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Pay Gap, Risk-taking, and the Financial Crisis

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In this study, we examine how the occurrence of the financial crisis changed the effect of pay gap on risk-taking in financial firms under two competing hypotheses: tournament theory and equity fairness/quiet life theory. Based on a sample of financial firms between 1992 and 2009, we document a positive relationship between managerial pay gap and risk-taking. More importantly, we show that the positive effect of pay gap on risk-taking in financial firms has significantly weakened since the financial crisis, which implies that the crisis may have changed the attitude of top executives away from tournament incentives and more towards reluctance in dealing with risk-increasing behaviors. Our study is among the first to provide new evidence on the differential effect of pay gap on risk-taking conditional on the occurrence of financial crisis. We also provide an insight into this new evidence by highlighting the trade-off faced by senior executives in competing for promotion-based rewards with risk-taking. Our results are robust to different proxies for pay gaps and risk-taking incentives and have important implications for executive compensation policies in this era of political and regulatory change.

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1. Introduction

The recent financial crisis has drawn much attention as to whether executive compensation packages in the financial service industry are related to excessive risk taking behavior. The Board of Governors of the Federal Reserve System (2011) begins its review of incentive compensation practices with the following statement: "Risk-taking incentives provided by incentive compensation arrangements in the financial services industry were a contributing factor to the financial crisis that began in 2007" (p.1). Accordingly, regulatory agencies implemented policies to monitor and restrict the pay of financial executives. Most of these new regulations following the explosion of the financial crisis[1] have focused on the total level of compensation or equity-based compensation for executives (i.e. performance-based incentives). We provide regulators with an additional dimension in regulating executive compensation in the financial industry: the compensation gap between the CEO and other senior executives (i.e. promotion-based incentives). CEOs in the U.S. receive excessive pay and the gap between the CEO and executives at the next level of the corporate hierarchy becomes dramatic, attributing to increased CEO power on boards, increased ability of CEOs to set their own pay, heightened competition for top management talent, and indexing compensation to industry benchmarks (Kale et al. 2009). In this study, we examine the effect of managerial compensation gap on risk-taking in financial firms during the period of 1992-2009 by testing two competing hypotheses: tournament theory and equity fairness/quiet life theory.

It is notable that a number of studies already examine the effect of executive compensation on risk-taking behavior in the financial service industry (John et al. 2000, Palia and Porter, 2004; Chen et al. 2006; Fortin et al. 2010; Belkhir and Chazi, 2010; Vallascas and Hagendorff, 2011; Hagendorff and

[1] Examples include Emergency Economic Stabilization Act of 2008 and the Treasury guidelines published in 2009 on executive pay for financial institutions that have received government assistance.

Vallascas, 2011; Victoravich et al. 2011). We differentiate from these studies in three ways. First, unlike most of these studies which merely focus on the relationship between *performance-based* CEO compensation incentives and risk-taking behavior, we examine the effect of *promotion-based* compensation incentives for other senior executives on risk-taking. Second, prior studies mostly focus on the relationship between executive compensation and risk-taking in general and do not take into account the possible effect of financial crisis on the relationship. To our knowledge, our study is among the first to provide new evidence on how financial crisis has changed the attitude of top executives in dealing with risk-taking behavior. Third, our paper is related to Kini and Williams (2012), who find a significantly positive relationship between promotion-based incentives and firm risk in financial firms. Their findings are consistent with tournament theory[2] (Lazear and Rosen, 1981; O'Reilly et al. 1988). As the theory considers promotions as mechanisms for rewarding strong employee performance, it implies a positive relationship between increasing compensation gap in hierarchical levels and greater risk-taking by senior executives as they will compete against each other in order to obtain larger prizes at the top. We complement Kini and Williams (2012) by including quiet life theory[3] as a potential factor to explain the relationship between promotion-based incentives and risk-taking. Quiet life theory suggests senior managers may choose to enjoy their quiet life and are reluctant to deal with cognitively difficult decisions involved in risk-increasing activities, especially when their job securities are at risk. We provide an assessment of this theory in the context of financial crisis.

Based on a sample of financial firms in EXECUCOMP between 1992 and 2009, we document a positive effect of managerial pay gap on risk-taking as proxied by total, systematic, idiosyncratic volatilities of stock returns, and asset return risk. Importantly, we show that the positive effect of pay gap on risk-taking in financial firms has significantly weakened since the financial crisis. The results suggest that the financial crisis may have changed the attitude of top executives away from tournament incentives and more towards reluctance in dealing with risk-increasing behaviors due to their concerns about job securities. Our results are robust to different proxies for pay gaps, and OLS and firm fixed effect regressions.

Our findings suggest the importance of taking into account the impact of macroeconomic conditions on the relationship between pay gap and risk-taking. We add new evidence to the literature by documenting that managerial compensation gap has a differential effect on risk-taking in financial firms between the pre-financial crisis and post-financial crisis periods. We also provide an insight into this new evidence by highlighting the trade-off faced by senior executives between the benefits from larger compensation if promoted and the costs due to a greater threat to their job security in competing for promotion with risk-taking. Specifically, as deteriorating economic conditions can adversely affect job security and intensify the competition among managerial team members, more senior managers may have altered their perception about risk-taking. They would rather choose to enjoy a quiet life and be reluctant or discouraged to deal with cognitively difficult decisions involved in risk-increasing activities.

Second, our study also suggests the importance of including senior executives below the rank of the CEO in studying firm policy choices. It is generally believed that senior executives below the rank of the CEO may not have a significant influence on investment policies in a firm (Kini and Williams, 2012). Prior compensation research was also often restricted to the CEO. However, according to our findings, the attitude of other senior executives regarding promotion-based incentives does affect firm riskiness. So our work not only contributes to recent research that examines executive-team compensation (Aggrawal and Samwick, 2003; Barron and Waddell, 2003), but also adds to the new strand of studies that started to examine the effects of incentives of senior executives other than CEOs on firm policy choices (Jiang et al. 2010; Chava and Purnanandam, 2010; Coles et al. 2006).

