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美國產險業 CEO 更迭與再保險需求

CEO Turnover and Reinsurance Demand in the U.S. Property Casualty Insurance Industry

何佳玲 / 淡江大學保險學系助理教授
Chia-Ling Ho / Assistant Professor, Department of Insurance, Tamkang University

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摘 要

本文探討美國產險業 CEO 更迭對再保險需求的影響。實證結果顯示，有 CEO 更迭的保險公司在 CEO 更迭後更有可能增加再保險的需求。本文進一步分析，在 CEO 更迭後，非例行性（強迫性）CEO 更迭較沒有更迭的保險公司更有可能增加再保險的需求，但例行性（任意性）CEO 更迭較沒有更迭的保險公司則不太會改變對再保險的需求。一個可能的解釋是，來自非例行性（強迫性）更迭的新任 CEO 的保險公司更有可能增加再保險需求是為穩定盈餘與減少風險以確保新任 CEO 的工作安全性。此外，在 CEO 更迭後，相互保險的組織型態與 CEO 更迭的交乘項與再保險需求為負相關。研究結果顯示，在 2002 年沙賓法案通過後，保險公司 CEO 更迭與再保險需求無關。本研究結果指出 CEO 更迭顯著影響再保險需求。

【關鍵字】再保險需求、CEO 更迭、非例行性 CEO 更迭、強迫性 CEO 更迭、SOX 法案

Abstract

This paper examines the impact of CEO turnover on reinsurance demand in the U.S. property casualty insurance industry. Our evidence shows that insurers with CEO turnover are more likely to increase reinsurance demand after CEO turnover. More detailed analyses indicates that insurers with non-routine (forced) CEO turnover are more likely to increase reinsurance than insurers without CEO turnover, but insurers with routine (voluntary) CEO turnover are not likely to change reinsurance policies after CEO turnover. One possible explanation for these results is that an insurer with a new CEO resulting from non-routine (forced) CEO turnover is more likely to increase demand for reinsurance to stabilize earnings and reduce risk to protect the job security of the new CEO. The evidence shows that the interaction effect between mutual form and CEO turnover is negatively related to reinsurance demand after CEO turnover. Finally, our results also show that insurers with CEO turnover are not related to reinsurance demand after the Sarbanes–Oxley Act of 2002. The overall results of this study indicate that CEO turnovers have a significant impact on the demand for reinsurance.

【Keywords】reinsurance demand, CEO turnover, non-routine CEO turnover, forced CEO turnover, SOX Act

1. Introduction

This paper examines the impact of chief executive officer (CEO) turnover on reinsurance demand in the property casualty insurance industry. Managers of the insurance industry should operate insurance companies on a financially sound basis to provide financial protection to policyholders and other stakeholders. Reinsurance is not only a traditional hedging instrument available to primary insurers but also a means to reduce the insolvency risk of primary insurers by stabilizing loss experience, limiting claim liabilities, and protecting insurers against catastrophes (e.g., Niehaus and Mann, 1992; Drechsler and Cummins, 2008). Reinsurance effectively serves as a substitute for equity capital, because the transfer of risk from insurers to reinsurers reduces the strain on the capital of the insurer (Adiel, 1996).

A large body of research focuses on various topics related to reinsurance decisions such as organizational structure, motivation of purchasing reinsurance, tax shield, comparative advantages, corporate governance and executive compensations.[1] Very few studies have investigated the relation between CEO turnover and reinsurance demand except He and Sommer (2011), who examine the impact of reinsurance decision on CEO turnover. In other words, they use CEO turnover as dependent variable and reinsurance demand as independent variable.[2] This paper utilizes reinsurance demand as dependent variable and CEO turnover as independent variable.

The main purpose of this study is to examine the relation between CEO turnover and reinsurance policy. CEOs substantially influence major corporate policies. In particular, a CEO can significantly affect corporate policies of risk management, including reinsurance purchases of an insurance company. It is very important to know the reinsurance policy after CEO turnover because all the stakeholders (owners, policyholders, regulators, and employees) would be affected. If new CEOs choose to purchase less reinsurance, then the

1 The literature includes Mayers and Smith (1981), Hansmann (1985), Hoerger, Sloan, and Hassan (1990), Mayers and Smith (1990), Adiel (1996), Adams (1996), Chen, Hamwi, and Hudson (2001), Garven and Lamm-Tennant (2003), Shortridge and Avila (2004), Cole and McCullough (2006), Cole, McCullough, and Powell (2010), Garven, Hiliard, and Grace (2014), Powell and Sommer (2007), Adams, Hardwick, and Zou (2008), Cummins, Dionne, Gagné, and Nouira (2008), Wang, Chang, Lai, and Tzeng (2008), Shiu (2011), Lonkani, Ho, Lai, and Limpaphayom (2012), Ho and Lai (2014), and Ho (2016).

2 He and Sommer (2011) find a positive relation between reinsurance and non-routine CEO turnover. Cheng, Cummins, and Lin (2017) extend He and Sommer (2011) using a more detailed decomposition of ownership categories (e.g., family-member CEO, non-family CEO) to discuss CEO turnover. They exclude the reinsurance variable from the regression, because they find the variable to be statistically insignificant.

expected insolvency risk is higher. It is possible that insurers would suffer bankruptcy when insurers suffer catastrophic risk without appropriate reinsurance, and all stakeholders would be affected. Ho, Lai, and Lee (2013) suggest that the decision for insurance is a trade-off between risk management and profitability gained from cost savings. Deshmukh, Goel, and Howe (2013) find that the corporate selection of a top executive is often considered as commitment to or a signal of change for existing corporate policies. Consequently, whether an insurer's reinsurance demand changes after CEO turnover is an interesting issue. Since research on the reinsurance policy after CEO turnover has never been conducted, this study aims to fill in the gap in the literature. To the best of our knowledge, our study is the first to examine the impact of CEO turnover on reinsurance demand after CEO turnover in the U.S. property casualty insurance industry. This paper focuses on CEO turnover because the decision to replace a CEO is one of most important decisions made by directors on the board.

Recent studies affirm the importance of CEO turnover in the corporate governance issues (e.g., Huson, Parrino, and Starks, 2001; Adams and Mansi, 2009; Campbell, Gallmeyer, Johnson, Rutherford, and Stanley, 2011; Bushman, Dai, and Wan, 2010; He, Sommer, and Xie, 2011; He and Sommer, 2011; Cheng, Cummins, and Lin, 2017). Corporate governance mechanisms may play a disciplining role for poorly performing CEOs that take on excessive risk (Čihák, Maechler, Schaeck, and Stolz, 2009). A new CEO typically takes actions that combines operating, investing, and financing policy changes when CEO turnover occurs because of poor performance (e.g., Weisbach, 1988; Ofek, 1993; Perry, 2000; Huson et al., 2001; John, Litov, and Yeung, 2008; Adams and Mansi, 2009; He and Sommer, 2011[3]). CEO turnover events may also affect change in firm performance after the turnover (e.g., Denis and Denis, 1995; Huson et al., 2001). However, no research examines whether reinsurance demand changes after CEO turnovers, which is an important issue in the insurance industry. In this study, we categorize CEO turnovers into routine (voluntary) turnover CEOs and non-routine (forced) turnover CEOs.

Reinsurance demand can be separated total reinsurance from affiliated reinsurers into reinsurance from non-affiliated reinsurers to avoid calculation bias (e.g., Powell and Sommer, 2007; Wang et al., 2008). Powell and Sommer (2007) suggest that total reinsurance ratio may be biased because of double counted premiums and retroceded inter-company pooling arrangement.

3 He and Sommer (2011) determine that stock insurers with CEO turnover are negatively related to prior performance, but mutual insurers are absent in the U.S. property casualty insurance industry from 1996 to 2004.

Purchasing reinsurance from affiliated insurers has benefits. Doherty and Smetters (2005) find heavy use of monitoring when the primary insurer and reinsurer are affiliates where monitoring costs are lower. On the other hand, there exists little or no use of monitoring on the primary insurers when the primary insurers and reinsurers are not affiliates (i.e., not part of the same financial group). Purchasing reinsurance from affiliated insurers also has drawbacks because it would not reduce underwriting risk from the perspective of the financial group.

The benefit of purchasing reinsurance from non-affiliated reinsurance is risk reduction. However, purchasing reinsurance from non-affiliated reinsurance has the disadvantage of reinsurance cost. Insurers which purchase reinsurance from non-affiliated reinsurers suffer from profit reduction.

New CEOs may change their behavior in reinsurance policy to alter risk profits and expected profitability of insurers. Whether purchases reinsurance from affiliated reinsurers or from non-affiliated reinsurers will be based on CEO's risk-taking behavior.

Financial scandals at some of the large corporations such as Enron have a devastating impact on investor confidence. Subsequent passage of the Sarbanes–Oxley Act (SOX) of 2002 has led to some changes in board composition. Wang, Davidson, and Wang (2010) find that CEOs have become significantly more risk averse following the passage of the SOX. It is interesting to examine whether new CEOs would purchase more reinsurance post-SOX.

Our sample consists of 252 U.S. property casualty insurance companies and 2,772 firm-years during the period from 2000 through 2010. Our evidence shows that insurers with CEO turnover are more likely to increase reinsurance demand than insurers without CEO turnover after CEO turnover. Specifically, an insurer with new CEO is more likely to have a more conservative strategy and thus increase demand for reinsurance because new CEO does not have much track records with the board and trust from the board. More detailed analyses indicates that insurers with non-routine (forced) CEO turnover are more likely to increase reinsurance than insurers without CEO turnover, but insurers with routine (voluntary) CEO turnover are not likely to change reinsurance policies after CEO turnover. One possible explanation for these results is that an insurer with a new CEO resulting from non-routine (forced) CEO turnover is more likely to have a more conservative strategy and thus increased demand for reinsurance to stabilize earnings and reduce risk to protect the job security of new CEO. If insurers suffer huge losses and have insufficient reinsurance, new CEOs are more likely to be fired than CEOs without turnover. The evidence shows that the interaction effect between mutual form and CEO turnover is negatively related to reinsurance

demand after CEO turnover. Specifically, mutual insurers with non-routine (forced) CEO turnover are more likely to purchase less reinsurance from affiliated reinsurers. Finally, our results also show that insurers with CEO turnover are not related to reinsurance demand post-SOX. The overall results of this study indicate that CEO turnovers have a significant impact on the demand for reinsurance.

Our study stands out in several ways. First, we are the first to examine the impact of CEO turnover on reinsurance demand after CEO turnover in the U.S. property casualty insurance industry. Second, we also examine the impact of reinsurance demand on four CEO turnover types (i.e., routine CEO, non-routine CEO, forced CEO and voluntary CEO). While most previous literature focuses on large and publicly listed firms, we include mutual insurers. To obtain turnover types for mutual insurers, we hand collect the data for major CEO turnover types.[4] Third, no research has been done on reinsurance demand related to CEO turnover in the context of organizational structure and the SOX Act. Our paper also contributes more broadly as an organizational structure issue to analyze CEO turnover on reinsurance policy.

The paper is organized as follows: Section 2 presents the hypothesis development. The data and methodology are described in Section 3. Section 4 provides the summary statistics and empirical results. Section 5 presents the conclusion.

2. Hypothesis Development

This section addresses the relation between reinsurance demand and CEO turnover. We develop five hypotheses to examine the impact of CEO turnover on reinsurance demand.

2.1 CEO Turnover and Reinsurance Demand

Bebchuk, Cremers, and Peyer (2011) show that a CEO playing a dominant role in the firm's decision-making may lead to more conservative (i.e., risk averse) decisions because he/she wants to protect his or her job.[5] Pathan (2009) suggests that CEOs who have more power to influence board decisions are more likely to take on lower risk because managers have un-diversifiable wealth, including human capital and a comparatively fixed salary. A new CEO typically takes actions including a combination of operating, investing, and

4 In prior literature on the insurance industry, authors have focused on routine and non-routine CEO turnover rather than forced and voluntary CEO turnover (e.g., He and Sommer, 2011; Cheng et al., 2017).

5 This paper notes that managers will avoid excessive risk taking to protect their positions.

financing policy changes when CEO turnover occurs because of poor performance (e.g., Weisbach, 1988; Ofek, 1993; Perry, 2000; Huson et al., 2001; John et al., 2008; Adams and Mansi, 2009; He and Sommer, 2011).

