How do co-opted directors influence corporate risk-taking?

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Abstract

Motivated by agency theory, we explore the effect of co-opted directors, i.e. directors appointed after the incumbent CEO assumes office, on corporate risk taking. Our results show that a higher proportion of co-opted directors on the board leads to significantly higher corporate risk-taking, as reflected by the substantially higher volatility in stock returns and a higher standard deviation of Tobin' q. The evidence is consistent with the notion that co-opted directors represent a weakened governance mechanism that allows managers to take more risk. Additional tests show that endogeneity is unlikely, including a fixed-effects analysis, an instrumental-variable analysis, propensity score matching, and an analysis where we exploit the Sarbanes-Oxley Act as an exogenous regulatory shock that raises board co-option. Crucially, our evidence shows that board co-option can explain the extent of corporate risk-taking much better than does board independence, which has been the dominant measure of board quality in the literature.

JEL Classification: G32, G34

Keywords: co-opted directors, co-option, risk-taking, agency theory, corporate governance, board of directors

I. Introduction

The Great Recession of 2008, the most recent financial crisis, was triggered by corporate executives taking excessive risk. To prevent future crises, it is crucial to understand the nature of corporate risk-taking. Effective corporate governance can alleviate excessive risk-taking. In fact, prior research has examined how governance mechanisms influence corporate risk-taking. For instance, a number of studies examine how executive compensation, a primary element of a firm's governance structure, affects risk-taking (Guay, 1999; Coles, Daniel, and Naveen, 2006; Low, 2009; Dong, Wang, and Xie, 2010; Armstrong and Vashishtha, 2012; Hayes, Lemmon, and Qiu, 2012; Gormley, Matsa, and Milbourn, 2013). Beyond executive compensation, Kim and Lu (2011) investigate the moderating effects of external governance on CEO ownership and corporate risk-taking. Bargeron, Lehn, and Zutter (2010), and Cohen, Dey, and Lys (2013) assess the effects of the Sarbanes-Oxley (SOX) Act on corporate risk-taking.

Our study contributes to the literature by investigating how the board of directors, which is the paramount governance mechanism, influences the degree of risk-taking. In the literature, the most dominant measure of board quality is board composition, i.e. the proportion of independent outside directors on the board. In a recent study, however, Coles, Daniel, and Naveen (2014) show that one aspect of the board of directors that has been neglected in the literature has a significant impact on corporate outcomes. In particular, they show that co-opted directors i.e. directors appointed after the incumbent CEO assumes office, weaken board monitoring. For instance, the proportion of co-opted directors on the board leads to more excessive executive compensation and lower pay-performance sensitivities. They suggest that the proportion of co-opted directors constitutes an alternative measure of board quality. Consistent with Coles, Daniel, and Naveen (2014), Jiraporn and Lee (2016) demonstrate that co-opted directors lead to a weaker tendency for

firms to pay dividends and, for dividend-paying firms, smaller dividends. They argue that co-opted boards constitute a weakened governance mechanism that allows managers to retain more free cash flow within the firm, rather than pay it out as dividends.

Motivated by prior research on corporate governance in general and on co-opted directors in particular, we seek to understand how co-opted directors influence corporate risk-taking. We employ several alternative measures of risk-taking, i.e. total risk, idiosyncratic risk, and systematic risk. Our empirical evidence shows that firms with more co-opted directors on the board employ corporate policies that are significantly more risky, as reflected by the significantly higher volatility in stock returns. To confirm the results, we also employ additional measures of risk-taking. In particular, we calculate the standard deviations of firm value (represented by Tobin's q) in the next three year and the next five years and use them as our alternative proxies for risk-taking. The results show that firms with more co-opted directors experience more volatility in firm value. It appears that corporate executives tend to take excessive risk, probably because of the nature of the compensation that ties executive pay to firm performance. This tendency to take more risk is exacerbated when the board of directors is co-opted.

We also execute additional analysis to minimize endogeneity. First, we run a fixed-effects regression analysis. This approach captures only the variation over time within firms. So, it minimizes the omitted-variable bias. The fixed-effects results are still consistent, showing that our results are not likely driven by unobservable characteristics. Second, we look at firms where co-option does not change over time for two consecutive years. For these firms, reverse causality is unlikely because co-option remains constant and thus clearly does not change in response to changes in the degree of risk-taking. We still obtain consistent results. Third, we execute an instrumental variable analysis using as our instrument the value of co-option in the earliest year.

Because co-option in the earliest year could not have resulted from risk-taking in any of the subsequent years, reverse causality is unlikely. The results remain similar. In addition, we construct a matched control sample using propensity score matching based on several firm and board characteristics. Using the propensity-score matched sample, we continue to find that more co-opted directors bring about more risk-taking.

Finally, we run a quasi-natural experiment. In particular, we exploit the passage of the Sarbanes-Oxley Act of 2002 (SOX) as an exogenous regulatory shock. SOX required the majority of independent directors on the board. Firms that were not in compliance tended to appoint outside directors to be in compliance. Thus, this represents an exogenous shock to board co-option. This approach is substantially less vulnerable to endogeneity and is much more likely to show a causal effect. Using SOX as a regulatory shock, our analysis shows that co-opted directors are not merely associated with, but rather bring about more risk-taking.

Our research makes several contributions to the literature. First and foremost, we contribute to the literature in corporate governance. Board governance has been extensively examined in the literature. The most dominant measure of board quality is board independence. We show that board co-option, rather than board independence, is more relevant to corporate risk taking. This is critically important because public policies such as the Sarbanes-Oxley Act (SOX) were motivated by the presupposition that board independence represented board quality. Our results suggest that an additional dimension, i.e. board co-option, should be taken into account as well.

Second, there has been a proliferation of scholarship that investigates corporate risk taking. This is, to a large extent, motivated by the latest financial crisis, which was triggered by excessive risk-taking. We contribute to this area of the literature by showing that co-opted directors impose less stringent monitoring and allow managers to take significantly more risk. Third, our research

contributes to a fledging, albeit rapidly growing, literature that employs board co-option to explain various corporate outcomes (Coles, Daniel, and Naveen, 2014; Jiraporn and Lee, 2016; Chintrakarn, Jiraporn, Sakr, and Lee, 2016). Our results add to the growing evidence that co-opted directors are relevant to corporate policies and outcomes. Fourth, our study contributes to the literature that exploits the passage of the Sarbanes-Oxley Act as an exogenous regulatory shock. Although several studies have used this empirical strategy to study the effect of board independence, our study is among the first to use this approach to examine the effect of co-opted directors on the extent of firms' risk-taking.

II. Hypothesis Development

Based on the literature on agency theory, we develop two opposing hypotheses. First, unlike typical shareholders who hold diversified portfolios, managers have their human capital as well as a significant portion of their wealth tied up in the firm and are therefore exposed to more non-systematic (firm-specific) risk (Fama, 1980; Amihud and Lev, 1981). This under-diversification leads the manager to develop a higher degree of risk aversion, resulting in corporate strategies that are less risky. Board co-option represents a weakened governance mechanism that allows managers to adopt corporate policies that reflect their own risk aversion. As a result, this view argues that co-opted directors lead to a lower degree of corporate risk-taking. We refer to this hypothesis as the risk-avoidance hypothesis.