Finally, our study has direct implications for corporate executive compensation policies. Misaligned CEO incentive compensation and high CEO pays in financial firms has been under fire

[2] Please refer to Section 2 for the detailed discussion of tournament theory.
[3] Please refer to Section 2 for the detailed discussions of quiet life theory.

from politicians, regulators, and the media. Our findings about pay gap between the CEO and other senior executives provide regulators with an additional dimension in regulating executive compensation in the financial industry. It should also be of interest to the board of directors who contemplate compensation contracts for managers. Attention should be given not only to the level or structure of compensation for individual executives, but also to pay gaps between executives, since they will also impact bank risk-taking policies. In particular, during normal economic periods when excessive risk-taking usually does not cause a serious concern, managerial pay gaps should actually be closely monitored, as our evidence suggests that promotion tournaments are more likely to motivate senior executives to undertake riskier investment under good economic conditions.

The rest of the paper is organized as follows. Section 2 discusses prior literature and develops our hypotheses. Section 3 describes the sample, data and major variables, and reports the summary statistics. Section 4 presents the empirical results, and section 5 concludes.

2. Literature Review and Hypotheses Development

As financial researchers and analysts attempt to explain and identify the causes of the recent financial crisis, excessive risk-taking driven by executive compensation packages emerges as an important explanation. However, prior studies in the financial service industry focus on the relationship between performance-based incentives (i.e. the level or structure of executive compensation) and risk-taking behavior (e.g., John et al. 2000, Palia and Porter, 2004; Chen et al. 2006; Fortin et al. 2010; Belkhir and Chazi, 2010; Vallascas and Hagendorff, 2011; Victoravich et al. 2011, Hagendorff and Vallascas, 2011). The effect of promotion-based incentives (i.e. the compensation gap between the CEO and other senior executives) on risk-taking in financial firms has received limited attention. Kini and Williams (2012) is the only research so far that addresses this issue. By measuring the promotion-based incentives as the natural logarithm of the lagged difference between the CEO's total compensation and the median total compensation of other senior executives (VPs), they find a significantly positive relationship between pay gaps and firm risks in financial firms. Their findings are consistent with tournament theory

Tournament theory was developed by Lazear and Rosen (1981) and O'Reilly et al. (1988). As firms use promotions as mechanisms for rewarding strong employee performance, the competition for promotions and rewards within a corporate hierarchy is viewed as a tournament. High performing senior executives win promotions and generous compensation in their new positions as prizes. Increasing the compensation gap in hierarchical levels (larger prizes at the top) will provide more incentives for executives to participate in the managerial tournament. Therefore, it is implied that senior executives will compete against each other by taking greater risks in order to increase their chances to be promoted to be the CEO, who is usually rewarded with the highest compensation package. With theoretically modeling, Goel and Thakor (2008) also show that the chosen risk level for all senior executives will increase with the promotion prize in the tournament. Most of empirical tests on tournament theory focus on the effect of tournament incentives on firm performance (O'Reilly et al. 1988; Main et al. 1993; Eriksson, 1999; Conyon et al. 2001; Srivastava and Insch, 2007; Jans and Otten, 2008) and their results are mixed. Except Kini and Williams (2012), the empirical evidence on the relationship between tournament incentives and risk-taking is very sparse in the literature.

In contrast with tournament theory, equity fairness theory predicts a negative effect of pay gaps on risk-taking incentives. It argues that the quality of social relationship in the workplace affects employees' efforts and then firm performance (Akerlof and Yellen, 1988, 1990; Milgrom, 1988; Milgrom and Roberts, 1988, 1990). Accordingly, larger pay gap can lead to poor loyalty and counterproductive activities as it adversely affects employee relations and satisfactions, and increases dysfunctional behavior among employees (Lee et al. 2008),. Under these assumptions, greater pay dispersion among top executives may discourage senior managers from undertaking risky projects since their enthusiasm to be promoted is dampened. The literature includes some empirical tests of equity fairness theory that document a negative effect of compensation dispersion on productivity (Pfeffer and Langton (1993); Cowherd and Levine (1992); Drago and Garvey (1998); and Hibbs and

Locking (2000)). However, the evidence on the effect of compensation dispersion on risk-taking activities due to equity fairness is very limited.

Similar to equity fairness theory, quiet life theory suggested by Hicks (1935) and Bertran and Mullainathan (2003) argues that senior managers may choose to enjoy their quiet life and are reluctant to deal with cognitively difficult decisions involved in risk-increasing activities. Specifically, Bertran and Mullainathan (2003) find that when managers are insulated from takeovers, they are more likely to avoid risky projects. For example, they are less likely to open new plants, which may require finding appropriate projects, adapting to a new industry, and perhaps upsetting the balance of the power between managers inside the firm. Similarly, they are less likely to shut down old plants, which may require facing down unions, engaging in layoffs, and dealing with the management in charge of those plants. In the context of conglomerate mergers, Amihud and Lev (1981) suggest that risk-reduction activities of managers may arise from their largely undiversifiable "employment risk" such as risk of losing job or professional reputation. Therefore, according to quiet life theory, if greater pay gap within the management team suggests an unbalanced power between top executives, senior managers may choose to enjoy their quiet life and avoid the usual difficult risk-taking activities which may adversely affect their job security.

To summarize, tournament theory predicts a positive relationship between managerial pay gap and risk-taking whereas equity fairness theory and quiet life theory predict a negative relationship. While tournament and equity fairness/quiet life theories provide different predictions regarding the effect of pay gap on risk-taking, the empirical evidence on the subject with an assessment of all these theories thus far is limited. As these theories are not necessarily mutually exclusive, we propose that the importance of economic conditions should not be overlooked as it may alter managerial perceptions regarding the motivational benefits and the costs associated with pay dispersion. We posit that in normal economic conditions where relative performance is a better incentive mechanism than absolute performance (Lee et al. 2008), the net benefits are likely to exceed the costs associated with larger pay dispersion. Thus, we predict that:

H1: Managerial pay gap is positively related to risk-taking in financial firms on average.