It is interesting to examine whether insurers with CEO turnover would change their risk-taking behavior such as reinsurance decision. Insurers with CEO turnover may purchase less reinsurance because new CEOs may desire increased retention to reduce reinsurance costs and increase profitability. On the contrary, new CEOs may want to purchase more reinsurance to transfer their firms' risk to reinsurers. We believe that new CEOs want to be more conservative because they do not have track records as CEOs with the company and the board. If some huge unexpected losses occurred, the board may blame new CEOs for their reinsurance decisions. Based on the two conflict arguments, we suggest the existence of a relation between CEO turnover and reinsurance demand, but the sign cannot be predicted. This leads to the following null hypothesis:

Hypothesis 1: Insurers with CEO turnover are not likely to change their reinsurance policies after CEO turnover.

2.2 Routine CEO Turnover, Non-Routine CEO Turnover and Reinsurance Demand

We develop a hypothesis related to routine and non-routine CEO turnover.[6] CEO turnover may affect firm performance post-turnover (e.g., Denis and Denis, 1995; Huson et al., 2001). For example, Huson et al. (2001) find a significant and positive relation between non-routine CEO turnover and operating rate of return on total assets post-turnover. They suggest that the presence of noticeable performance improvements due to managerial quality enhancement is observed compared to before, when the firms' board composition is dominated by outside directors and incumbent CEOs are outsiders. In addition, Weisbach (1988) and Borokhovich, Parrino, and Trapani (1996) show that non-routine CEO turnover are more likely than routine CEO turnover to dismiss poorly performing CEOs, replaceing them with executives who will improve corporate value. The empirical evidence from stock returns after CEO turnover indicates that shareholders benefit from non-routine CEO turnover, but suffer larger negative abnormal returns from routine CEO turnover (Borokhovich et al., 1996). It is implied that non-routine new CEOs may have strong

6 Following the definition of routine and non-routine CEO turnover from Kang and Shivdasani (1995) and He and Sommer (2011), a non-routine CEO turnover is defined as a change in the CEO of the firm if the departing CEO is not on the board of directors; other turnover are defined as routine CEO turnover.

incentives to reduce risk resulting in purchasing more reinsurance based on managerial professional quality than routine new CEOs.

On the one hand, insurers with non-routine CEO turnover tend to purchase more reinsurance than insurers with routine CEO turnover because new CEOs resulting from routine turnover are from the board and they are familiar with the direction of the board. In addition, if the new CEO is promoted through routine turnover, she/he should be better trusted than non-routine CEO. Routine-turnover CEOs have worked with other directors in the past. If routine-turnover CEOs maintain the current reinsurance policy and unexpected huge losses occur, the board members are more likely to attribute the losses as unexpected losses rather than poor reinsurance decisions. New non-routine CEOs may want to purchase more reinsurance to transfer their firms' risk. When huge losses occur, non-routine turnover CEOs are more likely to be blamed for insufficient reinsurance because they have yet to establish their credibility with the board.

On the other hand, insurers with non-routine CEO turnover are more likely to take more risk and thus purchase less reinsurance. The reason is that non-routine CEO turnover are generally involved with certain negative events of insurers (e.g., termination of old CEOs because of poor performance). Goel and Thakor (2008) suggest that the board's decision to retain or fire a CEO is based on his/her observed performance. The board is more likely to tolerate new CEOs appointed as a result of non-routine CEO turnover that failed a high risk project than CEOs who have been with the insurers for a while. The two conflicting arguments above lead to the following null hypothesis:

Hypothesis 2: The reinsurance decision of insurers with routine or non-routine CEO turnover is not different from that of insurers without CEO turnover after CEO turnover.

2.3 Forced CEO Turnover, Voluntary CEO Turnover and Reinsurance Demand

Voluntary CEO turnover can emerge from normal CEO turnover (i.e., health, retirement, or death). However, no evidence of a significant relation between voluntary CEO turnover and prior corporate activities or performance has been obtained (e.g., Huson et al., 2001; Huson, Malatesta, and Parrino, 2004). In contrast, forced CEO turnovers may be associated with poor prior performance (e.g., DeFond and Park, 1999). Čihák et al. (2009) find that a significantly positive relation between a forced executive (i.e., president, chairperson, CEO and COO) turnover and higher default risk, because the executive's exposure to be forced out job risk. Huson et al. (2004) find that top management turnover

announcements are significantly positively related to average abnormal stock returns. They also suggest that turnover announcements are good news for investors, because they expect turnover to improve corporate performance. However, they find that there are no significant difference between post-turnovers related performance changes for forced and voluntary successions. Hazarika, Karpoff, and Nahata (2011) find that if forced CEOs suffer more severe career consequences, then they are less likely to maintain their board position and other board seats and be sued for earning management misbehavior than voluntary CEOs.[7] They also find that a positive relation between aggressive earnings management and forced CEO turnover, whereas the relation does not exist between earning management and voluntary turnover. The evidence implies that new CEOs resulting from forced CEOs turnover tend to adopt more conservative strategies and purchase more reinsurance to mitigate risk than voluntary CEOs turnover, because CEOs from forced CEO turnover are concerned about their job security based on their predecessors' experience.

Campbell et al. (2011) report that a strong relation between forced CEO turnover and CEO's optimism level measures only for good governance companies when boards of directors act in the interests of shareholders.[8] Hazarika et al. (2011) also find that forced CEO turnovers are positively related to risk-taking behavior. This finding implies that new CEOs resulting from forced CEOs turnover may take on high risk projects, and purchase less reinsurance post CEO turnover than new voluntary CEOs. This leads to the following null hypothesis:

Hypothesis 3: The reinsurance decision of insurers with forced or voluntary CEO turnover is not different from that of insurers without CEO turnover after CEO turnover.

2.4 CEO Turnover, Organizational Structure, and Reinsurance Demand

The literature suggests insurers purchase reinsurance to transfer risk, reduce loss claim and improve insurer's capacity when a covered event occurs (e.g., Chen, Doerpinghaus, Lin, and Yu, 2008). One interesting question is whether organizational form has impact on the relation between reinsurance and CEO turnover. Previous studies have examined the relation between organizational structure and reinsurance issues (Mayers and Smith, 1981;

7 Hazarika et al. (2011) use a sample of 1895 turnovers (402 forced turnovers and 1493 voluntary turnovers) by *Factiva and Lexis-Nexis databases* from 1992 to 2004.

8 Campbell et al. (2011) use a large sample of CEO turnovers from the ExecuComp database over the period from 1995 to 2005.

Hansmann, 1985; Hoerger et al., 1990; Mayers and Smith, 1990; Adiel, 1996; Garven and Lamm-Tennant, 2003; Cole and McCullough, 2006; Cole et al., 2010; Powell and Sommer, 2007; Cummins et al., 2008; Wang et al., 2008; Garven et al., 2014; Shiu, 2011; and Ho and Lai, 2014). For example, Mayer and Smith (1990) suggest that the organizational form of insurers is related to their risk taking and reinsurance demand. They suggest that mutual insurers purchase more reinsurance than stock insurers.[9]

On the other hand, Adams (1996) suggests that stock insurers use more reinsurance than mutual insurers. Cole and McCullough (2006) find that stock insurers purchase more reinsurance. Cummins et al. (2008) also suggest that stock insurers purchase more reinsurance from non-affiliated reinsurers than mutual insurers.[10] Garven and Lamm-Tennant (2003) indicate that an insignificant relation between organizational structure and reinsurance demand. In summary, the empirical evidence on the relation between organizational structure and reinsurance is inconclusive.

In addition, the relation between organizational structure and reinsurance demand is likely to be in equilibrium prior to CEO turnovers. Whether new CEOs will change the relation between organizational structure and reinsurance demand depends on the risk-taking behavior of new CEOs. Since we cannot predict whether new CEOs resulting from turnovers of mutual insurers will have higher or lower risk-taking behavior than new CEOs of stock insurers, the sign of the interaction term between routine (voluntary) or non-routine (forced) CEO turnover and organizational structure on reinsurance demand cannot be predicted. This leads to the following null hypothesis:

Hypothesis 4: There is no interaction effect between CEO turnover and organizational structure on reinsurance demand after CEO turnover.

2.5 The Sarbanes-Oxley Act and Reinsurance Demand

The Sarbanes-Oxley Act of 2002 requires CEOs to be responsible for the financial statements of the firm. Since the implementation of this act, boards of directors have become extremely cautious about their roles. Wang et al. (2010) examine risk-taking behavior in relation to CEO turnover prior to and following the implementation of SOX.[11] They find that CEOs have become significantly more risk averse following the passage of SOX. It is

9 Mayers and Smith (1990) find that widely held stock insurers purchase less reinsurance than closely held, single-owner, and association-owned insurers.

10 Cummins et al. (2008) use the data from 1995 to 2003 in the U.S. property casualty insurance industry.

11 Final sample includes 670 CEO turnovers from 1999 to 2005.

reported that some boards of directors became more intense in replacing managers after SOX (e.g., Kaplan and Minton, 2012; Kim, Robles, Cho, Lee, and Kim, 2008). Consequently, in the post-SOX environment, managers of insurers are more risk averse and thus purchase more reinsurance. These changes imply that an increase in the non-routine (forced) CEO turnover is associated with increasing reinsurance demand to reduce corporate risk after SOX. Thus, we expect the sign of the interaction term between non-routine (forced) CEO turnover and the Sarbanes-Oxley Act to be positive.

On the other hand, Ho et al. (2013) find that insurers do not significantly change their risk-taking behavior post-SOX with one exception, that is, insurers used less leverage. Since reinsurance demand is related to risk-taking behavior, the result of Ho et al. (2013) implies that the sign of interaction term between routine (voluntary) or non-routine (forced) CEO turnover and SOX on reinsurance demand cannot be predicted. Based on the above discussions, we provide the following null hypothesis:

Hypothesis 5: There is no interaction effect between CEO turnover and the Sarbanes-Oxley Act on reinsurance demand.

3. Data and Methodology

This section discusses data collection and methodology.

3.1 Data

Our sample consists of 252 U.S. property casualty insurance companies and 2,772 firm-years during the period from 2000 through 2010. The total premiums of our sample is 80% of total industry premiums in 2000. We hand collect detailed information on insurers' corporate governance variables including CEO turnover (routine and non-routine CEO turnover), CEO/Chairperson duality, board size, the percentage of independent directors on the board and auditors from A.M. Best's Insurance Report (Property-casualty) from 1999 through 2011. Specifically, we follow previous finance literature (e.g., Borokhovich et al., 1996; Campbell et al., 2011; Huson et al., 2001; Huson et al., 2004) to collect forced CEO turnover or voluntary CEO turnover data. We use Google, companies' websites or other websites to collect the relevant information. Based on the collected information, we define whether the CEO turnovers are forced or voluntary CEO turnovers. Organizational structure and other financial data are obtained from the National Association of Insurance Commissioners (NAIC) InfoPro database for the period 1996-2010. We measure standard deviation of loss ratios by using five-year rolling data to proxy underwriting risk. For

example, standard deviation of loss ratio for 2000 is calculated using loss ratios from 1996 through 2000. To examine the effect of SOX[12], we separate the full sample into two sub-samples: one prior to its implementation (2000-2004) and one following (2005-2010).

3.2 Methodology

We use regression analysis to examine the impact of CEO turnover on reinsurance demand. To examine the demand for reinsurance, we use three measures: total reinsurance, reinsurance from affiliated insurers and reinsurance from non-affiliated insurers (e.g., Wang et al., 2008). We also use Hausman test to determine whether fixed-effects models or random-effects models should be used since our sample is in the form of panel data. The results of Hausman test suggest that fix effects should be used for all analyses. Specifically, we use two-way fixed effects (both firm and year effect[13]) model.

We next discuss the endogeneity issue using Durbin-Wu-Hausman (DWH) test (a two-stage least squares method, 2SLS) to investigate the relation among CEO turnover, organizational structure, corporate governance, and reinsurance demand. Potential endogenous variables are regressed against all the exogenous variables and instrumental variables in the first stage. The instrumental variables follow previous studies including Eisfeldt and Kuhnen (2013), Lamm-Tennant and Starks (1993) and Linck, Netter, and Yang (2008). The instrumental variable in the first regression of CEO turnover is growth of net written premium[14] (Eisfeldt and Kuhnen, 2013), and the instrumental variable of mutual variable is relative size[15] (Lamm-Tennant and Starks, 1993) and growth ratio of net written premiums. The instrumental variable of CEO/chairperson of board duality and board size is firm age[16] (Linck et al., 2008)[17] and growth ratio of net written premiums, and the instrumental variable of percentage of independent director on the board is ratio of net

12 We follow Ho et al. (2013) using a two-year lag period to allow the time for the implementation of SOX to become effective in the insurance industry. According to Green (2006), SOX went into effect in 2004 for the insurance industry.