On the contrary, the opposing hypothesis argues that co-opted directors lead to a higher degree of corporate risk-taking. There are two reasons why this should be the case. First, the vast majority of executive compensation contracts make managerial compensation contingent on firm performance. The nature of these compensation contracts likely induces managers to take more

risk, expecting to obtain more lucrative compensation. The latest financial crisis is an example of a situation where executives were induced to take significantly more risk. Strong effective governance is expected to protect shareholders from unnecessary risk-taking. Conversely, weaker governance is less likely to keep managers from taking too much risk. Because board co-option constitutes a weakened governance mechanism, this view suggests that co-opted directors lead to more risk-taking. Second, managers enjoy more freedom in formulating corporate policies when governance is less restrictive (weaker governance). With more freedom, managers are less likely to have to compromise with shareholders, resulting in "less balanced decisions", i.e. decisions that are either really good or really bad. Such extreme decisions result in more variability in firm performance, which reflects higher risk (Adams, Almeida, and Ferreira, 2005). Because co-opted directors represents weak governance, this view predicts that board co-option leads to a higher degree of risk-taking. We refer to this view as the risk-seeking hypothesis.

III. Sample and Data Description

a. Sample selection

Our data on board co-option is provided by Coles, Daniel, and Naveen (2014), who use the data from the RiskMetrics database to calculate their measures of board co-option.[1] The data on firm characteristics are obtained from COMPUSTAT. We exclude financial firms (SIC code between 6000 and 6999) and utility firms (SIC code 4900s). Our sample period goes from 1996 to 2010 and encompasses a total of 11,178 firm-year observations.

b. Board co-option

[1] Our sincere thanks go to Lalitha Naveen for sharing the data on co-opted directors.

We follow Coles, Daniel, and Naveen (2014) in defining board co-option. The degree of board co-option is the proportion of directors elected after the CEO assumes office.

Co-option = No. of co-opted directors/Board size

This variable is therefore ranges from 0 to 1, with a higher value indicating a higher degree of co-option. Like Coles, Daniel, and Naveen (2014), we also employ an alternate measure of co-option, tenure-weighted co-option (TW co-option), which is the sum of the tenure of co-opted directors divided by the total tenure of all directors. The assumption behind this alternate measure is that co-opted directors with longer tenure exercise more influence on board decisions. This measure can vary from 0 to 1, with a higher value representing a higher degree of co-option.

We also include board independence in our analysis as it has been the traditional measures of board effectiveness. Board independence is defined as the percentage of independent directors on the board to total board size. Independent directors are those not classified as inside or grey directors (Weisbach, 1988; Byrd and Hickman, 1992; Brickley, Coles, and Terry, 1994).

c. Corporate risk-taking

Following the literature, we measure the extent of corporate risk-taking in three different ways. First, we calculate the standard deviation of daily stock returns in each year and use this variable as a proxy for total risk. Second, we regress daily stock returns on daily market returns. Then, we compute the standard deviation of the residuals from the regression. This variable represents the idiosyncratic risk as the effect of the broad market risk has been removed. Finally, we measure systematic risk by using the coefficient of the market return when daily returns are regressed on market returns. The coefficient represents the extent to which the firm's stock returns change in response to changes in market returns.

d. Control variables and descriptive statistics

Based on the literature, we include the following control variables. To account for firm value, we include Tobin's Q. To control for firm size, we include the logarithm of total assets. We also include the ratio of free cash flow to total assets. We capture firm growth by using the growth rate in sales. Leverage is included, which is the ratio of total debt to total assets. We control for corporate governance by including three board-related variables (i.e., board size, proportion of independent directors, and whether or not there is at least one female director on the board). We also control for CEO characteristics such as CEO age, CEO delta and CEO vega to control for CEO incentives to engage in risky projects. To control for variation across time and industries, we include year dummies as well industry dummies (based on the first two digits of SIC code).

Table 1 displays the summary statistics. The average proportion of co-opted directors on the board is 0.475, whereas tenure-weighted (TW) co-option averages 0.310. Total risk, which is the annualized standard deviation of daily stock returns, averages 0.457. The averages for idiosyncratic risk and systematic risk are 0.395 and 1.073 respectively. The average board size is 9.004 directors. In terms of board independence, the average percentage of independent directors on the board is 69.97%. The proportion of firms with at least one female directors is 62.4%. We also report the descriptive statistics for various firm characteristics in Table 1.

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e. Univariate analysis

Table 2 shows the results of the univariate analysis. We divide the sample into two groups based on each risk measure and compare co-option between the two groups. Panel A shows the result for total risk. For the low-risk group, the average co-option is0.453, whereas, for the high-risk group, the average is 0.497. The difference is statistically significant at the 1% level.

Higher co-option is associated with higher risk. In Panel B, we focus on the idiosyncratic risk. The average co-option for the low-risk group is 0.449, while the average for the high-risk group is 0.501. Again, the difference is statistically significant. Even when we focus on the idiosyncratic risk, we continue to fine that co-option is associated with higher risk. Panel C report the result for the systematic risk. Again, the result shows that higher co-option is related to a higher degree of risk-taking. The preliminary results strongly show that co-opted directors are associated with more risk-taking.

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IV. Results

a. Baseline Regressions

Table 3 shows the regression results. The standard errors are adjusted by clustered at the firm level. Model 1 and Model 2 have total risk as the dependent variable. The coefficients of co-option and tenure-weighted co-option are both positive and significant at the 1% level or better. It appears that board co-option leads to corporate strategies that are significantly more risky, as reflected by the significantly higher volatility in the daily stock returns. However, it can be argued that some of the volatility can be ascribed to the broad market movement in general and not specific to the firm. As a consequence, we look more specifically at the idiosyncratic risk, which is not related to the volatility in the market. Model 3 and Model 4 have idiosyncratic risk as the dependent variable. Both co-option and tenure-weighted co-option exhibit positive and significant coefficients. Thus, co-opted directors induce managers to adopt significantly more risky corporate strategies. Finally, we explore systematic risk, which is the dependent variable in Model 5 and

Model 6. Again, the results show that both co-option and tenure-weighted co-option produce positive and significant coefficient. Thus, regardless of how risk-taking is measured, we find consistent results that support the risk-seeking hypothesis. Board co-option constitutes a weakened governance mechanism that allows managers to take significantly higher risk. It is crucial to note that the coefficient of the percentage of independent directors is not significant in any of the regression. This is important because board independence has been the dominant measure of board quality in the literature. Our results, however, show that board co-option has stronger explanatory power than board independence, at least as far as corporate risk-taking is concerned.

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B. Robustness check: Fixed effect models.

It is conceivable that our results in Table 3 might be driven by certain unobservable firm characteristics that are omitted in the models. One approach that can help mitigate the effect of the omitted-variable bias is to run a fixed-effect model. This approach controls for any unobservable characteristics that remain constant through time. We, therefore, re-estimate the regressions of Table 3, but include year dummies and firm dummies. The regression results are shown in Table 4. Consistent with the results in Table 3, both co-option and TW co-option carry positive and significant coefficients. Therefore, our results are not likely driven by unobservable characteristics that may be omitted in the model.

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To further ensure that our results are robust, we execute additional robustness checks. We industry-adjust our risk measures. We calculate the industry average for each risk measure using the 2-digit SIC code each year. The results are shown in Table A1 in the Appendix. The coefficients for co-option are all positive. So, even with the industry adjusted risk measures, our results remain consistent.

