will command greater contracting cost advantages, leading them to specialize in business with greater managerial discretion.