13 We thank a reviewer for this valuable comment. The year effects fail to significantly possess explanatory powers. They do serve as control variable purpose.

14 Eisfeldt and Kuhnen (2013) discuss that CEO skills such as the ability to sale growth when using CEO turnover events from 1992 to 2006. We use the growth ratio of net written premium in the insurance industry as a proxy variable for sale growth.

15 Relative size is measured as the percentage of a firm's total premiums earned relative to all firms' premiums earned.

16 Firm age is measured as the number of years since the firm was established.

17 Linck et al. (2008) utilize a sample of 8,000 public companies of non-financial firms.

income after dividends to policyholders, but before federal and foreign income taxes divided by net admitted assets and growth ratio of net written premiums. Both F-statistics and J-statistics[18] are used to check instrument relevance and to perform tests of overidentifying restrictions for exogeneity issue (Stock and Watson, 2007). The F test statistics for instrument variables relevance test are significant at the 1 percent level, suggesting the instrument variables are relevant. If J statistics report statistically insignificant, it indicates the instruments may be valid. In the second stage, the residual of the endogenous variable is added to the original regression model. If a coefficient of residual of CEO turnover, organizational structure or corporate governance variables is statistically significant, the variable is considered to be endogenous; hence the predicted value of the variable replaces the original value in the regression model. Finally, we do not reject the hypothesis of Durbin-Wu-Hausman (DWH) test in all models. In other words, CEO turnover, organizational

18 The results are as follows. CEO turnover is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 4.834, 4.834, and 4.834 significant at the 1% level, respectively, suggesting the instrument variables are weak. The J-test statistic for the exogeneity test are 8.446 (0.489), 7.284 (0.608), and 4.906 (0.842) and insignificant, implying that instrument variables are exogenous. Mutual is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 24.553, 24.553, and 24.553 significant at the 1% level, respectively, suggesting the instrument variables are strong. The J-test statistic for the exogeneity test are 12.457 (0.330), 10.909 (0.451), and 3.601 (0.980) and insignificant, implying that instrument variables are exogenous. Duality variable is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 2.018, 2.018, and 2.018 significant at the 1% level, respectively, suggesting the instrument variables are weak. The J-test statistic for the exogeneity test are 12.007 (0.445), 13.507 (0.333), and 10.759 (0.549) and insignificant at the 1% level, implying that instrument variables are exogenous. Board size is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 11.659, 11.659, and 11.659 significant at the 1% level, respectively, suggesting the instrument variables are strong. The J-test statistic for the exogeneity test are 11.252 (0.508), 13.601 (0.327), and 14.281 (0.283) and insignificant at the 1% level, implying that instrument variables are exogenous. Independent director is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 6.755, 6.755, and 6.755 significant at the 1% level, respectively, suggesting the instrument variables are weak. The J-test statistic for the exogeneity test are 11.043 (0.525), 9.372 (0.671), and 12.530 (0.404) and insignificant at the 1% level, implying that instrument variables are exogenous. Big 4 auditor is an endogenous variable in the Models of change in reinsurance ratio, reinsurance demand from affiliated reinsurers and reinsurance from non-affiliated reinsurers, the F-test statistic for the IV relevance test are 10.748, 10.748, and 10.748 significant at the 1% level, respectively, suggesting the instrument variables are weak. The J-test statistic for the exogeneity test are 10.498 (0.572), 13.639 (0.324), and 9.057 (0.698) and insignificant at the 1% level, implying that instrument variables are exogenous.

structure and corporate governance variables are all exogenous variables.

The regression models used to examine the relation between CEO turnover and reinsurance demand are presented below:

$$\begin{aligned}\Delta \text{Re}ins\_ratio_{i,t} = {} & \alpha_0 + \alpha_1 Turnover_{i,t-1} + \alpha_2 Mutual_{i,t-1} + \alpha_3 Duality_{i,t-1} + \alpha_4 \Delta Boardsize_{i,t} + \\ & \alpha_5 \Delta Independent\_directors_{i,t} + \alpha_6 Big4auditor_{i,t-1} + \alpha_7 \Delta Ln(na)_{i,t} + \\ & \alpha_8 \Delta Herfindahl_{i,t} + \alpha_9 \Delta Geoherfindahl_{i,t} + \alpha_{10} \Delta Leverage_{i,t} + \\ & \alpha_{11} \Delta Underwritingrisk_{i,t} + \alpha_{12} \Delta 2yearlossdevelopment_{i,t} + \alpha_{13} \Delta Coastalprem_{i,t} + \\ & \alpha_{14} \Delta Longtail_{i,t} + \alpha_{15} \Delta Tax\_ex_{i,t} + \alpha_{16} \Delta ROA_{i,t} + \alpha_{17} \Delta Group_{i,t-1} + d_{i,t} + f_{i,t} + u_{i,t}\end{aligned}$$

$$\begin{aligned}\Delta \text{Re}ins\_aff\_ratio_{i,t} = {} & \alpha_0 + \alpha_1 Turnover_{i,t-1} + \alpha_2 Mutual_{i,t-1} + \alpha_3 Duality_{i,t-1} + \alpha_4 \Delta Boardsize_{i,t} + \\ & \alpha_5 \Delta Independent\_directors_{i,t} + \alpha_6 Big4auditor_{i,t-1} + \alpha_7 \Delta Ln(na)_{i,t} + \\ & \alpha_8 \Delta Herfindahl_{i,t} + \alpha_9 \Delta Geoherfindahl_{i,t} + \alpha_{10} \Delta Leverage_{i,t} + \\ & \alpha_{11} \Delta Underwritingrisk_{i,t} + \alpha_{12} \Delta 2yearlossdevelopment_{i,t} + \\ & \alpha_{13} \Delta Coastalprem_{i,t} + \alpha_{14} \Delta Longtail_{i,t} + \alpha_{15} \Delta Tax\_ex_{i,t} + \alpha_{16} \Delta ROA_{i,t} + \\ & \alpha_{17} \Delta Group_{i,t-1} + d_{i,t} + f_{i,t} + u_{i,t}\end{aligned}$$

$$\begin{aligned}\Delta \text{Re}ins\_nonaff\_ratio_{i,t} = {} & \alpha_0 + \alpha_1 Turnover_{i,t-1} + \alpha_2 Mutual_{i,t-1} + \alpha_3 Duality_{i,t-1} + \alpha_4 \Delta Boardsize_{i,t} + \\ & \alpha_5 \Delta Independent\_directors_{i,t} + \alpha_6 Big4auditor_{i,t-1} + \alpha_7 \Delta Ln(na)_{i,t} + \\ & \alpha_8 \Delta Herfindahl_{i,t} + \alpha_9 \Delta Geoherfindahl_{i,t} + \alpha_{10} \Delta Leverage_{i,t} + \\ & \alpha_{11} \Delta Underwritingrisk_{i,t} + \alpha_{12} \Delta 2yearlossdevelopment_{i,t} + \\ & \alpha_{13} \Delta Coastalprem_{i,t} + \alpha_{14} \Delta Longtail_{i,t} + \alpha_{15} \Delta Tax\_ex_{i,t} + \alpha_{16} \Delta ROA_{i,t} + \\ & \alpha_{17} \Delta Group_{i,t-1} + d_{i,t} + f_{i,t} + u_{i,t}\end{aligned}$$

3.3 Variables

3.3.1 Dependent Variables

We use the changes in all dependent variables to investigate the relation between CEO turnover and change in reinsurance demand.[19] Dependent variables include $\Delta \text{Re}ins\_ratio_{i,t}$, $\Delta \text{Re}ins\_aff\_ratio_{i,t}$, and $\Delta \text{Re}ins\_nonaff\_ratio_{i,t}$. ΔReins ratio is defined as the difference in the value of total reinsurance ratio of each year minus total reinsurance ratio of year -1, ΔReins_ aff_ratio is defined as the difference in the value of affiliated reinsurance ratio of each year

19 Thanks to the reviewer's wonderful comments, we use changes in total reinsurance ratio, affiliated reinsurance ratio and non-affiliated reinsurance ratio.

minus affiliated reinsurance ratio of year -1, and ΔReins_nonaff_ratio is defined as the difference in the value of non-affiliated reinsurance ratio of each year minus non-affiliated reinsurance ratio of year -1, respectively. Re$ins_ratio_{i,t}$ (total reinsurance ratio) is measured as the ratio of reinsurance ceded divided by the sum of direct premiums written and reinsurance assumed (e.g., Mayers and Smith, 1990; Garven and Lamm-Tennant, 2003; Cole and McCullough, 2006; Cummins et al., 2008[20]). Re$ins_aff_ratio_{i,t}$ (affiliated reinsurance ratio) is measured as the ratio of affiliated reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed. Re$ins_nonaff_ratio_{i,t}$ (non-affiliated reinsurance ratio) is measured as the ratio of non-affiliated reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed.

3.3.2 Independent Variables

We classified independent variables into two categories: major independent variables and control variables. The major independent variable of interest is the CEO turnover. We separate CEO turnover event into two types: routine CEO and non-routine CEO turnover, or forced CEO and voluntary CEO turnover. The others independent variables of interest include organizational structure and corporate governance variables. We also use changes in some independent variables and control variables (e.g., board size, independent director, firm size) because the dependent variable is changes in reinsurance demand. For other independent variables and control variables, we lag these variables one year if a variable is a dummy variable (such as mutual, duality, Big 4 auditor, and group). "Δx" means change in independent variable or control variable x, which specifically sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. For example, $\Delta Boardsize_{i,t}$ means $Boardsize_{i,t}$ minus $Boardsize_{i,t-1}$. Finally, $d_{i,t}$ is the time fixed-effects for year t, $f_{i,t}$ is the firm fixed-effects for insurer i, and $u_{i,t}$ is the error term.

3.3.3 CEO Turnover Variables

CEO turnover information obtained from the "Management" section of *Best's Insurance Reports*[21] is how we identify CEO turnover events. If there are any change in CEO names between two consecutive years (t–1 and t), we define a CEO turnover event in the t^{th}year.

20 Cummins et al. (2008) suggests that reinsurance ratio is defined only as the premiums ceded to non-affiliated reinsurers. In addition, an alternative measure of reinsurance is share of written premiums ceded to non-affiliated reinsurers.

21 Best's Insurance Reports and proxy statements have the means of company officers with following titles: Chairman of the Board, President, CEO, Senior Vice President, Secretary, CFO, Vice President and Treasurer. All companies in our sample have at least one of the three titles: CEO, President, or Chairman of the Board.

$Turnover_{i,t}$ (Turnover) is an indicator variable: 1 = if CEO changes from year t–1 to t, 0 = otherwise (Kang and Shivdasani, 1995; He and Sommer, 2011 and He et al., 2011). $RoutineCEO_{i,t}$ (Routine CEO turnover) is an indicator variable: 1 = if the departing CEO remains on the board of directors in year t, 0 = otherwise. $Non–RoutineCEO_{i,t}$ (Non-routine CEO turnover) is an indicator variable: 1 = if the departing CEO does not remain on the board of directors in year t, 0 = otherwise. $ForcedCEO_{i,t}$ (Forced CEO turnover) is an indicator variable: 1 = if the departing CEO does not leave for reasons for health, death, or to accept another position; or if the departing CEO is under the age of 60 and thus less likely to be retiring in year t (e.g., Borokhovich et al., 1996; Campbell et al., 2011; Huson et al., 2001; Huson et al., 2004), 0 = otherwise. $VoluntaryCEO_{i,t}$ (Voluntary CEO turnover) is an indicator variable: 1 = if the departing CEO leaves for reasons of retirement, health, death, or to accept another position in year t, 0 = otherwise. Routine and non-routine (forced and voluntary) CEO rates are defined as the ratio of CEO turnover event and number of observations. This paper investigates the reinsurance policy after CEO turnover event, thus CEO turnover in the previous year (e.g., $Turnover_{i,t-1}$) will be discussed.

3.3.4 Organizational Structure and Corporate Governance Variables

$Mutual_{i,t}$ (Mutual), the organizational structure variable, which is a binary variable: 1 = mutual organizational structure, 0 = otherwise. $Duality_{i,t}$ (CEO/chairperson of board duality) is a binary variable: 1 if the CEO and chairperson of the board are the same person and 0 otherwise; $Boardsize_{i,t}$ (Board Size) presents the total number of directors on the board (Cheng, 2008; Pathan, 2009; He and Sommer, 2011); $Independent\_directors_{i,t}$ (Independent Directors) is the percentage of independent directors on the board. Finally, $Big4Auditors_{i,t}$ (Big 4 Auditors) is a binary variable: 1 if the auditor is one of the four largest accounting companies in the U.S. (PricewaterhouseCoopers LLP, Ernst & Young, Deloitte, and KPMG), and 0 otherwise.