C. Exploring endogeneity and additional robustness checks.

We execute a number of additional tests to cope with possible endogeneity. First, we identify firms where board co-option does not change in at least two consecutive years. The logic is that, for these firms, co-option remains constant over time. Thus, for these firms, it is not possible that co-option changes in response to changes in the degree of risk-taking, thereby minimizing reverse causality. Table 5 shows the regression results for this subsample where co-option does not change for at least two consecutive years. There are 4,488 observations in this subsample. We re-estimate all the regressions in Table 3 using this subsample. Both co-option and tenure-weighted co-option carry positive and significant coefficients in Model 1 to Model 4, confirming the results for the entire sample reported earlier. In Model 5 and Model 6 where the dependent variable is systematic risk, the coefficients of co-option and tenure-weighted co-option remain positive, although not statistically significant.

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For further robustness, we employ alternative measure of risk-taking. Firms that adopt more risky strategies experience more volatility in firm value. We calculate the standard deviation of Tobin's q over the next 3 years and 5 years and use them as our alternative measures for risk-

taking. The results are shown in Table 6. To be concise, we show only the results using TW co-option. The results are similar when simple co-option is used. In Model 1, the dependent variable is the standard deviation of Tobin's q in the next 3 years. In Models 2, the dependent variable is the standard deviation of Tobin's q in the next 5 years. Again, the coefficients remain significantly positive. So, even with the alternative measures of risk-taking, we continue to find that TW co-option leads to a higher degree of risk-taking. Our results appear to be robust.

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To further minimize reverse causality, we perform an instrumental-variable analysis. We identify the earliest year when each firm appears in our sample. Then, we replace the value of TW co-option in each given year by the value in the earliest year. TW co-option in earliest year could not have resulted from the firm's risk-taking in any of the subsequent years, making reverse causality unlikely. The results are shown in Table 7. Model 1 is the first-stage regression. TW co-option in the earliest year exhibits very high explanatory power. Model 2 is the second-stage regression where the dependent variable is total risk. The coefficient of instrumented TW co-option is significantly positive. In Model 2 to Model 5, we employ different measures of risk-taking as the dependent variables. The results are consistent. More co-opted directors lead to significantly more risk-taking.

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In addition, we introduce an additional instrumental variable in order to perform the test of over-identifying restrictions. We use as an additional instrument the industry-average of TW co-option. Industry-wide changes are more likely to be exogenous as they are beyond the control of any one firm in the industry. The results are shown in Table 8. Model 1 is the first-stage regression with the two instrumental variables. Both instrumental variables show positive and significant coefficients. Shea's partial R^2 is 38.1%, suggesting that our instruments are not weak. Model 2 is the second-stage regression where the dependent variable is the standard deviation of Tobin's q in the next three years. Instrumented TW co-option shows a significantly positive coefficient. Model 3 is the second-stage regression where the dependent variable is the standard deviation of Tobin's q in the next five years. Again, the result is consistent. The p-value of Sargan's statistics are 0.699 and 0.999 in Model (2) and (3) respectively, which is not significant. Our instrumental variables are therefore acceptable. Our results are robust and do not appear to be vulnerable to endogeneity. Co-opted directors induce firms to take significantly more risk.

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Furthermore, we execute additional analysis using propensity score matching. We sort the sample by TW co-option. We regard those firms whose TW co-option in the highest quartile as our "treatment" group. Then, for each firm in the treatment group, we identify a firm not in the treatment group that is most similar using propensity score matching. Our matching is based on firm and board characteristics (the eight control variables in the regression analysis). Therefore, our treatment and control firms are virtually identical in terms of observable characteristics. The only difference is that the treatment group has higher TW co-option. If co-option did not matter,

the two groups of firms would exhibit a similar degree of risk-taking. Table 9 shows the results of the regression analysis based on propensity score matching. High Co-option is a dummy variable equal to one if TW co-option belong to the highest quartile and zero otherwise. The coefficient of High Co-option is significantly positive in all Models 1, 2, and 3, where the dependent variables are total risk, idiosyncratic risk, and systematic risk. Even with propensity score matching, our results remain significant, showing that co-opted directors lead to more risk-taking.

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Finally, to show the causal impact of co-option, we exploit as a natural experiment the passage of the Sarbanes-Oxley Act and the associated listing requirements by NYSE and NASDAQ requiring firms to have a majority of independent directors on their board. To be in compliance, non-compliant firms chose to appoint new independent directors to the board (Linck, Netter, and Yang, 2008). This resulted in an exogenous increase in co-option. We follow the approach adopted by Coles, Daniel, and Naveen (2014) and estimate the following difference-in-difference regression.

$$\text{Risk-taking} = \beta_0 + \beta_1(\text{Co-option}) + \beta_2(\text{Post-SOX}\times\text{Co-option}) + \beta_3(\text{Non-compliant}\times\text{Co-option}) + \beta_4(\text{Post-SOX}\times\text{Non-compliant}\times\text{Co-option}) + \beta_5(\text{Post-SOX}) + \beta_6(\text{Non-compliant}) + \text{Controls}$$

Because of the three-way interaction, it can be challenging to interpret this model. Coles, Daniel, and Naveen (2014) demonstrate that the "clean" effect that can be directly attributed to co-option is represented by $\beta_{1+}\beta_{3+}\beta_4$. Further explanations on this model can be found in Coles, Daniel,

and Naveen (2014). We apply the same approach to our sample. We show the results of the clean effect in Table 10. We focus on the column labelled "Clean estimates". All the coefficients are positive and highly significant. Because this approach relies on an exogenous regulatory shock, it is substantially less vulnerable to endogeneity. The results appear to be robust to endogeneity and show that co-opted directors are not merely associated with, but rather bring about a higher degree of risk-taking, consistent with the prediction of the risk-seeking hypothesis.

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D. Cross-sectional analyses: Regulation and CEO Age

D. 1: Regulation

Theory suggests that regulated firms are less subject to agency problems because regulation imposes an additional layer of monitoring, making it more difficult for opportunistic managers to exploit the shareholders. Prior research has shown that regulation can change the manner in which corporate governance influences important corporate outcomes, such as dividend policy and capital structure (Jiraporn and Gleason, 2007; Jiraporn and Ning, 2006). This may have implications for our study as the adverse effect of board co-option may be more muted in regulated firms. Furthermore, most studies in empirical corporate finance tend to leave out regulated firms such as financials and utilities. As a result, these firms are largely neglected in the literature. We intend to fill this gap in the literature. There are 2,426 observations from the heavily regulated industries including financial industry (SIC code between 6000 and 6999) and utility industry (SIC code 4900s) in our sample period. We re-estimate fixed effect models using a subsamples of these

heavily regulated firms and the results are displayed in Table 11. As expected, none of the coefficients of co-option or TW co-options are significant. This reinforces our argument that the adverse effect of board co-option is moderated in regulated firms.

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D. 2: CEO Age

CEO age also could be a characteristic that may affect corporate risk-takings. Younger CEOs who have career concerns are more likely risk-averse and engage in less accrual based and real earnings management (Demers and Wang 2010). Alternatively, young CEOs take greater risks to signal their superior ability (Prendergast and Stole 1996). To test effect of CEO age on corporate risk-taking behavior, we divide our sample into two groups based on the firm's CEO age. Specifically, following Jenter and Lewellen (2015), we use the CEO age of 65 as a cutoff to partition the sample and re-estimate fixed effect models. The results are displayed in Table 12. To be concise, we show only the results using TW co-option. For every risk measures, we only observe the positive effect of the increase in co-option in the below CEP age-65 sub-sample. So, board co-option leads to excessive risk-takings only when the CEO is still relatively far from retirement.