In addition, we also propose that the occurrence of a financial crisis can affect the perception of senior managers about the benefits and costs of compensation dispersion. Specifically, as the financial crisis can adversely affect job security and intensify the competition among managerial team members, it is more likely that senior managers would choose to enjoy their quiet life and would be more reluctant or discouraged to deal with cognitively difficult decisions involved in risk-increasing activities. As a result, the positive effect of managerial pay gap on risk-taking in financial firms is expected to weaken after the financial crisis. Therefore, we predict that:

H2: The positive effect of managerial pay gap on risk-taking decreases following the financial crisis.

3. Sample, Variables and Summary Statistics

3.1 Sample and Data

Our sample includes financial firms (SIC 6000-6999) on EXECUCOMP over the period of 1992-2009. Data for CEO tenure, compensation, and the data used in the calculations of delta and vega are obtained from EXECUCOMP. Daily stock returns to calculate equity volatility are from CRSP. The calculation of systematic volatility and idiosyncratic volatility requires returns on the S&P 500 index as a market proxy and this is also obtained from CRSP. Financial data are from COMPUSTAT. After merging the databases, our primary sample to examine the relationship between managerial pay gap and risk-taking (equity volatility) includes 1487 firm-year observations. We divide the sample into two periods: pre-financial crisis period (1992-2006) and post-financial crisis period (2007-2009)[4]. Pre-

[4] Federal Reserve Bank of St. Louis published a timeline of events and policy actions during the recent financial crisis (see http://timeline.stlouisfed.org/). The first event listed is the Freddie Mac's announcement that it would no longer buy the most risky subprime mortgages and mortgage related securities in February 2007. According to the S&P/Case-Shiller price index, by

financial crisis period includes 1069 firm-year observations and post-financial crisis period includes 418 firm-year observations.

3.2. Variables

3.2.1. Risk-taking Variables

We use multiple measures of firm risk including total risk, systematic risk, idiosyncratic risk, and asset return risk (ARR) to test our hypotheses. *Total risk* is the standard deviation of daily stock returns. Following Anderson and Fraser (2000), we use the single-index market model to estimate systematic risk and idiosyncratic risk. *Systematic risk* is the standard deviation of the predicted component and *idiosyncratic risk* is the standard deviation of the error terms based on the following market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

In the above model, β is systematic risk, R_m is market return on equally-weighted market index (S&P 500 index), and ε is the residual. In addition, following Pathan (2009), we also use asset return risk (*ARR*), which is calculated as the standard deviation of the daily stock returns times the ratio of market value of equity to market value of total assets times the square-root of 250.

3.2.2. Managerial Pay Gap Variables

We use several measures of managerial pay gap to test our hypotheses. These measures include total gap, short-term gap, long-term gap, compensation dispersion (DISPAY), and CEO pay slice (CPS). First, following Kale et al. (2009), *total gap, short-term gap*, and *long-term gap* are the log of the difference between the CEO's compensation and the median compensation of the top four executives for a given firm-year, in terms of total compensation, short-term compensation, and long-term compensation, respectively. Second, we measure compensation dispersion (*DISPAY*) with the coefficient of variation of total compensation across the top five highest paid executives by following Lee et al. (2008). Third, CEO pay slice (*CPS*) is defined as the fraction of the aggregate compensation of the top five executives captured by the CEO, according to Bebchuk et al. (2011).

3.2.3. Compensation Incentives

In addition to managerial pay gap, explicit compensation incentives, including delta and vega, have been shown to affect managerial risk-taking. *Delta* is the sensitivity of CEO portfolio wealth to a 1% change in stock price. *Vega* is the sensitivity of CEO portfolio wealth to a 1% change in the standard deviation of the stock return. The estimation of delta is based on the CEO total wealth portfolio, which includes newly granted options, outstanding options, and stocks. However, Guay (1999) shows that option vega is several orders of magnitude higher than stock vega. Therefore, we follow the convention in the literature and use option vega to approximate the vega of CEO total wealth (e.g., Knopf et al. 2002; Rajgopal and Shevlin, 2002; and Coles et al. 2006). In addition, we follow Core and Guay (2002) and use the one-year approximation (OA) method to estimate delta and vega of outstanding options. Specifically, for the inputs to estimate delta and vega (of both new and outstanding options), we use the annualized standard deviation of monthly stock returns over the past sixty months as the volatility measure, and the average dividend yield over the past three years as the dividend yield measure. We also use the yield on seven-year U.S. Treasury bonds as the risk-free rate and adjust the maturity of a newly granted option to be 70 percent of its actual maturity. This approach, which recognizes the fact that the overwhelming majority of executive stock options carry ten-year terms and an executive usually exercises his options 70 percent of the way into its nominal term, is used by EXECUCOMP and some related studies (e.g. Kini and Williams, 2012; Brick et al. 2012). Because delta and vega have skewed distributions, we take the logs of both variables.

3.2.4. Control Variables

November 2007, average U.S housing prices had fallen approximately 8% from their peaked price. We therefore use 2007 as the starting year of the recent financial crisis.

Following prior studies such as Lee et al. (2008), Kale et al. (2009), and Kini and Williams (2012), we also control for firm and CEO characteristics in our regressions, including *firm size, return on assets (ROA), leverage, Tobin's Q, sales growth,* and *CEO tenure*. Please refer to the Appendix for the definitions of these variables.

3.3. Summary Statistics

Table 1 presents summary statistics[5], correlations, and univariate analysis for the variables in our primary analyses. According to the summary statistics in Panel A, the average (median) firm in our sample has total stock return volatility of 0.027 (0.021), *short-term gap* of 1,003.464 (533.366) thousand dollars, long-term gap of 3,388.507 (1271.461) thousand dollars, and *total gap* of 4,353.336 (2116.460) thousand dollars. Furthermore, the value of the average (median) CEO's option and stock portfolio increases by $1,156,879 ($261,921) for a 1% increase in stock price, and increases by $149,412 ($48,005) for a 1% increase in the annualize standard deviation of stock returns.