Previous studies have documented a series of factors affecting reinsurance demand such as firm size, line of business concentration, geographic concentration, risk, two year loss development, tax effects, and ROA (Mayers and Smith, 1990; Garven and Lamm-Tennant, 2003; Cole and McCullough, 2006; Cole et al., 2010; Garven et al., 2014; Cummins et al., 2008; Wang et al., 2008; Shiu, 2011; Ho, 2016). Our regressions of reinsurance demand include controls for all of them.

3.3.5 Control Variables

Control variables include firm size in terms of net admitted assets, lines of business Herfindahl index, geographic Herfindahl index, leverage, risk, two year loss development,

percentage of premiums in long-tail lines, coastal states premium, tax shield, ROA, and group. $Ln(na)_{i,t}$ is proxy for firm size which is the natural logarithm of net admitted assets (Mayers and Smith, 1990; Hoyt and Khang, 2000; Garven and Lamm-Tennant, 2003; Weiss and Chung, 2004; Cole and McCullough, 2006; Garven et al., 2014; Wang et al., 2008). $Herfindahl_{i,t}$ is line of business concentration as measured by Herfindahl index = $\Sigma(PW_i/TPW)^2$, where PW_i is the value of written premiums in line i and TPW is the insurer's total written premiums (Mayers and Smith, 1990; Garven and Lamm-Tennant, 2003). $Geoherfindahl_{i,t}$ (Geographic Herfindahl Index) is a measure of geographic concentration (e.g., Cole and McCullough, 2006). The Geographic Herfindahl index is defined as $\Sigma(PW_i/TPW)^2$ where PW_i is the value of written premiums in state i, and TPW is the insurer's total written premiums. $Leverage_{i,t}$ (Leverage) is defined as 1 minus the surplus-to-assets ratio. $UnderwritingRisk_{i,t}$ (Underwriting Risk) is measured as the standard deviation of the loss ratio. The loss ratio is defined as the ratio of loss incurred plus loss adjustment expenses incurred divided by premiums earned (Angoff, 2005[22]). This is a major measurement with respect to insurer risk. $2year\_Loss\_Development_{i,t}$ (Two Year Loss Development) is definied as the development in estimated losses and loss expenses incurred two years before the current year and prior year scaled by policyholders' surplus (Cole and McCullough, 2006). $Coastal\_prem_{i,t}$ (Coastal Premium) is measured as the percentage of sum of the premium when the insurer is domiciled in a hurricane-prone state (Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, and Virginia) divided by total net written premium (Chen and Yan, 2012[23]). $Long–tail_{i,t}$ (Percentage of Long-tail Lines), is premiums of long-tail lines divided by total net written premiums. Long-tail lines or short-tail lines are determined by the length of the loss payout period, as defined by Schedule P of the NAIC annual financial statement. $Tax\_ex_{i,t}$ (Tax-exempt) is measured as the ratio of tax-exempt investment income to total investment income (Garven and Lamm-Tennant, 2003; Wang et al., 2008). $ROA_{i,t}$ (ROA) is

22 Angoff (2005) notes that adjusted loss ratio, defined as the ratio of losses incurred (including loss expenses incurred) divided by premiums earned, represents the pure cost of insurance coverage.

23 Chen and Yan (2012) use the coastal state dummy variable: 1 = if the insurer is domiciled in a hurricane-prone state (Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, and Virginia) and 0 = otherwise. They defined the variable based on Landscape of Natural Disasters of USATODAY.com

net income on admitted assets (Ho, 2016).[24] $Group_{i,t}$ is an indicator variable: 1 if the firm is a member of a group and 0 otherwise.

4. Summary Statistics and Empirical Results

4.1 Summary Statistics

Table 1 presents summary statistics for all variables in the full sample and CEO turnover samples (routine CEO, non-routine CEO, forced CEO, and voluntary CEO), respectively. The mean of total reinsurance ratio, affiliated reinsurance ratio, non-affiliated reinsurance ratio in the full sample are 26.6%[25], 12.7% and 13.9%, respectively. The average insurance company purchases reinsurance from non-affiliated reinsurers at a higher rate than reinsurance from affiliated reinsurers. For CEO turnover sample, mean of affiliated reinsurance ratio (16.4%) is higher than non-affiliated reinsurance ratio (12.9%). Because we are ultimately interested in CEO turnover, we report that insurers with routine CEO turnover, non-routine CEO turnover and forced CEO turnover are more likely to purchase more reinsurance ratio from affiliated reinsurers (15.8%, 16.8%, and 18.2%) than non-affiliated reinsurers (13.6%, 12.4%, and 12.4%), respectively. On average, insurers with CEO turnover tend to increase total reinsurance ratio, affiliated reinsurance ratio and non-affiliated reinsurance ratio (4.5%, 2.8%, and 1.7%) than full sample (0.9%, 0.4%, and 0.1%). Average of insurers with non-routine CEO increase reinsurance ratio from affiliated (non-affiliated) reinsurers 3.4% (0.3%) is higher (less) than the insurers with routine CEO 1.8% (4.1%), and forced CEO increase reinsurance ratio from affiliated (non-affiliated) reinsurers 3.9% (2.3%) is higher than the insurers with voluntary CEO 0.2% (0.1%). Mean routine and non-routine (forced and voluntary) CEO turnover are about 3.4% and 5.9%[26] (6.5% and 2.7%) in the full sample, respectively. The average CEO turnover rate for the full sample is 9.2%. A total of 161 (180) of 254 CEO turnover are identified as non-routine (forced) CEO turnover. The average board size is 10 in our sample. The mean of board size is similar to findings in previous literature (e.g., Ashbaugh-Skaife, Collins, and LaFond, 2006). Lipton and Lorsch (1992) indicate that boards of eight or nine members are the most effective. On average, the

24 We also use the ROE (Return on Equity), REBIT (net income after dividends to policyholders, after capital gains tax and before all other federal and foreign income taxes divided by net admitted assets), underwriting ROA (net income after dividends to policyholders, after capital gains tax and before all other federal and foreign income taxes divided by net admitted assets), and operating ROA (net income before dividends to policyholders, after capital gains tax and before all other federal and foreign income taxes divided by net admitted assets) (e.g., Adams and Mansi, 2009; He and Sommer, 2011) as the proxy for firm performance.

25 This result is similar to the findings (0.272) of Garven and Lamm-Tennant (2003).

26 The mean of routine and non-routine CEO turnover are 5% and 9%, respectively (He et al., 2011).

Table 1 Descriptive Statistics

Sample	Full sample		CEO Turnover		Routine CEO	
Variables	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Reins ratio	0.266	0.227	0.292	0.251	0.294	0.228
Reins_aff_ratio	0.127	0.207	0.164	0.239	0.158	0.230
Reins_nonaff_ratio	0.139	0.146	0.129	0.140	0.136	0.132
ΔReins ratio	0.009	0.353	0.045	0.485	0.059	0.470
ΔReins_aff_ratio	0.004	0.231	0.028	0.364	0.018	0.127
ΔReins_nonaff_ratio	0.001	0.342	0.017	0.348	0.041	0.458
Turnover	0.092	0.289	1.000	0.000	1.000	0.000
Routine CEO	0.034	0.180	0.366	0.483	1.000	0.000
Non-Routine CEO	0.059	0.235	0.634	0.482	0.000	0.000
Forced CEO	0.065	0.246	0.709	0.455	0.667	0.474
Voluntary CEO	0.027	0.161	0.291	0.455	0.333	0.474
Mutual	0.468	0.517	0.355	0.505	0.420	0.541
Duality	0.457	0.498	0.402	0.491	0.495	0.503
Board size	10.17	4.529	9.953	4.683	10.140	4.182
Independent director	0.675	0.259	0.644	0.285	0.640	0.294
Big 4 auditor	0.820	0.384	0.827	0.379	0.785	0.413
Ln(na)	20.359	1.378	20.531	1.485	20.438	1.320
Herfindahl	0.437	0.302	0.449	0.302	0.445	0.304
Geoherfindahl	0.432	0.366	0.407	0.366	0.418	0.367
Leverage	0.607	0.147	0.602	0.159	0.589	0.140
Underwriting risk	0.113	0.18	0.127	0.235	0.097	0.108
2yearLoss Development	-0.022	0.199	-0.001	0.246	-0.032	0.167
Coastal prem	0.46	0.378	0.453	0.355	0.441	0.365
Long-tail	0.726	0.268	0.707	0.285	0.690	0.283
Tax_ex	0.384	0.253	0.382	0.255	0.376	0.229
ROA	0.023	0.047	0.018	0.057	0.022	0.042
Group	0.798	0.400	0.830	0.376	0.804	0.399
N =	2,772		254		93	

Sample	Non-Routine		Forced CEO		Voluntary CEO	
Variables	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Reins ratio	0.291	0.263	0.306	0.262	0.260	0.218
Reins_aff_ratio	0.168	0.244	0.182	0.255	0.121	0.187
Reins_nonaff_ratio	0.124	0.144	0.124	0.131	0.140	0.159
∆Reins ratio	0.037	0.494	0.062	0.573	0.003	0.096
∆Reins_aff_ratio	0.034	0.447	0.039	0.430	0.002	0.083
∆Reins_nonaff_ratio	0.003	0.265	0.023	0.411	0.001	0.064
Turnover	1.000	0.000	1.000	0.000	1.000	0.000
Routine CEO	0.000	0.000	0.344	0.477	0.419	0.497
Non-Routine CEO	1.000	0.000	0.656	0.477	0.581	0.497
Forced CEO	0.733	0.444	1.000	0.000	0.000	0.000
Voluntary CEO	0.267	0.444	0.000	0.000	1.000	0.000
Mutual	0.318	0.481	0.277	0.486	0.542	0.502
Duality	0.348	0.478	0.406	0.492	0.392	0.492
Board size	9.845	4.958	9.183	4.200	11.824	5.266
Independent director	0.647	0.281	0.605	0.286	0.741	0.261
Big 4 auditor	0.851	0.357	0.839	0.369	0.797	0.405
Ln(na)	20.583	1.573	20.371	1.474	20.916	1.450
Herfindahl	0.452	0.301	0.468	0.310	0.406	0.278
Geoherfindahl	0.400	0.367	0.427	0.373	0.360	0.348
Leverage	0.610	0.169	0.608	0.165	0.588	0.143
Underwriting risk	0.144	0.283	0.143	0.272	0.089	0.095
2yearLoss Development	0.016	0.280	0.011	0.276	-0.030	0.149
Coastal prem	0.460	0.350	0.447	0.350	0.466	0.369
Long-tail	0.717	0.287	0.702	0.296	0.718	0.258
Tax_ex	0.386	0.271	0.349	0.259	0.459	0.230
ROA	0.015	0.064	0.018	0.057	0.018	0.057
Group	0.845	0.363	0.838	0.369	0.811	0.394
N =	161		180		74	

Note: This table presents summary statistics for variables included in this study. Please see definition of all variables in Appendix A.

mean percentage of independent directors on the boards represents 67.5 % of directors. The mean ROA is 0.023, which is similar to the results of previous studies (e.g., Garven et al., 2014).

Table 2 presents the Pearson (lower triangle) and Spearman (upper triangle) correlation coefficients. We find some variables are highly correlated. For example, Table 2 shows the percentage of independent director of the board is positively and significantly related to board size (0.486 at the 1 percent level with Pearson and 0.555 at the 1 percent level with Spearman). In addition, percentage of the independent director on the board is highly associated with mutual insurers (0.419 at the 1 percent level with Pearson and 0.380 at the 1 percent level with Spearman). We use variance-inflation factors (VIFs) to test for multicollinearity among all independent variables in the regression design (Neter, Wasserman, and Kutner, 1985). The VIFs of all independent variables in the regressions are lower than 2, thus these results support the lack of presence of multicollinearity.