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V. Concluding Remarks

Motivated by agency theory**,** our research explores the effect of co-opted directors on corporate risk-taking. Co-opted directors are those appointed after the incumbent CEO assumes office. Prior research shows that co-opted directors represent a weakened governance mechanism (Coles, Daniel, and Naveen, 2014). Built on prior research, our study shows that the proportion of co-opted directors on the board has a significant influence on corporate risk-taking. In particular, a higher proportion of co-opted directors lead to corporate strategies that are much more risky, as reflected by the higher volatility in stock returns.

For robustness, we employ five different measures of risk-taking, i.e. total risk, idiosyncratic risk, systematic risk, and volatility of Tobin's q in the next three year and five years. The results are consistent, regardless of how risk-taking is measured. Furthermore, we execute a number of tests to make sure that our results are not driven by endogeneity. In particular, we run a fixed-effects analysis, an instrumental-variable analysis, propensity score matching, and using as a natural experiment the passage of SOX. It is hard, if not impossible to rule out endogeneity completely. Nevertheless, given the consistent results yielded by the various tests, endogeneity is unlikely. It is crucial to note that we control for board independence in the regression analysis and find that board co-option has substantially stronger explanatory power than board independence does. Our results reinforce Coles, Daniel, and Naveen's (2014) argument that board co-option is a good alternative measure of board quality.

We contribute to the debate on the effectiveness of the board of directors and provide evidence that board co-option is a crucial aspect that warrants more attention. Our results also make contributions to the literature on corporate risk-taking. Due to the most recent crisis, which was triggered by excessive risk-taking, it is imperative to understand what can contribute to

excessive risk-taking. Our results show that co-opted directors represent a weakened governance mechanism that allows managers to take substantially more risk. Finally, our study adds to the recent literature that exploits the Sarbanes-Oxley Act as an exogenous shock. This approach is much less vulnerable to endogeneity and much more likely to show causality, rather than merely an association.

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Table 1. Summary statistics

Co-option is the number of directors appointed after the CEO assumes office, divided by board size. TW Co-option is the sum of the tenure of co-opted directors, divided by the sum of tenure of all directors. For detailed definitions of Co-option and TW Co-option, please refer to Coles, Daniel, and Naveen (2014). Total risk is calculated as the annualized standard deviation of daily stock return. Idiosyncratic risk is estimated as the annualized standard deviation of the error term obtained from the market model where daily stock returns are regressed on daily market return in each year. Systematic risk is also estimated as a coefficient of daily market return using the same market model as used to estimate idiosyncratic risk. Tobin's q represents MV over BV of the firm. Sales represents annual sales. FCF/Assets represents free cash flow divided by total assets. Sales growth rate represents current sales divided by sales in previous year. Leverage represents total debts divided by total assets. Board size represents the total number of directors on board. % of Independent Directors is the number of independent directors divided by board size. Female director has a value of 1 if the board has a female director and zero otherwise. CEO age represents the age of the CEO at the firm. CEO delta is the sensitivity of a CEO's stock and option value ($ in thousands) to a 1% change in stock price. CEO vega is the sensitivity of a CEO's stock and option value ($ in thousands) to a 1% change in stock return volatility.

	Mean	Median	St.Dev	25th	75th
Co-option					
Co-option	0.475	0.444	0.318	0.200	0.750
TW Co-option	0.310	0.175	0.328	0.043	0.491
Risk Measures					
Total risk	0.457	0.405	0.216	0.307	0.552
Idiosyncratic risk	0.395	0.348	0.196	0.260	0.480
Systematic risk	1.073	1.012	0.535	0.707	1.371
Firm Characteristics					
Tobin's Q	2.104	1.631	1.727	1.244	2.381
Assets	7.426	7.273	1.518	6.339	8.370
FCF/Assets	0.095	0.093	0.092	0.054	0.138
Sales growth rate	1.103	1.077	0.277	0.991	1.175
Leverage	0.216	0.208	0.177	0.057	0.325
Board Characteristics					
Board Size	9.004	9.000	2.413	7.000	11.000
% of Independent Directors	69.966	72.727	16.239	60.000	83.333
Female Director (Dummy)	0.624	1.000	0.484	-	1.000
CEO Characteristics					
CEO Age (years)	55.849	56.000	6.101	52.000	59.750
CEO Delta ($ in thousands)	948.883	248.197	8,380.561	99.332	631.565
CEO Vega ($ in thousands)	157.200	67.053	309.742	26.617	164.768

Table 2. Univariate analysis

The table shows the results of the univariate analysis. We divide the sample into two groups based on each risk measure and compare co-option between the two groups by conducting mean difference tests. Panel A shows the result for total risk. In Panel B, we focus on the idiosyncratic risk. Panel C report the result for the systematic risk. For variable definitions, please refer to table 1. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Total Risk	LOW		HIGH		Mean Difference	
	Obs	mean	Obs	mean	Difference	t-statistic
Co-option	7858	0.453	7941	0.497	-0.044***	-8.722

Panel B: Idiosyncratic Risk	LOW		HIGH		Mean Difference	
	Obs	mean	Obs	mean	Difference	t-statistic
Co-option	7858	0.449	7913	0.501	-0.052***	-10.226

Panel C: Systematic Risk	LOW		HIGH		Mean Difference	
	Obs	mean	Obs	mean	Difference	t-statistic
Co-option	7804	0.458	7995	0.491	-0.032***	-6.367

Table 3. Baseline regressions: Effect of co-option on the degree of firms' risk taking

The table reports regressions of risk measures, each representing the degree of risk-taking by a firm. Specifically, from models 1 to 6, we employ OLS regressions where the dependent variables are total risk, idiosyncratic risk and systematic risk respectively. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total risk		Idiosyncratic risk		Systematic risk	
Co-option	0.0492***		0.0482***		0.0503**	
	(6.376)		(6.887)		(2.273)	
TW Co-option		0.0520***		0.0510***		0.0560**
		(6.505)		(7.021)		(2.410)
Tobin's Q	0.00933***	0.00928***	0.00578***	0.00573***	0.0481***	0.0481***
	(5.474)	(5.475)	(4.517)	(4.494)	(6.475)	(6.488)
Log (Assets)	-0.0165***	-0.0163***	-0.0229***	-0.0227***	0.0269***	0.0272***
	(-6.030)	(-5.975)	(-9.091)	(-9.031)	(3.443)	(3.479)
FCF/Assets	-0.427***	-0.425***	-0.384***	-0.382***	-0.797***	-0.795***
	(-13.93)	(-13.93)	(-13.74)	(-13.75)	(-9.066)	(-9.056)
Sales growth rate	0.0108	0.0109	0.0106	0.0107	0.0754***	0.0754***
	(1.436)	(1.445)	(1.582)	(1.592)	(3.511)	(3.516)
Leverage	0.0247	0.0237	0.0367**	0.0357**	-0.142***	-0.143***
	(1.293)	(1.239)	(2.084)	(2.024)	(-2.848)	(-2.877)
Log (Board Size)	-0.120***	-0.117***	-0.103***	-0.0998***	-0.280***	-0.276***
	(-8.521)	(-8.278)	(-7.865)	(-7.608)	(-7.655)	(-7.531)
% of Independent Directors	-0.000137	-0.000126	-0.000142	-0.000131	1.21e-06	1.10e-05
	(-0.816)	(-0.752)	(-0.928)	(-0.859)	(0.00259)	(0.0236)
Female Director (Dummy)	-0.0149**	-0.0145**	-0.0125**	-0.0120**	-0.0462***	-0.0456***
	(-2.503)	(-2.432)	(-2.293)	(-2.218)	(-2.789)	(-2.754)
Log(CEO Age)	-0.0981***	-0.102***	-0.0875***	-0.0914***	-0.201***	-0.207***
	(-4.547)	(-4.729)	(-4.482)	(-4.672)	(-3.158)	(-3.243)
Log(delta)	-0.00880***	-0.00918***	-0.0112***	-0.0115***	0.0225***	0.0218***
	(-3.569)	(-3.753)	(-5.030)	(-5.244)	(3.047)	(2.964)
Log(vega)	-0.0131***	-0.0128***	-0.0103***	-0.00996***	-0.0358***	-0.0354***
	(-5.669)	(-5.563)	(-5.022)	(-4.898)	(-5.108)	(-5.070)
Constant	1.259***	1.273***	1.196***	1.210***	2.023***	2.041***
	(14.39)	(14.59)	(15.10)	(15.29)	(7.852)	(7.934)
Year fixed effect	YES	YES	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES	YES	YES
Observations	11,178	11,178	11,178	11,178	11,178	11,178
R-squared	0.523	0.524	0.527	0.528	0.348	0.348
Adjusted R2	0.520	0.520	0.523	0.524	0.343	0.343