Table 1. Summary Statistics

Panel A: Summary Statistics

	Mean	Median	Min	Max	N
			Compensation Variables		
Total Gap	4353.336	2116.460	-15201.960	83866.920	1487
ST Gap	1003.464	533.366	-11408.830	42635.970	1487
LT Gap	3388.507	1271.461	-21511.480	85383.490	1487
CPS	0.374	0.374	0.005	0.821	1487
DISPAY	61.203	57.861	4.757	173.562	1487
CEO Delta (10^3)	1156.879	261.921	0.000	68756.851	1487
CEO Vega (10^3)	149.412	48.005	0.000	3504.786	1487
			Risk Measures		
Total Risk	0.027	0.021	0.008	0.159	1487
Idiosyncratic Risk	0.022	0.017	0.006	0.140	1487
Systematic Risk	1.070	0.983	-0.213	3.572	1487
ARR	0.151	0.097	0.000	1.240	1487
			Firm/CEO Characteristics		
ROA	2.646	1.744	-175.722	40.022	1487
Size	8.992	8.804	4.467	14.270	1487
Leverage	0.239	0.141	0.000	0.933	1487
Tobinq's Q	1.489	1.121	0.733	16.648	1487
Sales Growth	0.159	0.057	-0.988	60.540	1478
CEO Tenure	6.866	5.000	0.000	44.000	1487

Notes: This table reports the summary statistics, correlations, and univariate analysis of the major variables used in the empirical analysis. Panel A lists the summary statistics. Panel B reports the correlation matrix for the major variables. Panel C reports the univariate differences in the major variables between the pre-crisis period (1992-2006) and the post-crisis period (2007-2009). Significance of the mean differences is based on a *t*-test. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All the variables are in their raw format. CPS, DISPAY, Size, Leverage, Tobin's Q, and Sales Growth are winsorized at the 1st and 99th percentile levels. See the Appendix for the definitions of all the variables.

Panel B reports the correlation matrix for the major variables. Generally, pay gap variables are significantly correlated with systematic risk and asset return risk. As expected, different proxies for pay gaps are positively correlated, except for short-term gaps and long-term gaps, which have a negative correlation. Similarly, different risk-taking variables are positively correlated.

[5] The number of observations in the regressions is a little fewer than what is reported in the summary statistics here since in regression we require pay gap and compensation incentive variables are lagged by one year with respect to CEO-firm matched pair.

Panel B: Correlations

	1	2	3	4	5	6	7	8	9	10	11
Total Gap	1.000										
ST Gap	0.247***	1.000									
LT Gap	0.950***	-0.060**	1.000								
CPS	0.454***	0.192***	0.402***	1.000							
DISPAY	0.444***	0.175***	0.397***	0.707***	1.000						
CEO Delta	0.123***	0.202***	0.064***	-0.028	0.015	1.000					
CEO Vega	0.322***	0.234***	0.262***	0.053*	0.099***	0.230***	1.000				
Total Risk	0.008	-0.046*	0.022	-0.039	-0.014	-0.055**	-0.077***	1.000			
Idiosyncratic Risk	-0.016	-0.041	-0.005	-0.026	0.005	-0.067***	-0.115***	0.965***	1.000		
Systematic Risk	0.082***	0.046*	0.072***	-0.060**	-0.039	0.062**	0.037	0.655***	0.523***	1.000	
Asset Return Risk	-0.100***	-0.095***	-0.074***	-0.069***	-0.044*	0.024	-0.116***	0.360***	0.368***	0.168***	1.000

Panel C: Univariate Analysis

	Pre-crisis Period		Post-crisis Period		
	N	Mean	N	Mean	*Difference in mean*
		Compensation Variables			
Total Gap	1069	4181.100	418	4793.900	-612.800
ST Gap	1069	1226.600	418	432.700	793.900***
LT Gap	1069	3005.800	418	4367.300	-1361.500***
CPS	1069	0.375	418	0.372	0.003
DISPAY	1069	61.674	418	59.997	1.677
CEO Delta	1069	1509.400	418	255.200	1254.200***
CEO Vega	1069	161.200	418	119.300	41.900***
		Risk Measure			
Total Risk	1069	0.021	418	0.041	-0.020***
Idiosyncratic Risk	1069	0.019	418	0.031	-0.012***
Systematic Risk	1069	0.895	418	1.518	-0.623***
ARR	1069	0.138	418	0.184	-0.046***
		Firm/CEO Characteristics			
ROA	1069	3.484	418	0.503	2.981***
Size	1069	8.999	418	8.974	0.025
Leverage	1069	0.229	418	0.263	-0.034***
Tobin's Q	1069	1.577	418	1.263	0.314***
Sales Growth	1069	0.111	418	0.283	-0.172
CEO Tenure	1069	6.880	418	6.828	0.052

Panel C reports the univariate differences in major variables between the pre-crisis period (1992-2006) and the post-crisis (2007-2009) period. According to *t*-test, there is a significant difference

between the pre- and post-crisis time periods in terms of executive pay gaps and risk. Therefore, we next turn to a multivariate analysis to address whether there is a relationship between pay gaps and risk and whether this relationship has changed as a result of the financial crisis.

4. Empirical Analysis

In this section, we first examine the general effect of the executive compensation gap between the CEO and VPs on the level of risk-taking in financial firms. To consider the influence of outliers, we either winsorize a variable at the 1st and 99th percentiles, or take the log of that variable. In addition, the variables of size and sales are inflation-adjusted.

We estimate the following specification using an OLS regression.

$$\begin{aligned}\text{Risk}_{it} = {} & \beta_0 + \beta_1 \text{Pay Gap}_{i,t-1} + \beta_2 \text{Delta}_{i,t-1} + \beta_3 \text{Vega}_{i,t-1} + \beta_4 \text{CEO Tenure}_{i,t} + \beta_5 \text{Size}_{it} + \\ & \beta_6 \text{Sales Growth}_{i,t} + \beta_7 \text{Leverage}_{i,t} + \beta_8 \text{ROA}_{i,t} + \beta_9 \text{Tobin's Q}_{i,t} + \text{Two-digit SIC industry dummies} \\ & + \text{Year dummies} + \varepsilon_{it} \end{aligned} \quad (2)$$

The OLS regression approach is commonly employed in the literature. But this specification is subject to concerns of endogeneity in the form of reverse causality or omitted variable bias. To alleviate the potential reverse causality, all the executive compensation gap variables and compensation incentive variables are lagged by one year (Coles et al. 2006; Kini and William, 2012). Specifically, they are lagged with respect to the CEO-firm matched pair because these variables should be both firm- and CEO-specific.