4.2 Empirical Results

Table 3 presents the results of regression of change in reinsurance demand on CEO turnover. Three regression results are obtained, namely, total demand for reinsurance, demand for reinsurance from an affiliated reinsurers, and demand for reinsurance from a non-affiliated reinsurers. We discuss reinsurance demand from affiliated and non-affiliated reinsurers, because reinsurance ceded to affiliated reinsurers has more retention (lower cost) than that to non-affiliated reinsurers. In addition, insurers with reinsurance through non-affiliated reinsurers have lower insolvency risk which is a main concern for CEOs.[27]

In Models of ΔReins_ratio, ΔReins_aff_ratio and ΔReins_nonaff_ratio, CEO turnover is positively related to change in total reinsurance ratio, reinsurance ratio from affiliated reinsurers and reinsurance ratio from non-affiliated reinsurers, implying that insurers with CEO turnover tend to increase total reinsurance ratio, affiliated reinsurance ratio and non-affiliated reinsurance ratio after CEO turnover. One possible reason is that new CEOs want to be more conservative and may purchase more reinsurance from affiliated and/or non-affiliated reinsurers as risk transfer to reduce insolvency risk. This result rejects Hypothesis 1.

We find that the organizational form variable is not significant in all Models. It is implied that stock or mutual insurers are not significantly related to change in reinsurance

27 Cummins et al. (2008) suggest that reinsurance can reduce insolvency risk.

demand. CEO/Chairperson duality is negatively related to change in total reinsurance ratio and affiliated reinsurance ratio in Models of ΔReins_ratio and ΔReins_aff_ratio, suggesting that the insurers with CEO/Chairperson duality tend to decrease total reinsurance ratio. The decreasing total reinsurance ratio is driven by reinsurance ratio from affiliated reinsurers. A possible reason is that the CEO/Chairperson of the board duality focuses more on insurers' performance than riskiness. The coefficient of board size is not significantly related to change in reinsurance ratio. The change in board size does not affect change in reinsurance ratio. The change in percentage of independent directors on the board is positively and significantly related to change in reinsurance from non-affiliated reinsurers. This finding can be attributed to independent directors, and can serve as external monitors to ascertain that reinsurance decisions transfer risk better to non-affiliated reinsurers, and reduce expected insolvency risk. The coefficient of Big 4 auditor is not significantly related to change in reinsurance.

For control variables, $Ln(na)_{i,t}$ is a proxy for firm size. We find change in firm size is negatively and significantly related to change in total reinsurance ratio and affiliated reinsurance ratio, indicating larger insurers have lower reinsurance demand. This result is consistent with the results of previous studies (Mayers and Smith, 1990; Hoyt and Khang, 2000; Garven and Lamm-Tennant, 2003; Weiss and Chung, 2004; Cole and McCullough, 2006; Powell and Sommer, 2007; Garven et al., 2014; Wang et al., 2008; Ho and Lai, 2014; Ho, 2016). The change in Herfindahl index is not significantly related to change in reinsurance demand in all Models. Changes in Geographic Herfindahl index in the Models of ΔReins_ratio and ΔReins_aff_ratio are negative and significant, suggesting insurers with higher geographic Herfindahl concentration tend to lower total reinsurance ratio and affiliated reinsurance ratio. This result is consistent with previous findings of Mayers and Smith (1990), Cole and McCullough (2006), Powell and Sommer (2007), and Garven et al., (2014) that insurers are more geographically concentrated resulting in lower reinsurance demand. The empirical result shows that change in leverage is positively and significantly related to change in reinsurance ratio from non-affiliated reinsurers. This result shows that the positive relation between reinsurance demand and leverage is consistent with the findings of Hoerger et al. (1990), Adams (1996), Garven and Lamm-Tennant (2003), Shortridge and Avila (2004), Powell and Sommer (2007), Adams et al. (2008), and Shiu (2011). We find that change in underwriting risk is negatively related to change in total reinsurance ratio, reinsurance ratio from affiliated reinsurers, and reinsurance ratio from non-affiliated reinsurers, implying that insurers with higher underwriting risk are more likely to lower

Table 2 Correlation Coefficients of Variables

	Variables	1	2	3	4	5	6	7	8	9
1	Turnover	1.000	0.600	0.764	0.822	0.533	-0.072	-0.031	-0.026	-0.037
			0.000	0.000	0.000	0.000	0.001	0.134	0.214	0.074
2	Routine CEO	0.587	1.000	-0.048	0.448	0.386	-0.020	0.014	-0.007	-0.021
		0.000		0.021	0.000	0.000	0.344	0.508	0.750	0.304
3	Non-Routine CEO	0.776	-0.047	1.000	0.663	0.355	-0.074	-0.053	-0.027	-0.028
		0.000	0.014		0.000	0.000	0.000	0.011	0.200	0.169
4	Forced CEO	0.830	0.455	0.669	1.000	-0.045	-0.102	-0.025	-0.075	-0.073
		0.000	0.000	0.000		0.031	0.000	0.223	0.000	0.000
5	Voluntary CEO	0.521	0.354	0.368	-0.044	1.000	0.025	-0.017	0.066	0.044
		0.000	0.000	0.000	0.022		0.220	0.415	0.002	0.033
6	Mutual	-0.070	-0.017	-0.072	-0.097	0.024	1.000	-0.065	0.355	0.380
		0.000	0.379	0.000	0.000	0.221		0.002	0.000	0.000
7	Duality	-0.035	0.014	-0.057	-0.027	-0.022	-0.047	1.000	-0.128	-0.140
		0.063	0.460	0.003	0.152	0.254	0.016		0.000	0.000
8	Board size	-0.015	-0.001	-0.018	-0.057	0.061	0.276	-0.132	1.000	0.555
		0.428	0.952	0.351	0.003	0.001	0.000	0.000		0.000
9	Independent director	-0.038	-0.025	-0.027	-0.072	0.042	0.419	-0.143	0.486	1.000
		0.047	0.186	0.160	0.000	0.027	0.000	0.000	0.000	
10	Big 4 auditor	0.005	-0.017	0.021	0.013	-0.010	-0.194	0.118	0.005	-0.133
		0.780	0.366	0.267	0.503	0.601	0.000	0.000	0.790	0.000
11	Ln(na)	0.040	0.011	0.040	0.002	0.067	-0.129	0.161	0.158	-0.144
		0.038	0.574	0.035	0.902	0.000	0.000	0.000	0.000	0.000
12	Herfindahl	0.013	0.005	0.011	0.026	-0.017	-0.076	-0.060	-0.009	-0.023
		0.500	0.798	0.561	0.167	0.372	0.000	0.002	0.645	0.230
13	Geoherfindahl	-0.022	-0.007	-0.020	-0.004	-0.033	0.191	-0.181	0.163	0.247
		0.254	0.704	0.290	0.838	0.087	0.000	0.000	0.000	0.000
14	Leverage	-0.009	-0.023	0.003	0.003	-0.021	-0.112	0.058	-0.002	-0.028
		0.631	0.236	0.858	0.865	0.263	0.000	0.002	0.937	0.147
15	Underwriting risk	0.025	-0.016	0.041	0.044	-0.022	-0.087	-0.002	0.003	-0.045
		0.197	0.405	0.032	0.022	0.253	0.000	0.920	0.858	0.020
16	2yearLoss	0.033	-0.009	0.047	0.043	-0.007	-0.131	0.111	-0.012	-0.047
	Development	0.085	0.620	0.013	0.023	0.713	0.000	0.000	0.542	0.014
17	Coastal prem	-0.006	-0.010	0.004	-0.009	0.003	0.100	0.009	0.160	0.049
		0.748	0.616	0.853	0.642	0.895	0.000	0.653	0.000	0.010
18	Long-tail	-0.022	-0.025	-0.007	-0.023	-0.005	0.178	-0.111	0.111	0.142
		0.243	0.186	0.714	0.229	0.804	0.000	0.000	0.000	0.000
19	Tax_ex	-0.003	-0.006	-0.002	-0.036	0.050	-0.109	0.050	-0.024	-0.054
		0.901	0.761	0.935	0.068	0.012	0.000	0.012	0.231	0.007
20	ROA	-0.033	-0.003	-0.038	-0.028	-0.017	-0.038	0.037	-0.054	-0.078
		0.082	0.864	0.050	0.147	0.370	0.054	0.054	0.005	0.000
21	Group	0.023	0.002	0.029	0.025	0.004	-0.081	0.069	-0.105	-0.119
		0.220	0.928	0.130	0.196	0.825	0.000	0.000	0.000	0.000

Note: This table presents the Pearson (lower triangle) and Spearman (upper triangle) correlation coefficients.

10	11	12	13	14	15	16	17	18	19	20	21
0.022	0.051	0.016	-0.037	-0.005	0.009	0.020	0.002	-0.007	-0.006	-0.012	0.021
0.284	0.014	0.431	0.071	0.804	0.676	0.344	0.906	0.719	0.782	0.569	0.313
-0.005	0.024	0.008	-0.012	-0.021	-0.006	-0.005	0.004	-0.025	-0.002	0.007	0.001
0.825	0.245	0.710	0.552	0.314	0.756	0.798	0.840	0.225	0.935	0.733	0.976
0.033	0.045	0.015	-0.035	0.006	0.011	0.028	0.004	0.011	-0.010	-0.018	0.027
0.112	0.031	0.475	0.087	0.771	0.603	0.179	0.851	0.595	0.641	0.376	0.188
0.030	0.010	0.031	-0.013	0.022	0.042	0.027	0.000	0.007	-0.046	-0.015	0.022
0.145	0.644	0.138	0.535	0.288	0.042	0.186	0.989	0.750	0.027	0.471	0.286
-0.006	0.075	-0.017	-0.047	-0.042	-0.047	-0.006	0.005	-0.023	0.058	0.002	0.004
0.775	0.000	0.411	0.025	0.044	0.023	0.762	0.820	0.269	0.005	0.943	0.852
-0.203	-0.111	-0.059	0.252	-0.159	-0.043	-0.160	0.058	0.159	-0.089	-0.079	-0.106
0.000	0.000	0.004	0.000	0.000	0.038	0.000	0.005	0.000	0.000	0.000	0.000
0.122	0.130	-0.055	-0.218	0.033	-0.025	0.097	0.038	-0.082	0.052	0.049	0.069
0.000	0.000	0.007	0.000	0.115	0.234	0.000	0.068	0.000	0.012	0.018	0.001
-0.005	0.176	-0.066	0.121	-0.049	-0.029	-0.085	0.117	0.040	0.005	-0.074	-0.120
0.829	0.000	0.001	0.000	0.018	0.163	0.000	0.000	0.052	0.830	0.000	0.000
-0.116	-0.055	-0.009	0.243	-0.040	-0.069	-0.072	-0.011	0.042	-0.018	-0.067	-0.145
0.000	0.008	0.663	0.000	0.056	0.001	0.001	0.589	0.043	0.377	0.001	0.000
1.000	0.340	-0.047	-0.249	0.145	-0.005	0.027	-0.013	-0.080	-0.002	0.026	0.159
	0.000	0.023	0.000	0.000	0.819	0.190	0.539	0.000	0.935	0.208	0.000
0.302	1.000	-0.216	-0.292	0.101	-0.024	0.033	0.089	-0.173	0.235	0.103	0.326
0.000		0.000	0.000	0.000	0.247	0.107	0.000	0.000	0.000	0.000	0.000
-0.017	-0.177	1.000	0.187	0.095	0.265	-0.138	0.143	0.231	-0.032	0.068	-0.188
0.361	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.001	0.000
-0.222	-0.263	0.217	1.000	-0.102	0.047	-0.181	-0.051	0.232	-0.128	-0.039	-0.230
0.000	0.000	0.000		0.000	0.024	0.000	0.013	0.000	0.000	0.060	0.000
0.095	0.113	0.108	-0.076	1.000	0.106	0.081	0.062	0.258	-0.149	-0.199	-0.036
0.000	0.000	0.000	0.000		0.000	0.000	0.003	0.000	0.000	0.000	0.085
0.038	0.073	0.279	0.045	0.091	1.000	0.014	-0.056	0.185	-0.003	-0.043	-0.083
0.047	0.000	0.000	0.020	0.000		0.508	0.007	0.000	0.886	0.038	0.000
-0.016	0.061	-0.158	-0.115	0.092	0.066	1.000	0.018	-0.140	0.003	-0.249	0.139
0.413	0.001	0.000	0.000	0.000	0.001		0.378	0.000	0.891	0.000	0.000
-0.029	0.035	0.126	0.029	0.080	0.013	-0.001	1.000	0.117	-0.010	-0.054	0.126
0.133	0.069	0.000	0.138	0.000	0.502	0.954		0.000	0.624	0.009	0.000
-0.086	-0.131	-0.039	0.210	0.171	-0.162	-0.053	0.130	1.000	-0.135	-0.134	-0.248
0.000	0.000	0.041	0.000	0.000	0.000	0.005	0.000		0.000	0.000	0.000
-0.005	0.222	-0.009	-0.118	-0.135	0.020	-0.024	-0.019	-0.133	1.000	0.239	0.095
0.800	0.000	0.639	0.000	0.000	0.326	0.239	0.356	0.000		0.000	0.000
0.015	0.075	-0.011	-0.043	-0.165	-0.217	-0.249	-0.030	-0.089	0.174	1.000	-0.018
0.433	0.000	0.564	0.028	0.000	0.000	0.000	0.127	0.000	0.000		0.395
0.136	0.270	-0.229	-0.244	-0.028	-0.004	0.083	0.074	-0.190	0.100	-0.020	1.000
0.000	0.000	0.000	0.000	0.147	0.837	0.000	0.000	0.000	0.000	0.289	

reinsurance ratio from affiliated reinsurers and from non-affiliated reinsurers.[28] Changes in two year loss development is positively and significantly related to changes in total reinsurace ratio and reinsurance ratio from affiliated reinsurers[29], but negatively and significantly related to changes in reinsurance ratio from non-affiliated reinsurers. The change in percentage of long-tail lines to total written premiums is positively related to changes in total reinsurance ratio and reinsurance ratio from affiliated reinsurers. This result is consistent with those of previous studies (e.g., Garven and Lamm-Tennant, 2003; Garven et al., 2014) that show a positive relation between reinsurance demand and percentage of line of long-tail business. The change in coastal premium variable is negatively related to change in total reinsurance ratio and affiliated reinsurance ratio, implying insurers with higher percentage of coastal premium tend to have lower reinsurance from affiliated reinsurers to reduce insolvency risk.[30] Tax shield is not significantly related to demand for reinsurance. This result is consistent with the findings of Garven and Lamm-Tennant (2003). ROA is positively and weakly significantly related to change in reinsurance ratio from non-affiliated reinsurers, suggesting that an insurer with increasing benefit tends to increase reinsurance from non-affiliated reinsurers. Finally, group is not significantly related to reinsurance demand.