Table 4. Robustness check: Fixed-effects models

The table reports regressions of risk measures, each representing the degree of risk-taking by a firm. Specifically, from models 1 to 6, we employ OLS regressions where the dependent variables are total risk, idiosyncratic risk and systematic risk respectively. All models include year dummies and firm dummies. For variable definitions, please refer to table 1. The robust t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total risk		Idiosyncratic risk		Systematic risk	
Co-option	0.0272***		0.0236***		0.0446**	
	(4.568)		(4.449)		(2.372)	
TW Co-option		0.0381***		0.0336***		0.0595***
		(5.501)		(5.423)		(2.763)
Tobin's Q	0.00371***	0.00370***	0.000661	0.000649	0.0386***	0.0386***
	(3.072)	(3.067)	(0.629)	(0.619)	(4.277)	(4.279)
Log (Assets)	-0.0305***	-0.0307***	-0.0390***	-0.0392***	0.0174	0.0170
	(-5.718)	(-5.766)	(-8.363)	(-8.415)	(1.044)	(1.024)
FCF/Assets	-0.141***	-0.140***	-0.123***	-0.122***	-0.246***	-0.246***
	(-5.213)	(-5.187)	(-5.037)	(-5.010)	(-3.274)	(-3.263)
Sales growth rate	-0.00441	-0.00412	-0.00119	-0.000933	0.0190	0.0195
	(-0.688)	(-0.642)	(-0.212)	(-0.165)	(0.922)	(0.941)
Leverage	0.0454**	0.0448**	0.0603***	0.0597***	-0.0658	-0.0668
	(2.397)	(2.368)	(3.510)	(3.482)	(-1.371)	(-1.391)
Log (Board Size)	-0.0877***	-0.0852***	-0.0679***	-0.0658***	-0.223***	-0.219***
	(-7.674)	(-7.501)	(-6.643)	(-6.467)	(-6.228)	(-6.137)
% of Independent Directors	-0.000100	-8.43e-05	-0.000112	-9.77e-05	8.49e-05	0.000112
	(-0.720)	(-0.605)	(-0.884)	(-0.775)	(0.197)	(0.260)
Female Director (Dummy)	0.00251	0.00282	0.00313	0.00340	-0.0124	-0.0119
	(0.513)	(0.578)	(0.713)	(0.777)	(-0.844)	(-0.812)
Log(CEO Age)	-0.0298*	-0.0377**	-0.0260*	-0.0332**	-0.0949*	-0.106*
	(-1.707)	(-2.141)	(-1.653)	(-2.091)	(-1.763)	(-1.950)
Log(delta)	-0.00301	-0.00336	-0.00795***	-0.00829***	0.0555***	0.0551***
	(-1.389)	(-1.554)	(-4.064)	(-4.243)	(7.131)	(7.109)
Log(vega)	-0.0231***	-0.0228***	-0.0181***	-0.0179***	-0.0668***	-0.0664***
	(-9.633)	(-9.530)	(-8.712)	(-8.599)	(-8.670)	(-8.629)
Constant	1.003***	1.030***	0.981***	1.006***	1.502***	1.539***
	(12.38)	(12.67)	(13.51)	(13.77)	(5.943)	(6.059)
Year fixed effect	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES
Observations	11,178	11,178	11,178	11,178	11,178	11,178
R-squared	0.757	0.758	0.764	0.764	0.629	0.629
Adjusted R2	0.714	0.715	0.722	0.723	0.563	0.563

Table 5. Robustness check: Reverse causality

The table reports results of OLS regressions of each risk-taking measure using a sub-sample which the percentage of co-option (TW co-option) does not change for two consecutive years. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total risk		Idiosyncratic risk		Systematic risk	
Co-option	0.0522***		0.0526***		0.0385	
	(5.011)		(5.579)		(1.276)	
TW Co-option		0.0513***		0.0518***		0.0414
		(5.197)		(5.817)		(1.403)
Tobin's Q	0.0139***	0.0138***	0.00900***	0.00892***	0.0653***	0.0653***
	(5.929)	(5.888)	(4.423)	(4.369)	(8.141)	(8.172)
Log (Assets)	-0.0162***	-0.0163***	-0.0239***	-0.0240***	0.0358***	0.0360***
	(-4.234)	(-4.255)	(-6.976)	(-7.012)	(3.084)	(3.094)
FCF/Assets	-0.417***	-0.415***	-0.371***	-0.369***	-0.850***	-0.848***
	(-9.961)	(-9.932)	(-9.574)	(-9.548)	(-6.984)	(-6.963)
Sales growth rate	0.00672	0.00674	0.00846	0.00847	0.0597	0.0597
	(0.503)	(0.503)	(0.725)	(0.725)	(1.631)	(1.631)
Leverage	0.0488*	0.0471*	0.0597**	0.0579**	-0.108*	-0.110*
	(1.829)	(1.760)	(2.400)	(2.321)	(-1.678)	(-1.707)
Log (Board Size)	-0.0994***	-0.0967***	-0.0794***	-0.0766***	-0.264***	-0.262***
	(-5.099)	(-4.966)	(-4.412)	(-4.260)	(-4.964)	(-4.913)
% of Independent Directors	-0.000207	-0.000196	-0.000197	-0.000186	-8.17e-05	-7.59e-05
	(-0.920)	(-0.869)	(-0.968)	(-0.913)	(-0.127)	(-0.118)
Female Director (Dummy)	-0.0130*	-0.0124	-0.00992	-0.00927	-0.0496**	-0.0489**
	(-1.658)	(-1.581)	(-1.387)	(-1.298)	(-2.237)	(-2.207)
Log(CEO Age)	-0.117***	-0.120***	-0.108***	-0.111***	-0.171*	-0.176*
	(-3.741)	(-3.841)	(-3.887)	(-4.006)	(-1.772)	(-1.809)
Log(delta)	-0.0113***	-0.0114***	-0.0131***	-0.0131***	0.0152	0.0147
	(-3.380)	(-3.426)	(-4.256)	(-4.322)	(1.626)	(1.587)
Log(vega)	-0.0139***	-0.0137***	-0.0104***	-0.0102***	-0.0412***	-0.0410***
	(-4.510)	(-4.443)	(-3.810)	(-3.730)	(-4.369)	(-4.352)
Constant	1.284***	1.297***	1.225***	1.238***	1.874***	1.891***
	(10.04)	(10.14)	(10.74)	(10.87)	(4.755)	(4.777)
Year fixed effect	YES	YES	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES	YES	YES
Observations	4,488	4,488	4,488	4,488	4,488	4,488
R-squared	0.516	0.517	0.515	0.516	0.350	0.350
Adjusted R2	0.507	0.508	0.506	0.507	0.338	0.338