To alleviate the potential omitted variable bias, in addition to the list of control variables as described in the previous section, we also control for the two-digit SIC industry and year effects in all the regressions. Furthermore, we use a firm fixed effect model as our second regression specification. Some unobserved sources of firm heterogeneity can affect compensation gaps and risk-taking at the same time, which can bias estimations of coefficients in an OLS. Fixed effects are immune to such omission of unobserved firm characteristics and therefore can mitigate the concerns for endogeneity (Himmelberg et al. 1999; Kale et al. 2009; Kini and Williams, 2012). In both model specifications, standard errors are adjusted for heteroskedasticity and clustered at the firm level.

Second, in order to examine whether the influence of pay gaps on risk-taking in financial firms changed after the recent financial crisis, we test whether the pay gap variables have different coefficients between the pre-financial crisis period (1992-2006) and the post-financial crisis period (2007-2009). We define a dummy variable (*D_2007)* that equals one if the year is in the post-financial crisis period, and zero otherwise. We then interact the dummy with pay gap variables as in the following specification.

$$\begin{aligned}\text{Risk}_{it} = {} & \beta_0 + \beta_1 \text{Pay Gap}_{i,t-1} + \beta_2 (\text{Pay Gap}_{i,t-1} * \text{D_2007}) + \beta_3 \text{Delta}_{i,t-1} + \beta_4 \text{Vega}_{i,t-1} \\ & + \beta_5 \text{CEO Tenure}_{i,t} + \beta_6 \text{Size}_{it} + \beta_7 \text{Sales Growth}_{i,t} + \beta_8 \text{Leverage}_{i,t} + \beta_9 \text{ROA}_{i,t} \\ & + \beta_{10} \text{Tobin's Q}_{i,t} + \text{Two-digit SIC industry dummies} + \text{Year dummies} + \varepsilon_{it} \end{aligned} \quad (3)$$

If the financial crisis changed the way that executive compensation gaps affect risk-taking, we would observe a significant interaction term between pay gap variables and the dummy that indicates the post-financial crisis period. In particular, if the financial crisis weakened the general effect of pay gaps on risk-taking incentives, the coefficient on the interaction term would have a sign that is opposite to the coefficient on the pay gap variable.

4.1. Managerial Pay Gap and Risk-taking

Table 2 reports the OLS regression results on the four risk-taking measures as discussed in Section 3. Panels A-E use measures of the pay gap between CEOs and VPs based on total compensation, short-term compensation, and long-term compensation, compensation dispersion across the top-five executives, and CEO pay slice, respectively. The models show *pay gaps*, *compensation dispersion*, and *CEO pay slice* tend to have a positive impact on risk-taking in financial firms. Specifically, Panel A and

Panel C show that both *total gap* and *long-term gap* are positively and significantly related to *total risk, idiosyncratic risk,* and *asset return risk*. Similarly, as reported in Panel D and Panel E, both *compensation dispersion* and *CEO pay slice* have a significantly positive effect on *total risk* and *idiosyncratic risk*. *Compensation dispersion* is also significantly related to *systematic risk*. When we focus on short-term pay gap in Panel B, the coefficients on the variable of *short-term gap* are also positive in all the regressions for four risk measures, even though it is significant only in the regression for systematic risk.

In Table 3 we examine the robustness of the positive effect of managerial pay gap on risk-taking using firm fixed effects models. These models are immune to the possibility that some unobservable firm-specific characteristics may simultaneously influence managerial compensation and risk-taking incentives. As shown in Table 3, all the pay gap variables, including *total gap, short-term gap, long-term gap, CEO pay slice,* and *compensation dispersion*, have a positive effect on *asset return risk*. Except the coefficient for *short-term gap*, which has 10% significance, all the other coefficients are significant at the 1% level. The positive coefficient on *compensation dispersion* is also significant in the regressions for *total risk*.

Overall, the results in Table 2 and Table 3 document a consistently positive effect of pay gaps on risk-taking, without taking into account different economic conditions. The evidence thus shows a support for tournament theory. In the next sub-section, we will distinguish the pre-crisis period and post-crisis period and reexamine the relationship between pay gaps and risk-taking.

Table 2. Managerial Pay Gap and Risk-taking (OLS Models)

Panel A: Total Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
Total Gap	0.589***	0.705***	0.094	0.872***
CEO Delta	-0.010	-0.014	-0.004	0.108***
CEO Vega	-0.007	-0.011	0.001	0.030*
CEO Tenure	-0.018	-0.017	-0.008	-0.081***
Size	-0.054***	-0.082***	0.060***	-0.325***
Salesgrowth	0.015***	0.018***	0.011***	-0.012
Leverage	0.142	0.181*	0.119	-0.613***
ROA	-0.014***	-0.015***	-0.009***	0.015***
Tobin's Q	0.063***	0.061***	0.085***	0.070***
Constant	-6.264***	-6.555***	-1.499**	-4.442***
Observations	1,312	1,312	1,308	1,312
Adjuested R-squared	0.68	0.62	0.43	0.71

Panel B: Short Term Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
ST Gap	0.070	0.075	0.120**	0.113
CEO Delta	-0.002	-0.005	-0.003	0.119***
CEO Vega	-0.002	-0.005	0.002	0.039**
CEO Tenure	-0.024	-0.024	-0.009	-0.089***
Size	-0.043***	-0.069***	0.061***	-0.310***
Salesgrowth	0.015***	0.018***	0.011***	-0.011
Leverage	0.121	0.155	0.119	-0.645***
ROA	-0.014***	-0.016***	-0.010***	0.015***
Tobin's Q	0.066***	0.064***	0.086***	0.074***
Constant	-4.192***	-4.038***	-1.613***	-1.412***
Observations	1,312	1,312	1,308	1,312
Adjuested R-squared	0.68	0.61	0.43	0.70