Table 4 shows the results of regression of change in reinsurance demand on insurers with routine CEO turnover, non-routine CEO turnover vs. insurers without CEO turnover (reference variable).[31] We find that insurers with non-routine CEO turnover on average increase their total reinsurance ratio, affiliated reinsurance ratio and non-affiliated reinsurance ratio than insurers without CEO turnover. This finding indicates that new CEOs resulting from non-routine CEO turnovers purchase more reinsurance from affiliated reinsurers and reinsurance from non-affiliated reinsurers than insurers without CEO turnover. A possible reason is that new CEOs resulting from non-routine CEO turnover tend to have more conservative strategies and thus increased demand for reinsurance to stabilize earnings

28 The change in underwriting risk is not significantly and positively related to change in reinsurance ratio or non-affiliated reinsurance, but insignificantly and negatively related to change in reinsurance from affiliated reinsures when using univariate analysis.

29 This result is consistent with the findings of Cole and McCullough (2006).

30 The change in percentage of coast premium is not significantly and negatively related to change in total reinsurance ratio and affiliated reinsurance ratio, but is insignificantly and positively related to change in non-affiliated reinsurance ratio when using univariate analysis.

31 Thanks to reviewer's valuable suggestion, we consider three CEO turnover types to discuss in all Models when insurers without CEO turnover are the reference variable.

and reduce risk. New CEOs result from non-routine turnovers have more concerns because they do not have much track records with and trust from the board. The coefficient of routine CEO turnover is not significantly related to change in reinsurance demand when compared to insurers without CEO turnover in all Models. Because new routine CEOs are familiar with the direction of the board, they tend to follow the original reinsurance decision as well. This result is rejects Hypothesis 2. Other results of Table 4 show that corporate governance and control variables which are statistically significant are similar to those in Table 3.

Table 3 Regressions of Reinsurance Demand on CEO Turnover

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Turnover (t-1)	0.043***	0.006	0.032**	0.041	0.011*	0.058
Mutual (t-1)	-0.007	0.915	0.013	0.851	-0.020	0.411
Duality (t-1)	-0.051***	0.007	-0.041**	0.031	-0.010	0.147
Δ Board size	0.001	0.883	0.000	0.972	0.000	0.758
Δ Independent director	0.030	0.474	-0.002	0.963	0.032**	0.035
Big 4 auditor (t-1)	0.007	0.731	-0.001	0.960	0.008	0.276
Δ Ln(na)	-0.279***	0.000	-0.290***	0.000	0.011	0.467
Δ Herfindahl	0.018	0.837	0.066	0.454	-0.048	0.125
Δ Geoherfindahl	-0.475***	0.000	-0.489***	0.000	0.014	0.702
Δ Leverage	0.034	0.769	-0.170	0.151	0.204***	0.000
Δ Underwriting risk	-0.298***	0.000	-0.215***	0.008	-0.083***	0.004
Δ 2yearLossDevelopment	0.091***	0.011	0.139***	0.000	-0.048***	0.000
Δ Coastal prem	-0.365**	0.014	-0.308**	0.040	-0.057	0.286
Δ Long-tail	0.249***	0.007	0.235**	0.012	0.014	0.666
Δ Tax_ex	-0.023	0.354	-0.026	0.315	0.002	0.797
Δ ROA	0.068	0.650	-0.022	0.883	0.090*	0.095
Group (t-1)	0.012	0.726	0.026	0.443	-0.014	0.235
Intercept	0.026	0.689	0.018	0.778	0.007	0.751
Hausman Test	14.29		13.08		28.84	
R-Square	0.086		0.084		0.122	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on CEO turnover. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 4 Regressions of Reinsurance Demand on Routine CEO, Non-Routine CEO vs. Non CEO Turnover

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Routine CEO (t-1)	0.019	0.426	0.025	0.314	-0.005	0.530
Non-Routine CEO (t-1)	0.059***	0.003	0.036**	0.067	0.022***	0.002
Mutual (t-1)	-0.009	0.887	0.012	0.858	-0.021	0.370
Duality (t-1)	-0.050***	0.008	-0.041**	0.032	-0.009	0.173
Δ Board size	0.000	0.893	0.000	0.979	0.000	0.764
Δ Independent director	0.033	0.434	-0.001	0.982	0.033**	0.026
Big 4 auditor (t-1)	0.007	0.753	-0.001	0.953	0.008	0.299
Δ Ln(na)	-0.276***	0.000	-0.289***	0.000	0.012	0.395
Δ Herfindahl	0.017	0.843	0.066	0.456	-0.049	0.122
Δ Geoherfindahl	-0.479***	0.000	-0.490***	0.000	0.011	0.771
Δ Leverage	0.038	0.745	-0.168	0.154	0.206***	0.000
Δ Underwriting risk	-0.297***	0.000	-0.215***	0.008	-0.082***	0.004
Δ 2yearLossDevelopment	0.091**	0.011	0.139***	0.000	-0.048***	0.000
Δ Coastal prem	-0.365**	0.014	-0.307**	0.041	-0.058	0.281
Δ Long-tail	0.251***	0.007	0.235**	0.012	0.015	0.643
Δ Tax_ex	-0.023	0.358	-0.026	0.317	0.002	0.789
Δ ROA	0.072	0.632	-0.021	0.889	0.093*	0.086
Group (t-1)	0.011	0.741	0.026	0.446	-0.015	0.220
Intercept	0.029	0.655	0.019	0.768	0.009	0.685
Hausman Test	14.37		13.06		28.26	
R-Square	0.087		0.084		0.126	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on routine CEO, non-routine CEO vs. non CEO turnover (reference variable). "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 5 shows the results of the regression of change in reinsurance demand on insurers with forced CEO turnover, voluntary CEO turnover vs. insurers without CEO turnover (reference variable). We find that forced CEO turnover are positively and significantly related to changes in total reinsurance ratio, affiliated reinsurance ratio and non-affiliated reinsurance ratio. Voluntary CEO turnover are not significantly related to changes in reinsurance decision. This result suggests that insurers with forced CEO turnover are likely to have more reinsurance than insurers without CEO turnover. In general, insurers with new CEOs resulting from forced CEO turnover are likely to have more conservative strategies and purchase more reinsurance, because they are aware of the fact that their predecessor are

fired and want to stabilize earnings and reduce risk to protect the job security of new CEOs. This result rejects Hypothesis 3. The results of corporate governance variables and all control variables are very similar to those in Table 3.

We next investigate the interaction effect between CEO turnover and organizational structure whether resulting in change in reinsurance demand in Table 6. Model ΔReins_ratio presents that the coefficient of the interaction term between CEO turnover and mutual insurers is negative and weakly significant, suggesting the positive relation between CEO turnover and change in total reinsurance ratio is weakened for mutual insurers. This result rejects Hypothesis 4.

Table 5 Regressions of Reinsurance Demand on Voluntary CEO, Forced CEO vs. Non CEO Turnover

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Voluntary CEO (t-1)	0.006	0.818	0.000	0.998	0.006	0.521
Forced CEO (t-1)	0.061***	0.001	0.048**	0.012	0.013*	0.058
Mutual (t-1)	-0.005	0.940	0.014	0.830	-0.019	0.417
Duality (t-1)	-0.052***	0.006	-0.042**	0.028	-0.010	0.143
Δ Board size	0.001	0.851	0.000	0.944	0.000	0.747
Δ Independent director	0.029	0.486	-0.003	0.950	0.032**	0.035
Big 4 auditor (t-1)	0.006	0.779	-0.002	0.917	0.008	0.286
Δ Ln(na)	-0.278***	0.000	-0.289***	0.000	0.011	0.463
Δ Herfindahl	0.017	0.843	0.066	0.458	-0.048	0.124
Δ Geoherfindahl	-0.467***	0.000	-0.483***	0.000	0.015	0.684
Δ Leverage	0.023	0.843	-0.179	0.129	0.202***	0.000
Δ Underwriting risk	-0.295***	0.000	-0.212***	0.008	-0.082***	0.004
Δ 2yearLossDevelopment	0.088**	0.013	0.136***	0.000	-0.048***	0.000
Δ Coastal prem	-0.357**	0.016	-0.301**	0.046	-0.056	0.296
Δ Long-tail	0.246***	0.008	0.232**	0.013	0.014	0.673
Δ Tax_ex	-0.022	0.396	-0.024	0.348	0.003	0.777
Δ ROA	0.067	0.655	-0.023	0.878	0.090*	0.096
Group (t-1)	0.013	0.702	0.027	0.426	-0.014	0.240
Intercept	0.032	0.625	0.023	0.721	0.008	0.729
Hausman Test	14.80		13.63		28.52	
R-Square	0.087		0.085		0.122	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on voluntary CEO, forced CEO vs. non CEO turnover (reference variable). "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 6 Regressions of Reinsurance Demand on CEO Turnover with Interaction Effect of Organizational Structure

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Turnover (t-1)	0.034	0.452	0.018	0.687	0.015	0.342
Mutual (t-1)	0.015	0.823	0.030	0.662	-0.015	0.543
Turnover (t-1)×Mutual (t-1)	-0.057*	0.064	-0.047	0.125	-0.009	0.410
Duality (t-1)	-0.047**	0.018	-0.034*	0.088	-0.013*	0.074
Δ Board size	0.000	0.901	0.000	0.989	0.000	0.761
Δ Independent director	0.033	0.437	0.007	0.872	0.026*	0.088
Big 4 auditor (t-1)	0.002	0.925	-0.007	0.734	0.009	0.224
Δ Ln(na)	-0.277***	0.000	-0.287***	0.000	0.010	0.502
Δ Herfindahl	0.026	0.763	0.074	0.401	-0.048	0.127
Δ Geoherfindahl	-0.486***	0.000	-0.501***	0.000	0.015	0.689
Δ Leverage	0.030	0.798	-0.168	0.154	0.198***	0.000
Δ Underwriting risk	-0.303***	0.000	-0.224***	0.005	-0.079***	0.006
Δ 2yearLossDevelopment	0.089**	0.013	0.140***	0.000	-0.052***	0.000
Δ Coastal prem	-0.371**	0.012	-0.308**	0.041	-0.064	0.234
Δ Long-tail	0.254***	0.006	0.243***	0.010	0.011	0.737
Δ Tax_ex	-0.022	0.394	-0.024	0.352	0.002	0.799
Δ ROA	0.067	0.657	-0.015	0.923	0.081	0.133
Group (t-1)	0.014	0.676	0.029	0.387	-0.015	0.202
Intercept	0.032	0.625	0.025	0.705	0.007	0.770
Hausman Test	15.08		14.05		28.27	
R-Square	0.089		0.089		0.128	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on CEO turnover with interaction terms of organizational structure. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Tables 7 (8) shows empirical results of change in reinsurance demand on the interaction effect between routine CEO turnover, non-routine CEO turnover *vs*. non CEO turnover (voluntary CEO turnover, forced CEO turnover vs. non CEO turnover) and organizational structure. The coefficient of interaction term of non-routine CEO turnover and mutual form is negative and significant in Models ΔReins_ratio and ΔReins_aff_ratio of Table 7. The result suggests that mutual insurers with non-routine CEO turnover are more likely to purchase less reinsurance after CEO turnovers. This finding suggests that the positive relation between insurers with non-routine CEO turnover and change in total reinsurance

ratio is weakened for mutual insurers. One possible reason is that new CEOs of mutual insurers from non-routine CEO turnover have higher risk-taking behavior than stock insurers. On average, mutual insurers with non-routine CEO turnover may attempt to save reinsurance costs. The interaction term between routine CEO turnover and reinsurance demand is not statistically significant.