Table 6: Robustness checks: Alternative measures of risk-taking

The table reports results of OLS regressions where the dependent variables are the standard deviations of Tobin's Q in the next three years and five years. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)
	SD of Tobin's q (3 years)	SD of Tobin's q (5 years)
TW Co-option	0.061**	0.048**
	(2.503)	(2.457)
Tobin's Q	0.384***	0.349***
	(9.099)	(17.017)
Log (Assets)	0.006	-0.008
	(0.434)	(-0.985)
FCF/Assets	-1.008***	-0.725***
	(-5.340)	(-5.460)
Sales growth rate	0.017	0.036
	(0.572)	(1.265)
Leverage	-0.177***	-0.171***
	(-3.012)	(-3.425)
Log (Board Size)	-0.100***	-0.110***
	(-2.723)	(-3.203)
% of Independent Directors	-0.001	-0.000
	(-0.978)	(-0.519)
Female Director (Dummy)	-0.027	-0.011
	(-1.554)	(-0.734)
Log(CEO Age)	-0.053	-0.064
	(-0.588)	(-0.823)
Log(delta)	-0.034*	-0.023**
	(-1.706)	(-2.033)
Log(vega)	-0.008	-0.003
	(-1.048)	(-0.460)
Constant	0.373	0.477
	(0.865)	(1.345)
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Observations	9,566	9,614
R-squared	0.671	0.719

Table 7: Instrumental-variable analysis

The table reports results of instrumental-variable (IV) regressions where we use TW co-option in the earliest year when each firm appears in our sample as an instrumental variables in the first-stage regressions. We use the predicted value of TW co-option obtained in the first-stage IV regressions as an explanatory variable in the second-stage IV regressions where the dependent variables are total risk, idiosyncratic risk, systematic risk, and the standard deviations of Tobin's Q in the next three years and five years respectively. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage	Second Stage	Second Stage	Second Stage	Second Stage	Second Stage
	TW Co-option	Total Risk	Idiosyncratic Risk	Beta	SD of Tobin's q (3 years)	SD of Tobin's q (5 years)
TW Co-option (Earliest year)	0.507***					
	(26.378)					
TW Co-option (Instrumented)		0.054***	0.053***	0.084***	0.058**	0.065***
		(6.538)	(7.028)	(3.518)	(2.064)	(2.775)
Tobin's Q	-0.011***	0.009***	0.006***	0.048***	0.385***	0.351***
	(-3.694)	(9.367)	(6.384)	(16.865)	(116.567)	(128.523)
Log (Assets)	-0.042***	-0.017***	-0.023***	0.026***	0.005	-0.009*
	(-8.308)	(-9.711)	(-14.619)	(5.257)	(0.776)	(-1.743)
FCF/Assets	-0.086	-0.430***	-0.386***	-0.791***	-1.015***	-0.722***
	(-1.638)	(-24.839)	(-24.610)	(-15.895)	(-16.197)	(-13.969)
Sales growth rate	0.008	0.009*	0.009*	0.072***	0.018	0.037**
	(0.664)	(1.693)	(1.868)	(4.471)	(0.900)	(2.290)
Leverage	0.056**	0.026***	0.038***	-0.137***	-0.173***	-0.165***
	(1.985)	(2.667)	(4.348)	(-4.977)	(-5.157)	(-5.976)
Log (Board Size)	-0.092***	-0.117***	-0.100***	-0.273***	-0.102***	-0.108***
	(-3.926)	(-14.130)	(-13.278)	(-11.467)	(-3.591)	(-4.576)
% of Independent Directors	0.001**	-0.000	-0.000	0.000	-0.001*	-0.000
	(2.222)	(-1.396)	(-1.612)	(0.014)	(-1.884)	(-1.235)
Female Director (Dummy)	-0.021**	-0.015***	-0.012***	-0.049***	-0.029**	-0.011
	(-2.035)	(-4.119)	(-3.651)	(-4.653)	(-2.310)	(-1.022)
Log(CEO Age)	0.413***	-0.107***	-0.095***	-0.239***	-0.051	-0.069*
	(9.337)	(-7.415)	(-7.257)	(-5.739)	(-1.018)	(-1.665)
Log(delta)	0.072***	-0.009***	-0.012***	0.021***	-0.034***	-0.026***
	(13.507)	(-5.201)	(-7.253)	(4.149)	(-5.527)	(-5.046)
Log(vega)	-0.015***	-0.012***	-0.010***	-0.033***	-0.006	-0.001
	(-2.859)	(-7.113)	(-6.157)	(-6.571)	(-0.920)	(-0.116)
Constant	-1.464***	1.214***	1.113***	2.237***	0.202	0.291
	(-6.991)	(17.746)	(17.952)	(11.368)	(0.842)	(1.470)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,774	10,774	10,774	10,774	9,218	9,265
R-squared	0.478	0.528	0.530	0.355	0.674	0.724

Table 8: Instrumental-variable analysis with an additional instrumental variable

The table reports results of instrumental-variable (IV) regressions where we use the industry-average of TW co-option based on the first two digits of the SIC codes as an additional instrumental variables. We use the predicted value of TW co-option obtained in the first-stage IV regressions as an explanatory variable in the second-stage IV regressions where the dependent variables are the standard deviations of Tobin's Q in the next three years and five years respectively. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	First Stage	Second Stage	Second Stage
VARIABLES	TW Co-option	SD of Tobin's q (3 years)	SD of Tobin's q (5 years)
TW Co-option (Earliest year)	0.497***		
	(25.957)		
TW Co-option (Industry-average)	0.687***		
	(13.679)		
TW Co-option (Instrumented)		0.061**	0.065***
		(2.223)	(2.860)
Tobin's Q	-0.011***	0.385***	0.351***
	(-3.764)	(116.634)	(128.582)
Log (Assets)	-0.042***	0.005	-0.009*
	(-8.563)	(0.802)	(-1.747)
FCF/Assets	-0.090*	-1.015***	-0.722***
	(-1.733)	(-16.193)	(-13.971)
Sales growth rate	0.007	0.018	0.037**
	(0.568)	(0.897)	(2.290)
Leverage	0.052*	-0.173***	-0.165***
	(1.863)	(-5.162)	(-5.977)
Log (Board Size)	-0.090***	-0.102***	-0.108***
	(-3.836)	(-3.578)	(-4.579)
% of Independent Directors	0.001**	-0.001*	-0.000
	(2.259)	(-1.887)	(-1.235)
Female Director (Dummy)	-0.017*	-0.029**	-0.011
	(-1.715)	(-2.302)	(-1.023)
Log(CEO Age)	0.402***	-0.053	-0.069*
	(9.333)	(-1.048)	(-1.669)
Log(delta)	0.071***	-0.035***	-0.026***
	(14.015)	(-5.606)	(-5.078)
Log(vega)	-0.014***	-0.005	-0.001
	(-2.644)	(-0.911)	(-0.116)
Constant	-1.587***	0.206	0.291
	(-7.000)	(0.859)	(1.471)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Observations	10,774	9,218	9,265
R-squared	0.496	0.674	0.724
Shea's Partial's R-squared	0.381		
Sargan's Statistic		0.699	0.999