Panel C: Long Term Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
LT Gap	1.354***	1.753***	-0.473	2.061**
CEO Delta	-0.007	-0.011	-0.001	0.111***
CEO Vega	-0.004	-0.007	0.003	0.036**
CEO Tenure	-0.019	-0.017	-0.010	-0.082***
Size	-0.048***	-0.075***	0.063***	-0.317***
Salesgrowth	0.015***	0.018***	0.011***	-0.011
Leverage	0.133	0.171	0.110	-0.627***
ROA	-0.014***	-0.016***	-0.010***	0.015***
Tobin's Q	0.065***	0.062***	0.086***	0.072***
Constant	-10.544***	-12.323***	1.192	-11.053**
Observations	1,312	1,312	1,308	1,312
Adjuested R-squared	0.68	0.61	0.43	0.70

Panel D: Dispay and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
Dispay	0.002***	0.002***	0.001***	0.000
CEO Delta	-0.005	-0.008	-0.005	0.118***
CEO Vega	-0.005	-0.008	-0.001	0.038**
CEO Tenure	-0.024	-0.024	-0.009	-0.089***
Size	-0.041***	-0.066***	0.064***	-0.309***
Salesgrowth	0.015***	0.018***	0.011***	-0.012
Leverage	0.134	0.169	0.129	-0.647***
ROA	-0.014***	-0.016***	-0.009***	0.015***
Tobin's Q	0.069***	0.067***	0.088***	0.074***
Constant	-4.007***	-3.843***	-1.215***	-0.966***
Observations	1,312	1,312	1,308	1,312
Adjuested R-squared	0.68	0.62	0.43	0.70

Panel E: CPS and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
CPS	0.172*	0.188*	0.187	0.165
CEO Delta	-0.002	-0.005	-0.002	0.119***
CEO Vega	-0.004	-0.007	-0.000	0.036**
CEO Tenure	-0.024	-0.024	-0.009	-0.090***
Size	-0.042***	-0.068***	0.062***	-0.309***
Salesgrowth	0.015***	0.018***	0.011***	-0.012
Leverage	0.124	0.158	0.121	-0.643***
ROA	-0.014***	-0.016***	-0.009***	0.015***
Tobin's Q	0.066***	0.065***	0.086***	0.075***
Constant	-3.978***	-3.810***	-1.201***	-1.022***
Observations	1,312	1,312	1,308	1,312
Adjuested R-squared	0.68	0.61	0.43	0.70

Notes: These models use OLS regressions to examine the relation between managerial pay gap and risk-taking. The sample consists of financial firms from 1992 to 2009. See the Appendix for the definitions of all variables. All models include year dummies and dummies for two-digit SIC code. These coefficients are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate significance based on a *t*-test at the 10%, 5%, and 1% levels, respectively.

Table 3. Managerial Pay Gap and Risk-taking (Fixed Effects Models)

Panel A: Total Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
Total Gap	0.112	0.173	-0.316	0.841***
CEO Delta	-0.046***	-0.053***	-0.007	0.039*
CEO Vega	-0.002	-0.005	-0.020	-0.009
CEO Tenure	-0.007	-0.015	0.030	0.027
Size	-0.019	-0.026	0.077	-0.362***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.068	-0.018	0.091	-0.668**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.003
Constant	-4.248***	-4.472***	0.101	-3.169**
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.43

Panel B: Short Term Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
ST Gap	0.011	-0.008	0.027	0.091*
CEO Delta	-0.044**	-0.049***	-0.014	0.054**
CEO Vega	-0.002	-0.005	-0.020	-0.007
CEO Tenure	-0.009	-0.017	0.035	0.014
Size	-0.018	-0.025	0.075	-0.357***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.070	-0.022	0.103	-0.685**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.079***	0.004
Constant	-3.833***	-3.730***	-1.307**	-0.080
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.42

Panel C: Long Term Gap and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
LT Gap	0.105	0.461	-1.315**	2.033**
CEO Delta	-0.044**	-0.051***	-0.007	0.046*
CEO Vega	-0.002	-0.004	-0.021	-0.008
CEO Tenure	-0.008	-0.015	0.029	0.023
Size	-0.018	-0.024	0.074	-0.355***
Sales growth	0.009***	0.012***	0.006***	-0.024***
Leverage	-0.069	-0.017	0.085	-0.666**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.004
Constant	-4.305*	-6.038**	5.298	-9.760**
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.42

Panel D: Display and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
DISPAY	0.001*	0.001	0.001	0.002***
CEO Delta	-0.047***	-0.052***	-0.016	0.050**
CEO Vega	-0.001	-0.004	-0.019	-0.007
CEO Tenure	-0.006	-0.015	0.037	0.018
Size	-0.018	-0.024	0.075	-0.357***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.051	-0.005	0.122	-0.649**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.022**	0.016	0.081***	0.007
Constant	-3.836***	-3.803***	-1.245**	0.193
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.42

Panel E: CPS and Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
CPS	-0.115	-0.141	-0.087	0.564**
CEO Delta	-0.043**	-0.048***	-0.013	0.052**
CEO Vega	-0.002	-0.004	-0.020	-0.011
CEO Tenure	-0.011	-0.020	0.033	0.024
Size	-0.017	-0.024	0.076	-0.360***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.075	-0.028	0.098	-0.661**
ROA	-0.003	-0.003	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.079***	0.004
Constant	-3.749***	-3.714***	-1.167**	0.097
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.43

Notes: These models use firm fixed effects regressions to examine the relation between managerial pay gap and risk-taking. The sample consists of financial firms from 1992 to 2009. See the Appendix for the definitions of all variables. All models include year dummies and dummies for two-digit SIC code. These coefficients are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate significance based on a *t*-test at the 10%, 5%, and 1% levels, respectively.

4.2. Financial Crisis and the Effect of Managerial Pay Gap on Risk-taking

Since the occurrence of financial crises can affect the perception of senior managers about the benefits and costs from larger compensation dispersion, here we examine whether the relationship between managerial pay gap and risk-taking in financial firms differs before and after the financial crisis.

Table 4 reports the OLS regression results by adding an interaction term between a post-crisis dummy and the pay gap variables. As explained before, our interest is to examine whether the coefficients on the interaction term show a differential effect of managerial pay gaps on risk-taking based on economic conditions. Similar to the tables in Section 4.1, Panels A-E of Table 4 show the results by using various pay gap variables, including total gap, short-term gap, and long-term gap in the compensation between CEOs and VPs, compensation dispersion across the top-five executives, and CEO pay slice.