Table 7 Regressions of Reinsurance Demand on Routine CEO, Non-Routine CEO vs. Non CEO Turnover with Interaction Effect of Organizational Structure

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Routine CEO (t-1)	0.028	0.273	0.033	0.210	-0.005	0.620
Routine CEO (t-1)×Mutual (t-1)	-0.053	0.352	-0.048	0.408	-0.005	0.804
Non-Routine CEO (t-1)	0.083***	0.000	0.058**	0.015	0.025***	0.003
Non-Routine CEO (t-1)×Mutual (t-1)	-0.078*	0.055	-0.068*	0.099	-0.010	0.503
Mutual (t-1)	0.021	0.759	0.038	0.577	-0.018	0.474
Duality (t-1)	-0.048**	0.011	-0.039**	0.041	-0.009	0.186
Δ Board size	0.000	0.918	0.000	0.998	0.000	0.771
Δ Independent director	0.032	0.436	-0.001	0.980	0.033**	0.026
Big 4 auditor (t-1)	0.006	0.766	-0.002	0.941	0.008	0.301
Δ Ln(na)	-0.275***	0.000	-0.288***	0.000	0.013	0.391
Δ Herfindahl	0.023	0.788	0.071	0.420	-0.048	0.128
Δ Geoherfindahl	-0.485***	0.000	-0.495***	0.000	0.010	0.786
Δ Leverage	0.035	0.761	-0.171	0.149	0.206***	0.000
Δ Underwriting risk	-0.300***	0.000	-0.217***	0.007	-0.083***	0.004
Δ 2yearLossDevelopment	0.087**	0.014	0.136***	0.000	-0.048***	0.000
Δ Coastal prem	-0.373**	0.012	-0.315**	0.036	-0.059	0.273
Δ Long-tail	0.252***	0.006	0.236**	0.012	0.016	0.640
Δ Tax_ex	-0.022	0.376	-0.025	0.331	0.003	0.778
Δ ROA	0.067	0.653	-0.025	0.870	0.092*	0.088
Group (t-1)	0.014	0.683	0.028	0.408	-0.014	0.230
Intercept	0.030	0.647	0.020	0.761	0.010	0.682
Hausman Test	10.38		12.14		24.46	
R-Square	0.089		0.086		0.126	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on routine CEO, non-routine CEO vs. non CEO turnover (reference variable) with interaction terms of organizational structure. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Model ΔReins_aff_ratio in Table 8 shows that the coefficient of interaction term between forced CEO turnover and mutual insurers is significant and negative. This finding suggests that mutual insurers with forced CEO turnover are more likely to purchase less reinsurance from affiliated reinsurers after CEO turnovers. This result is similar to that of interaction term between non-routine CEO turnover and mutual insurers. The explanation is similar, and thus, we will not provide further details. The interaction term between voluntary CEO turnover and mutual form is not significantly related to reinsurance demand. The results of others variables in Tables 7 and 8 are very similar to those in Table 6 with one exception. Duality becomes insignificantly related to reinsurance from non-affiliated reinsurers.

Table 9 shows the regression results of change in reinsurance demand on CEO turnover, organizational structure and corporate governance variables with SOX Act. In all Models, we find the interaction effect between CEO turnover and SOX are not significant, suggesting that new CEOs do not change their reinsurance decisions after SOX. The interaction term between SOX and CEO/chairperson duality is negatively and significantly related to change in total reinsurance ratio and affiliated reinsurance ratio, implying that insurers with CEO/chairperson duality tend to purchase less total reinsurance and reinsurance from affiliated reinsurers after SOX. We also find that the interaction term between SOX and change in percentage of independent directors on the board is negatively and significantly related to non-affiliated reinsurance ratio post-SOX. One possible reason is that increasing the number of independent directors can serve as external monitors to transfer risk, suggesting insurers with higher percentage of independent directors on the board are likely to purchase less reinsurance from non-affiliated reinsurers to reduce reinsurance cost after SOX. This result rejects Hypothesis 5. The results of control variable are similar those in Table 3.

Table 10 reports that the regression results of change in reinsurance demand on routine CEO turnover, non-routine CEO turnover vs. non CEO turnover, organizational structure and corporate governance variables with SOX Act. Table 11 also presents the interaction terms among forced CEO turnover, voluntary CEO turnover *vs*. non CEO turnover and SOX. In all Models, we find the interaction terms of CEO turnover (routine, non-routine, forced, and voluntary CEO turnover) and SOX are not significant, suggesting new CEOs from different types of turnover do not change the reinsurance decision after SOX. The results of corporate governance and control variable are similar those in Table 9.

Table 8 Regressions of Reinsurance Demand on Voluntary CEO, Forced CEO vs. Non CEO Turnover with Interaction Effect of Organizational Structure

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
Voluntary CEO (t-1)	0.003	0.932	-0.004	0.925	0.007	0.620
Voluntary CEO (t-1) ×Mutual (t-1)	0.004	0.943	0.006	0.915	-0.002	0.918
Forced CEO (t-1)	0.087***	0.000	0.071***	0.002	0.016**	0.050
Forced CEO (t-1) ×Mutual (t-1)	-0.079**	0.032	-0.070*	0.061	-0.009	0.497
Mutual (t-1)	0.026	0.701	0.042	0.543	-0.016	0.520
Duality (t-1)	-0.049***	0.010	-0.039**	0.040	-0.010	0.158
Δ Board size	0.001	0.855	0.000	0.946	0.000	0.753
Δ Independent director	0.031	0.453	-0.001	0.988	0.032**	0.034
Big 4 auditor (t-1)	0.006	0.772	-0.002	0.923	0.008	0.284
Δ Ln(na)	-0.277***	0.000	-0.288***	0.000	0.011	0.460
Δ Herfindahl	0.021	0.813	0.068	0.439	-0.048	0.129
Δ Geoherfindahl	-0.467***	0.000	-0.482***	0.000	0.015	0.690
Δ Leverage	0.018	0.879	-0.184	0.120	0.202***	0.000
Δ Underwriting risk	-0.296***	0.000	-0.214***	0.008	-0.083***	0.004
Δ 2yearLossDevelopment	0.084**	0.018	0.133***	0.000	-0.049***	0.000
Δ Coastal prem	-0.361**	0.015	-0.304**	0.043	-0.057	0.291
Δ Long-tail	0.247***	0.007	0.233***	0.013	0.014	0.670
Δ Tax_ex	-0.019	0.451	-0.022	0.394	0.003	0.755
Δ ROA	0.056	0.710	-0.033	0.827	0.089	0.101
Group (t-1)	0.013	0.695	0.027	0.422	-0.014	0.242
Intercept	0.033	0.613	0.025	0.708	0.008	0.729
Hausman Test	10.56		11.94		24.95	
R-Square	0.090		0.087		0.123	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on voluntary CEO, forced CEO vs. non CEO turnover (reference variable) with interaction terms of organizational structure. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 9 Regressions of Reinsurance Demand on CEO Turnover with SOX Act

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
SOX	-0.007	0.738	-0.018	0.408	0.011	0.162
Turnover (t-1)	0.027	0.285	0.012	0.646	0.015*	0.095
SOX×Turnover (t-1)	0.019	0.523	0.025	0.403	-0.006	0.562
Mutual (t-1)	-0.001	0.984	0.017	0.801	-0.018	0.445
SOX×Mutual (t-1)	0.000	0.995	0.000	0.991	0.000	0.989
Duality (t-1)	-0.035*	0.090	-0.022	0.303	-0.013*	0.073
SOX×Duality (t-1)	-0.041*	0.054	-0.050**	0.023	0.008	0.287
Δ Board size	0.002	0.570	0.002	0.650	0.000	0.765
SOX× Δ Board size	-0.003	0.285	-0.004	0.259	0.000	0.834
Δ Independent director	0.072	0.147	0.016	0.752	0.056***	0.002
SOX× Δ Independent director	-0.071	0.202	-0.019	0.731	-0.051***	0.010
Big 4 auditor (t-1)	0.011	0.643	0.003	0.883	0.007	0.385
SOX×Big 4 auditor (t-1)	-0.017	0.545	-0.018	0.518	0.001	0.886
Δ Ln(na)	-0.278***	0.000	-0.288***	0.000	0.009	0.521
Δ Herfindahl	0.019	0.826	0.067	0.448	-0.048	0.127
Δ Geoherfindahl	-0.473***	0.000	-0.483***	0.000	0.011	0.775
Δ Leverage	0.033	0.780	-0.168	0.155	0.201***	0.000
Δ Underwriting risk	-0.306***	0.000	-0.225***	0.005	-0.081***	0.005
Δ 2yearLossDevelopment	0.090**	0.012	0.136***	0.000	-0.046***	0.000
Δ Coastal prem	-0.355**	0.017	-0.304**	0.043	-0.051	0.339
Δ Long-tail	0.249***	0.007	0.235**	0.012	0.014	0.673
Δ Tax_ex	-0.021	0.405	-0.024	0.350	0.003	0.748
Δ ROA	0.048	0.747	-0.043	0.778	0.092*	0.092
Group (t-1)	0.010	0.769	0.024	0.472	-0.014	0.227
Intercept	0.027	0.678	-0.018	0.408	0.011	0.162
Hausman Test	13.07		12.08		36.79	
R-Square	0.090		0.088		0.128	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on CEO turnover, organizational structure and corporate governance variables with SOX Act. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 10 Regressions of Reinsurance Demand on Routine CEO, Non-Routine CEO vs. Non CEO Turnover with SOX Act

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
SOX	-0.007	0.738	-0.017	0.426	0.010	0.188
Routine CEO (t-1)	0.012	0.693	0.020	0.493	-0.009	0.403
SOX×Routine CEO (t-1)	0.017	0.740	0.003	0.949	0.013	0.459
Non-Routine CEO (t-1)	0.031	0.321	0.000	0.993	0.031***	0.005
SOX×Non-Routine CEO (t-1)	0.039	0.321	0.054	0.178	-0.015	0.297
Mutual (t-1)	-0.002	0.970	0.018	0.788	-0.021	0.388
SOX×Mutual (t-1)	-0.001	0.975	0.000	0.988	0.000	0.966
Duality (t-1)	-0.033	0.118	-0.019	0.375	-0.014*	0.067
SOX×Duality (t-1)	-0.042*	0.052	-0.050**	0.021	0.009	0.263
Δ Board size	0.002	0.584	0.002	0.662	0.000	0.777
SOX× Δ Board size	-0.003	0.282	-0.004	0.250	0.000	0.795
Δ Independent director	0.073	0.141	0.016	0.756	0.057***	0.001
SOX× Δ Independent director	-0.067	0.226	-0.016	0.772	-0.051**	0.011
Big 4 auditor (t-1)	0.010	0.672	0.003	0.906	0.007	0.400
SOX×Big 4 auditor (t-1)	-0.017	0.544	-0.018	0.523	0.001	0.909
Δ Ln(na)	-0.275***	0.000	-0.286***	0.000	0.011	0.464
Δ Herfindahl	0.015	0.866	0.063	0.479	-0.048	0.127
Δ Geoherfindahl	-0.474***	0.000	-0.480***	0.000	0.006	0.872
Δ Leverage	0.034	0.770	-0.169	0.154	0.203***	0.000
Δ Underwriting risk	-0.305***	0.000	-0.225***	0.005	-0.079***	0.006
Δ 2yearLossDevelopment	0.090**	0.012	0.136***	0.000	-0.046***	0.000
Δ Coastal prem	-0.352**	0.017	-0.300**	0.046	-0.052	0.327
Δ Long-tail	0.248***	0.007	0.233**	0.013	0.015	0.645
Δ Tax_ex	-0.021	0.405	-0.024	0.346	0.003	0.730
Δ ROA	0.049	0.742	-0.046	0.764	0.095*	0.079
Group (t-1)	0.008	0.811	0.022	0.507	-0.014	0.228
Intercept	0.030	0.651	0.019	0.771	0.010	0.663
Hausman Test	11.45		11.71		36.47	
R-Square	0.091		0.089		0.134	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on routine CEO, non-routine CEO vs. non CEO turnover (reference variable), organizational structure and and corporate governance variables with SOX Act. "Δx" means change in x. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