Table 9: Propensity score matching

The table reports the results of the OLS regressions where we conduct propensity score matching. High TW co-option is a dummy variable equal to one if TW co-option is in the highest quartile and zero otherwise. We execute propensity score matching based on eight firm and board characteristics (the eight control variables in the regression analysis). All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	Total Risk	Idiosyncratic	Beta
High TW Co-option	0.028***	0.026***	0.050**
	(4.154)	(4.378)	(2.481)
Tobin's Q	0.008***	0.005***	0.045***
	(3.853)	(3.388)	(4.360)
Log (Assets)	-0.025***	-0.032***	0.026**
	(-5.705)	(-8.156)	(2.078)
FCF/Assets	-0.460***	-0.416***	-0.849***
	(-11.883)	(-11.495)	(-8.079)
Sales growth rate	0.019	0.017	0.104***
	(1.211)	(1.148)	(2.683)
Leverage	0.010	0.022	-0.128**
	(0.460)	(1.036)	(-2.071)
Log (Board Size)	-0.103***	-0.088***	-0.225***
	(-5.829)	(-5.444)	(-4.413)
% of Independent Directors	0.000	0.000	0.001*
	(1.250)	(0.872)	(1.812)
Female Director (Dummy)	-0.016**	-0.012	-0.051**
	(-2.041)	(-1.585)	(-2.247)
Log(CEO Age)	-0.130***	-0.112***	-0.343***
	(-4.671)	(-4.199)	(-3.357)
Log(delta)	-0.005*	-0.006**	0.020**
	(-1.684)	(-2.411)	(2.042)
Log(vega)	-0.007**	-0.005*	-0.019*
	(-2.066)	(-1.754)	(-1.929)
Constant	1.175***	1.150***	1.877***
	(9.625)	(9.356)	(4.215)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Observations	5,882	5,882	5,882
R-squared	0.546	0.555	0.356

Table 10: Exploring causality using SOX as an exogenous regulatory shock

The table reports the effect of co-option on the degree of risk taking using a natural experiment. We follow the procedure adopted by Coles, Daniel, and Naveen (2014) and use the difference-in-difference methodology. Panel A presents estimates of the clean effects of each co-option variable from OLS regressions where we include the same control variables and industry dummies as we use in Table 2 and panel B presents estimates of the clean effects of each co-option variable from OLS regressions where we include the same control variables and firm dummies as we use in Table 3. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Estimates of the clean effects of co-option (with control variables and industry dummies)

Dependent variable	Co-option	Results from base case		Clean estimates	
		coefficient	t-stat	coefficient	t-stat
Total risk	Co-option	0.0492***	(6.376)	0.0924***	(3.84)
	TW Co-option	0.0520***	(6.505)	0.1171***	(4.78)
Idiosyncratic risk	Co-option	0.0482***	(6.887)	0.0841***	(3.99)
	TW Co-option	0.0510***	(7.021)	0.0954***	(4.34)
Systematic risk	Co-option	0.0503**	(2.273)	0.1399*	(1.94)
	TW Co-option	0.0560**	(2.410)	0.2247***	(2.82)

Panel B: Estimates of the clean effects of co-option (with control variables and firm dummies)

Dependent variable	Co-option	Results from base case		Clean estimates	
		coefficient	t-stat	coefficient	t-stat
Total risk	Co-option	0.0272***	(4.568)	0.0610***	(2.59)
	TW Co-option	0.0381***	(5.501)	0.1147***	(4.10)
Idiosyncratic risk	Co-option	0.0236***	(4.449)	0.0634***	(3.28)
	TW Co-option	0.0336***	(5.423)	0.0971***	(4.14)
Systematic risk	Co-option	0.0446**	(2.372)	0.0207	(0.34)
	TW Co-option	0.0595***	(2.763)	0.0926	(1.23)

Table 11. Cross-sectional analysis 1: Exploring the effect of regulation

The table reports results of OLS regressions of each risk-taking measure using a sub-sample of heavily regulated industries including financial industry (SIC code between 6000 and 6999) and utility industry (SIC code 4900s) in our sample period. All models include year dummies and firm dummies. For variable definitions, please refer to table 1. The robust t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Total risk		Idiosyncratic risk		Systematic risk	
Co-option	-0.00713		-0.00380		-0.0514	
	(-0.378)		(-0.226)		(-1.200)	
TW Co-option		-0.0128		-0.00749		-0.0747
		(-0.559)		(-0.362)		(-1.389)
Tobin's Q	0.0255***	0.0256***	0.0239***	0.0239***	0.0752***	0.0754***
	(4.928)	(4.932)	(4.899)	(4.902)	(3.591)	(3.589)
Log (Assets)	0.0300**	0.0302**	0.0299**	0.0300**	0.0248	0.0258
	(2.236)	(2.252)	(2.424)	(2.435)	(0.798)	(0.831)
FCF/Assets	-0.320***	-0.319***	-0.289***	-0.288***	-0.886***	-0.881***
	(-3.180)	(-3.168)	(-3.179)	(-3.174)	(-3.070)	(-3.028)
Sales growth rate	-0.0338**	-0.0337**	-0.0357**	-0.0357**	-0.0252	-0.0249
	(-1.968)	(-1.962)	(-2.292)	(-2.287)	(-0.732)	(-0.722)
Leverage	-0.0678	-0.0675	-0.0123	-0.0120	-0.546***	-0.547***
	(-1.033)	(-1.031)	(-0.200)	(-0.196)	(-3.435)	(-3.436)
Log (Board Size)	0.00191	0.00239	0.00472	0.00508	-0.0677	-0.0670
	(0.0697)	(0.0873)	(0.194)	(0.210)	(-0.976)	(-0.965)
% of Independent Directors	-0.000896***	-0.000902***	-0.000725**	-0.000728**	-0.00199**	-0.00202**
	(-2.605)	(-2.607)	(-2.395)	(-2.391)	(-2.246)	(-2.278)
Female Director (Dummy)	-0.0167	-0.0167	-0.0152	-0.0152	-0.0509*	-0.0506*
	(-1.460)	(-1.453)	(-1.447)	(-1.442)	(-1.726)	(-1.717)
Log(CEO Age)	0.183***	0.186***	0.171***	0.173***	0.273**	0.284**
	(3.288)	(3.324)	(3.427)	(3.438)	(2.085)	(2.132)
Log(delta)	-0.0473***	-0.0471***	-0.0440***	-0.0439***	-0.0420***	-0.0414***
	(-7.024)	(-6.994)	(-7.368)	(-7.342)	(-2.950)	(-2.906)
Log(vega)	-0.0122***	-0.0122***	-0.0120***	-0.0120***	-0.0152*	-0.0153*
	(-2.908)	(-2.914)	(-3.327)	(-3.331)	(-1.667)	(-1.681)
Constant	-0.347	-0.363	-0.380*	-0.390*	0.121	0.0653
	(-1.428)	(-1.481)	(-1.738)	(-1.770)	(0.202)	(0.106)
Year fixed effect	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES
Observations	2,426	2,426	2,426	2,426	2,426	2,426
R-squared	0.770	0.770	0.735	0.735	0.722	0.722
Adjusted R2	0.722	0.722	0.679	0.679	0.663	0.664