Consistent with the results in Table 2, the coefficients on the pay gap variables in most of the regressions are positive and highly significant, which shows that risk-taking in financial firms increases with managerial pay gap in the pre-financial crisis period. However, this dominant effect

weakens since the financial crisis. Specifically, when *compensation dispersion* and *CEO pay slice* are used as a proxy for pay gaps as in Panel D and E, the coefficients on the interaction term between these variables and the dummy indicating the post-crisis period (*D_2007*) are significantly negative in all the risk-taking regressions with different risk measures. The significantly negative coefficients on the interaction term are also documented in the total risk, systematic risk, and asset return risk regressions for total gap (Panel A), and in systematic risk and asset return risk regressions for long-term gap (Panel C). For short-term gap (Panel B), the coefficients on the interaction term are negative but not significant in the systematic risk and asset return risk regressions. Generally, the results show the positive effect of managerial pay gap on risk-taking has significantly decreased since the financial crisis. In addition, the reduction is large enough to shift the effect of pay gap on risk-taking toward being negative after the financial crisis in many regressions. For example, when the coefficients on both *CPS* and the interaction term in Panel E are taken into account, *CEO pay slice* shows a negative effect on risk-taking in the post-crisis period in the four regressions for *total risk, idiosyncratic risk, systematic risk,* and *asset return risk*.

We continue to use the firm fixed effects model in Table 5 to check the robustness of our findings in Table 4.

Table 4. Financial Crisis and the Effect of Managerial Pay Gap on Risk-taking (OLS Models)

Panel A: Financial Crisis and the Effect of Total Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
Total Gap	0.771***	0.833***	0.565**	1.287***
Total Gap*D_2007	-0.400*	-0.280	-1.036***	-0.913**
CEO Delta	-0.007	-0.012	0.002	0.113***
CEO Vega	-0.009	-0.013	-0.004	0.026
CEO Tenure	-0.021	-0.019	-0.015	-0.088***
Size	-0.054***	-0.082***	0.059***	-0.326***
Sales growth	0.015***	0.018***	0.011***	-0.012
Leverage	0.137	0.177*	0.105	-0.626***
ROA	-0.014***	-0.015***	-0.009***	0.016***
Tobin's Q	0.063***	0.061***	0.085***	0.070***
Constant	-7.035***	-7.094***	1.580**	-6.201***
Observations	1,312	1,312	1,308	1,312
Adjusted R-squared	0.68	0.62	0.44	0.71

Panel B: Financial Crisis and the Effect of Short Term Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
ST Gap	0.066	0.072	0.124**	0.114
ST Gap*D_2007	0.511	0.354	-0.448	-0.106
CEO Delta	-0.003	-0.005	-0.003	0.119***
CEO Vega	-0.002	-0.005	0.002	0.039**
CEO Tenure	-0.023	-0.024	-0.009	-0.089***
Size	-0.044***	-0.070***	0.062***	-0.310***
Sales growth	0.016***	0.019***	0.011***	-0.011
Leverage	0.122	0.156	0.118	-0.645***
ROA	-0.014***	-0.016***	-0.009***	0.015***
Tobin's Q	0.066***	0.064***	0.086***	0.074***
Constant	-5.943*	-5.372	0.814	-0.370
Observations	1,312	1,312	1,308	1,312
Adjusted R-squared	0.68	0.61	0.43	0.70

Panel C: Financial Crisis and the Effect of Long Term Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
LT Gap	2.228***	2.369***	1.377	3.973***
LT Gap*D_2007	-1.445	-1.019	-3.058***	-3.163**
CEO Delta	-0.006	-0.011	0.002	0.114***
CEO Vega	-0.006	-0.009	-0.001	0.032*
CEO Tenure	-0.020	-0.018	-0.014	-0.085***
Size	-0.048***	-0.076***	0.062***	-0.318***
Sales growth	0.015***	0.018***	0.011***	-0.012
Leverage	0.128	0.168	0.100	-0.637***
ROA	-0.014***	-0.015***	-0.009***	0.015***
Tobin's Q	0.064***	0.062***	0.085***	0.071***
Constant	-14.865***	-15.372***	7.862**	-20.514***
Observations	1,312	1,312	1,308	1,312
Adjusted R-squared	0.68	0.61	0.43	0.71

Panel D: Financial Crisis and the Effect of DISPAY on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
DISPAY	0.002***	0.002***	0.002***	0.001
DISPAY*D_2007	-0.002**	-0.002*	-0.003**	-0.003**
CEO Delta	-0.003	-0.006	-0.003	0.122***
CEO Vega	-0.005	-0.008	-0.001	0.037**
CEO Tenure	-0.027*	-0.026	-0.012	-0.093***
Size	-0.040***	-0.065***	0.065***	-0.308***
Sales growth	0.015***	0.018***	0.011***	-0.012
Leverage	0.134	0.169	0.129	-0.647***
ROA	-0.014***	-0.015***	-0.009***	0.015***
Tobin's Q	0.069***	0.067***	0.088***	0.074***
Constant	-3.918***	-3.786***	-1.141***	-0.851***
Observations	1,312	1,312	1,308	1,312
Adjusted R-squared	0.68	0.62	0.44	0.70

Panel E: Financial Crisis and the Effect of CPS on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
CPS	0.248**	0.269**	0.279*	0.347
CPS*D_2007	-0.372*	-0.398*	-0.452*	-0.897**
CEO Delta	-0.000	-0.003	-0.000	0.124***
CEO Vega	-0.005	-0.008	-0.001	0.034**
CEO Tenure	-0.024	-0.024	-0.010	-0.090***
Size	-0.042***	-0.068***	0.063***	-0.308***
Sales growth	0.015***	0.018***	0.011***	-0.011
Leverage	0.122	0.156	0.119	-0.648***
ROA	-0.014***	-0.016***	-0.009***	0.015***
Tobin's Q	0.067***	0.065***	0.086***	0.075***
Constant	-4.017***	-3.852***	-1.249***	-1.117***
Observations	1,312	1,312	1,308	1,312
Adjusted R-squared	0.68	0.61	0.43	0.70

Notes: These models use OLS regressions to examine if the relation between managerial pay gap and risk-taking changes after the recent financial crisis. The sample consists of financial firms from 1992 to 2009. *D_2007* is a dummy variable that equals one if the year is in the post-crisis period (2007-2009), and zero otherwise. See the Appendix for the definitions of all the other variables. All models include year dummies and dummies for two-digit SIC code. These coefficients are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate significance based on a *t*-test at the 10%, 5%, and 1% levels, respectively.