Table 11 Regressions of Reinsurance Demand on Voluntary CEO, Forced CEO vs. Non CEO Turnover with SOX Act

Dependent variables	ΔReins ratio		ΔReins_aff_ratio		ΔReins_nonaff_ratio	
Independent Variables	Estimate	P value	Estimate	P value	Estimate	P value
SOX	-0.008	0.707	-0.018	0.394	0.010	0.176
Voluntary CEO (t-1)	0.014	0.769	-0.005	0.911	0.019	0.260
SOX×Voluntary CEO (t-1)	-0.014	0.805	0.004	0.949	-0.018	0.388
Forced CEO (t-1)	0.023	0.482	0.016	0.645	0.008	0.516
SOX×Forced CEO (t-1)	0.050	0.212	0.042	0.299	0.008	0.594
Mutual (t-1)	0.003	0.963	0.020	0.766	-0.017	0.480
SOX×Mutual (t-1)	0.000	0.988	0.000	0.987	0.000	0.997
Duality (t-1)	-0.036*	0.083	-0.022	0.291	-0.014*	0.068
SOX×Duality (t-1)	-0.041*	0.055	-0.050**	0.022	0.009	0.267
Δ Board size	0.002	0.527	0.002	0.618	0.000	0.726
SOX× Δ Board size	-0.003	0.272	-0.004	0.247	0.000	0.830
Δ Independent director	0.070	0.156	0.014	0.775	0.056***	0.002
SOX× Δ Independent director	-0.068	0.218	-0.017	0.760	-0.051**	0.011
Big 4 auditor (t-1)	0.008	0.711	0.002	0.948	0.007	0.399
SOX×Big 4 auditor (t-1)	-0.016	0.565	-0.017	0.537	0.001	0.889
Δ Ln(na)	-0.276***	0.000	-0.286***	0.000	0.010	0.489
Δ Herfindahl	0.014	0.868	0.064	0.469	-0.050	0.115
Δ Geoherfindahl	-0.470***	0.000	-0.480***	0.000	0.010	0.789
Δ Leverage	0.021	0.854	-0.178	0.133	0.199***	0.000
Δ Underwriting risk	-0.300***	0.000	-0.221***	0.006	-0.079***	0.006
Δ 2yearLossDevelopment	0.087**	0.015	0.134***	0.000	-0.047***	0.000
Δ Coastal prem	-0.349**	0.019	-0.298**	0.048	-0.051	0.342
Δ Long-tail	0.246***	0.008	0.232**	0.013	0.014	0.683
Δ Tax_ex	-0.020	0.419	-0.023	0.368	0.003	0.767
Δ ROA	0.054	0.719	-0.040	0.793	0.094*	0.083
Group (t-1)	0.008	0.804	0.024	0.486	-0.015	0.204
Intercept	0.035	0.598	0.024	0.719	0.011	0.657
Hausman Test	12.66		12.32		40.16	
R-Square	0.092		0.090		0.128	
N	2,772		2,772		2,772	

Note: The table shows the regression results of reinsurance demand on voluntary CEO, forced CEO vs.non CEO turnover (reference variable), organizational structure and and corporate governance variables with SOX Act. "Δ*x*" means change in *x*. Specifically it sugggets that $\Delta x_{i,t}$ means $x_{i,t}$ minus $x_{i,t-1}$. Please see definition of all variables in Appendix A. ***significant at 1%, ** significant at 5%, * significant at 10%.

4.3 Robust Check

For robustness, we use level value with one-year lag instead of changes in all independent variables and control variables when dependent variable is change in reinsurance demand. All results for the variables of interest including CEO turnover, routine CEO turnover, non-routine CEO turnover, forced CEO turnover, and voluntary CEO turnover are qualitatively similar (the results are not tabulated). We also obtain similar results on interest variables when using the original value for total reinsurance ratio, reinsurance ratio from affiliated reinsurers, and reinsurance ratio from non-affiliated reinsurers rather than change value as dependent variables and original value for all independent variables and control variables with one-year lag (the results are not tabulated). In addition, we consider the products portfolios[32] (e.g., percentage of commercial lines) in this paper. We next separate the percentage of long-tail lines and percentage of short-tail lines (reference variable) into four categories (e.g., Choi, Park, and Ho, 2013): percentage of commercial long-tail lines, percentage of commercial short-tail lines, percentage of personal long-tail lines and percentage of personal short-tail lines (reference variable). The evidence (not tabulated) shows percentage of commercial long-tail lines is positively and significantly related to changes in total reinsurance ratio and reinsurance ratio from affiliated reinsurers. More important, the results of variables of interest controlling products portfolios are similar to those in Table 3.

5. Conclusion

The paper investigates the impact of CEO turnover on the demand for total reinsurance, demand for reinsurance from affiliated reinsurers and demand for reinsurance from non-affiliated reinsurers in the U.S. property casualty insurance industry from 2000 through 2010. Our evidence shows that insurers with CEO turnover are more likely to increase reinsurance demand than insurers without CEO turnover after CEO turnover. Specifically, an insurer with new CEO is more likely to have a more conservative strategy and thus increase demand for reinsurance because new CEO does not have much track records with the board and trust from the board.

More detailed analyses indicate that insurers with non-routine (forced) CEO turnover are more likely to increase reinsurance than insurers without CEO turnover, but insurers with routine (voluntary) CEO turnover are not likely to change reinsurance policies after CEO

32 We thank a reviewer for this valuable comment.

turnover. One possible explanation for these results is that an insurer with a new CEO resulting from non-routine (forced) CEO turnover is more likely to have a more conservative strategy and thus increased demand for reinsurance to stabilize earnings and reduce risk to protect the job security of new CEO. If insurers suffer huge losses and without sufficient reinsurance, new CEOs are more likely to be fired than CEOs without turnover.

The evidence shows that the interaction effect between mutual form and CEO turnover is negatively related to reinsurance demand after CEO turnover. Specifically, mutual insurers with non-routine (forced) CEO turnover are more likely to purchase less reinsurance from affiliated reinsurers. Finally, our results also show that insurers with CEO turnover are not related to reinsurance demand post-SOX. The overall results of this study indicate that CEO turnovers have a significant impact on the demand for reinsurance.

6. Limitations and Suggestions for Future Research

We believe that possible reasons for CEO replacement include CEO's corporate policies and/or governance are unsatisfactory or unappreciated by the board of directors. After the new CEO is on board, he or she may or may not change corporate policies. Reinsurance or risk management policy is probably one of the policies that are considered to be changed. In fact, he or she does not necessarily change reinsurance policy. Moreover, it is actually the new CEO's characteristics (e.g., overconfidence and risk aversion) or views of the reinsurance market (e.g., reinsurance cost, alternative risk transfer instruments) that primarily determine reinsurance policy. Future research topics can examine the relationship between new CEO's characteristics (e.g., overconfidence and risk aversion) or views of the reinsurance market (e.g., reinsurance cost, alternative risk transfer instruments) that primarily determine reinsurance policy.[33] Finally, changes in reinsurance decisions not only refer to reinsurance amount/ratio but also the types of reinsurance after CEO turnover. Thus, a study on types of reinsurance transactions (with limited current data) offers promising areas for future research.[34]

33 We thank a reviewer for this valuable comment.

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Appendix Definition of Variables

Variable	Definition
Dependent variables	
Δ Re*ins_ratio*$_{i,t}$	The variable is the difference value of total reinsurance ratio of each year minus total reinsurance ratio of year -1. Total reinsurance ratio (Re*ins_ratio*$_{i,t}$) is measured as the ratio of reinsurance ceded divided by the sum of direct premiums written and reinsurance assumed.
Δ Re*ins_aff_ratio*$_{i,t}$	The variable is the difference value of affiliated reinsurance ratio of each year minus affiliated reinsurance ratio of year -1. Affiliated reinsurance ratio (Re*ins_aff_ratio*$_{i,t}$) is measured as the ratio of affiliated reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed.
Δ Re*ins_nonaff_ratio*$_{i,t}$	The variable is the difference value of non-affiliated reinsurance ratio of each year minus non-affiliated reinsurance ratio of year -1. Non-affiliated reinsurance ratio (Re*ins_nonaff_ratio*$_{i,t}$) is measured as the ratio of non-affiliated reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed.
Independent variables	
CEO turnover variables	
Turnover$_{i,t}$	Turnover is an indicator variable: 1 = if CEO changes from year *t*–1 to *t*, 0 = otherwise.
RoutineCEO$_{i,t}$	Routine CEO turnover is an indicator variable: 1 = if the departing CEO remains on the board of directors in year *t*, 0 = otherwise.
Non–RoutineCEO$_{i,t}$	Non-routine CEO turnover is an indicator variable: 1 = if the departing CEO does not remain on the board of directors in year *t*, 0 = otherwise.
ForcedCEO$_{i,t}$	Forced CEO turnover is an indicator variable: 1 = if the departing CEO does not leave for reasons for health, death, or to accept another position; or departing CEO is under the age of 60 and thus less likely to be retiring in the year *t*, 0 = otherwise.
VoluntaryCEO$_{i,t}$	Voluntary CEO turnover is an indicator variable: 1 = if the departing CEO leaves for reasons for retirement, health, death, or to accept another position in year *t*, 0 = otherwise.
Organizational structure and Corporate governance variables	
Mutual$_{i,t}$	Mutual is a binary variable: 1 = mutual organizational structure, 0 = stock.
Duality$_{i,t}$	CEO/chairperson of board duality, is a binary variable, 1 if the CEO and chairperson of the board are the same person, 0 otherwise.
Boardsize$_{i,t}$	Board size is defined as total number of directors on the board.
Independent_directors$_{i,t}$	Independent directors is defined as the percentage of independent directors on the board.
Big4Auditors$_{i,t}$	Big 4 auditors, which is a binary variable, 1 if the auditor is one of the four largest accounting companies in the U.S. (PricewaterhouseCoopers LLP, Ernst & Young, Deloitte, and KPMG), and 0 otherwise.

Variable	Definition
Control variables	
$Ln(na)_{i,t}$	Ln(na) is proxy for firm size which is the natural logarithm of net admitted assets.
$Herfindahl_{i,t}$	Herfindahl index = $\Sigma(PW_i/TPW)^2$, where PW_i is the value of written premiums in line i and TPW is the insurer's total written premiums.
$Geoherfindahl_{i,t}$	Geographic Herfindahl index is defined as $\Sigma(PW_i/TPW)^2$ where PW_i is the value of written premiums in state i, and TPW is the insurer's total written premiums.
$Leverage_{i,t}$	1 minus the surplus-to-assets ratio.
$UnderwritingRisk_{i,t}$	Underwriting risk is measured as the standard deviation of the loss ratio.
$2year\_Loss\_Development_{i,t}$	Two year loss development is defined as the development in estimated losses and loss expenses incurred two years before the current year and prior year scaled by policyholders' surplus.
$Coastal\_prem_{i,t}$	Coastal premium is measured as the percentage of sum of the premium when the insurer is domiciled in a hurricane-prone state (Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, and Virginia) divided by total net written premium.
$Long–tail_{i,t}$	Percentage of long-tail lines is the premiums of long-tail lines divided by total net written premiums. Long-tail lines or short-tail lines are determined by the length of the loss payout period, as defined by Schedule P of the NAIC annual financial statement.
$Tax\_ex_{i,t}$	Tax-exempt is measured as the ratio of tax-exempt investment income to total investment income.
$ROA_{i,t}$	ROA is net income on admitted assets.
$Group_{i,t}$	Group is an indicator variable, 1 if the firm is a member of a group, 0 otherwise.
SOX	SOX is a binary variable, 1 = if year is 2005 to 2011, 0 = otherwise.

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作者簡介

* 何佳玲

Chia-Ling Ho holds her PhD in Risk Management and Insurance from Feng Chia University. She is an assistant professor of Department of Insurance, Tamkang University, Taiwan. Her research interests include corporate governance, risk taking and reinsurance demand, etc. Her works have appeared in Journal of Risk and Insurance, International Review of Economics & Finance, Managerial Finance and Academia Economic Papers, and so on.

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* E-mail: clho@mail.tku.edu.tw