Table 12. Cross-sectional analysis 1: Exploring the effect of CEO Age

The table reports the cross-sectional variation in the effects of board co-option on corporate risk-takings by CEO age. To be concise, we show only the results using TW co-option. The sample is partitioned into two groups based on whether the current CEO for a given firm is below/above 65 years old, All models include year dummies and firm dummies. For variable definitions, please refer to table 1. The robust t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
		Below CEO age 65			Above CEO age 65	
VARIABLES	Total risk	Idiosyncratic risk	Systematic risk	Total risk	Idiosyncratic risk	Systematic risk
TW Co-option	0.0330***	0.0298***	0.0390*	0.0647	0.0731	-0.0461
	(4.657)	(4.744)	(1.749)	(1.104)	(1.417)	(-0.277)
Tobin's Q	0.00375***	0.00112	0.0361***	0.00371	0.00159	0.0403**
	(3.106)	(1.148)	(4.275)	(0.678)	(0.327)	(2.028)
Log (Assets)	-0.0319***	-0.0386***	0.00654	-0.0538	-0.0709**	0.0839
	(-6.053)	(-8.518)	(0.386)	(-1.604)	(-2.388)	(0.845)
FCF/Assets	-0.149***	-0.125***	-0.322***	0.243*	0.237*	-0.136
	(-5.215)	(-4.874)	(-4.086)	(1.783)	(1.821)	(-0.387)
Sales growth rate	-0.00276	0.000817	0.0206	-0.00611	-0.00471	0.0750
	(-0.441)	(0.149)	(0.964)	(-0.176)	(-0.149)	(0.742)
Leverage	0.0454**	0.0603***	-0.0691	0.186*	0.201**	0.0925
	(2.299)	(3.391)	(-1.355)	(1.874)	(2.193)	(0.299)
Log (Board Size)	-0.0946***	-0.0744***	-0.245***	0.0196	0.0377	-0.149
	(-7.952)	(-7.013)	(-6.614)	(0.336)	(0.700)	(-0.913)
% of Independent Directors	-0.000184	-0.000196	-0.000131	-0.00158	-0.00136	-0.00162
	(-1.309)	(-1.581)	(-0.295)	(-1.409)	(-1.275)	(-0.625)
Female Director (Dummy)	0.00316	0.00297	-0.00190	0.0237	0.0329	-0.123
	(0.632)	(0.671)	(-0.125)	(0.853)	(1.262)	(-1.193)
Log(delta)	-0.00738***	-0.0122***	0.0504***	-0.0151	-0.0159	0.00159
	(-3.276)	(-6.056)	(6.754)	(-1.370)	(-1.521)	(0.0557)
Log(vega)	-0.0159***	-0.0116***	-0.0551***	-0.0133	-0.0119	-0.0246
	(-9.204)	(-7.817)	(-9.772)	(-1.467)	(-1.486)	(-0.903)
Constant	0.912***	0.892***	1.254***	0.792***	0.823***	0.553
	(21.50)	(23.91)	(9.207)	(3.443)	(3.828)	(0.864)
Year fixed effect	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES
Observations	10,597	10,597	10,597	765	765	765
R-squared	0.765	0.774	0.635	0.852	0.839	0.817
Adjusted R2	0.722	0.732	0.568	0.718	0.695	0.652

Appendix

Table A1: Using industry-adjusted risk measures

The table reports the results of the OLS regressions where we use the industry-adjusted risk measures as the dependent variable. We calculate the industry average for each risk measure using the 2-digit SIC code each year. All models include year dummies and industry (2 digit SIC) dummies. For variable definitions, please refer to table 1. The standard errors are adjusted for clustering at the firm level and the t-statistics are reported in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Industry-adjusted Total Risk		Industry-adjusted Idiosyncratic Risk		Industry-adjusted Systematic Risk	
Co-option	0.0449***		0.0442***		0.0475**	
	(6.159)		(6.568)		(2.307)	
TW Co-option		0.0455***		0.0453***		0.0463**
		(6.037)		(6.510)		(2.153)
Tobin's Q	0.00710***	0.00702***	0.00429***	0.00423***	0.0385***	0.0384***
	(4.856)	(4.830)	(3.644)	(3.597)	(6.409)	(6.413)
Log (Assets)	-0.0184***	-0.0184***	-0.0236***	-0.0236***	0.0155**	0.0154**
	(-6.912)	(-6.911)	(-9.577)	(-9.562)	(2.127)	(2.117)
FCF/Assets	-0.388***	-0.386***	-0.359***	-0.357***	-0.635***	-0.634***
	(-13.11)	(-13.12)	(-13.22)	(-13.23)	(-7.519)	(-7.509)
Sales growth rate	0.0208***	0.0209***	0.0165***	0.0165***	0.100***	0.101***
	(3.017)	(3.035)	(2.617)	(2.634)	(5.110)	(5.118)
Leverage	0.0225	0.0217	0.0308*	0.0300*	-0.0991**	-0.0998**
	(1.206)	(1.163)	(1.789)	(1.740)	(-2.070)	(-2.086)
Log (Board Size)	-0.107***	-0.104***	-0.0929***	-0.0902***	-0.241***	-0.238***
	(-8.029)	(-7.816)	(-7.415)	(-7.185)	(-7.197)	(-7.101)
% of Independent Directors	-8.28e-05	-7.16e-05	-8.97e-05	-7.91e-05	5.07e-05	6.35e-05
	(-0.523)	(-0.453)	(-0.614)	(-0.542)	(0.118)	(0.148)
Female Director (Dummy)	-0.0151***	-0.0148***	-0.0127**	-0.0124**	-0.0456***	-0.0454***
	(-2.697)	(-2.641)	(-2.442)	(-2.380)	(-2.973)	(-2.954)
Log(CEO Age)	-0.0941***	-0.0967***	-0.0839***	-0.0867***	-0.188***	-0.190***
	(-4.668)	(-4.784)	(-4.520)	(-4.653)	(-3.217)	(-3.248)
Log(delta)	-0.0105***	-0.0107***	-0.0113***	-0.0115***	0.00642	0.00646
	(-4.597)	(-4.696)	(-5.426)	(-5.567)	(0.951)	(0.957)
Log(vega)	-0.0107***	-0.0104***	-0.00938***	-0.00913***	-0.0197***	-0.0194***
	(-5.004)	(-4.907)	(-4.846)	(-4.734)	(-3.086)	(-3.059)
Constant	0.826***	0.836***	0.795***	0.805***	1.137***	1.145***
	(10.11)	(10.24)	(10.58)	(10.71)	(4.831)	(4.873)
Year fixed effect	YES	YES	YES	YES	YES	YES
Firm fixed effect	YES	YES	YES	YES	YES	YES
Observations	11,178	11,178	11,178	11,178	11,178	11,178
R-squared	0.251	0.251	0.288	0.288	0.084	0.084
Adjusted R2	0.245	0.245	0.282	0.283	0.0767	0.0767