Table 5. Financial Crisis and the Effect of Managerial Pay Gap on Risk-taking (Fixed Effects Models)

Panel A: Financial Crisis and the Effect of Total Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
Total Gap	0.147	0.113	-0.047	1.329***
Total Gap*D_2007	-0.087	0.149	-0.644**	-1.208***
CEO Delta	-0.045**	-0.054***	-0.001	0.051**
CEO Vega	-0.003	-0.004	-0.024	-0.017
CEO Tenure	-0.008	-0.013	0.024	0.014
Size	-0.020	-0.024	0.069	-0.377***
Sales growth	0.009***	0.012***	0.006***	-0.024***
Leverage	-0.066	-0.021	0.108	-0.643**
ROA	-0.003	-0.004	-0.000	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.003
Constant	-4.012***	-3.901***	2.427*	-4.701**
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.44

Panel B: Financial Crisis and the Effect of Short Term Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
ST Gap	0.010	-0.008	0.031	0.103*
ST Gap*D_2007	0.119	0.062	-0.570	-1.757
CEO Delta	-0.044**	-0.049***	-0.014	0.054**
CEO Vega	-0.002	-0.005	-0.019	-0.007
CEO Tenure	-0.009	-0.017	0.035	0.014
Size	-0.018	-0.024	0.074	-0.359***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.071	-0.022	0.106	-0.676**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.005
Constant	-3.831***	-3.728***	1.582	-0.117
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.42

Panel C: Financial Crisis and the Effect of Long Term Gap on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
LT Gap	0.179	0.112	-0.409	4.334**
LT Gap*D_2007	-0.134	0.633	-1.603	-4.175**
CEO Delta	-0.044**	-0.053***	-0.004	0.055**
CEO Vega	-0.002	-0.003	-0.023	-0.015
CEO Tenure	-0.008	-0.014	0.026	0.015
Size	-0.018	-0.023	0.070	-0.366***
Sales growth	0.009***	0.012***	0.006***	-0.024***
Leverage	-0.068	-0.021	0.099	-0.637**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.004
Constant	-4.283	-3.986	0.817	-20.610**
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.43

Panel D: Financial Crisis and the Effect of Dispay on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
DISPAY	0.001**	0.001*	0.001**	0.002***
DISPAY*D_2007	-0.001	-0.001	-0.003*	-0.001
CEO Delta	-0.045**	-0.051***	-0.011	0.052**
CEO Vega	-0.002	-0.004	-0.021	-0.008
CEO Tenure	-0.009	-0.017	0.031	0.015
Size	-0.020	-0.025	0.071	-0.359***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.049	-0.004	0.128	-0.647**
ROA	-0.003	-0.004	-0.001	0.013***
Tobin's Q	0.023**	0.017	0.083***	0.008
Constant	-3.462***	-3.669***	-1.251**	0.647
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.42

Panel E: Financial Crisis and the Effect of CPS on Risk-taking

	(1)	(2)	(3)	(4)
Variables	Total Risk	Idiosyncratic Risk	Systematic Risk	ARR
CPS	-0.071	-0.111	0.013	0.674**
CPS*D_2007	-0.255	-0.173	-0.563**	-0.623*
CEO Delta	-0.041**	-0.047***	-0.009	0.057**
CEO Vega	-0.002	-0.004	-0.021	-0.013
CEO Tenure	-0.012	-0.020	0.032	0.022
Size	-0.020	-0.025	0.070	-0.366***
Sales growth	0.010***	0.012***	0.007***	-0.024***
Leverage	-0.069	-0.024	0.113	-0.646**
ROA	-0.003	-0.003	-0.001	0.013***
Tobin's Q	0.021**	0.015	0.080***	0.005
Constant	-3.756***	-3.718***	-1.183**	0.080
Observations	1,312	1,312	1,308	1,312
Number of Firms	316	316	316	316
Adjusted R-squared	0.75	0.68	0.37	0.43

Notes: These models use firm fixed effects regressions to examine if the relation between managerial pay gap and risk-taking changes after the recent financial crisis. The sample consists of financial firms from 1992 to 2009. *D_2007* is a dummy variable that equals one if the year is in the post-crisis period (2007-2009), and zero otherwise. See the Appendix for the definitions of all the other variables. All models include year dummies and dummies for two-digit SIC code. These coefficients are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *, **, and *** indicate significance based on a *t*-test at the 10%, 5%, and 1% levels, respectively.

As shown in five panels of Table 5, most of the interaction terms between *D_2007* and pay gap variables have a negative coefficient. Specifically, the coefficients are significantly negative in the systematic risk regression for *total gap* (Panel A), *compensation dispersion* (Panel D) and *CEO pay slice* (Panel E), and in the asset return risk regression for *total gap* (Panel A), *long-term gap* (Panel C), and *CEO pay slice* (Panel E). Similar to Table 4, the effect of managerial pay gap on risk-taking also leans towards being negative after the financial crisis, when the coefficients on both pay gap variables and the interaction term are considered together.

In sum, both Table 4 and Table 5 show that financial crisis may have changed the attitude of top executives in financial firms regarding tournament incentives implied in pay gaps. The positive effect of managerial pay gaps on risk-taking has significantly weakened or shifted towards the

opposite direction since the financial crisis. As the financial crisis significantly affected job securities, it is likely that more senior managers would choose to enjoy their quiet life and are reluctant or discouraged to deal with cognitively difficult decisions involved in risk-increasing activities. Therefore, the tournament effect may be no longer dominant and a shift towards the quiet life effect may be taking place.

5. Conclusion

Based on a sample of financial firms in ExecuComp between 1992 and 2009, we document a positive effect of managerial pay gap on risk-taking. More importantly, we show that the positive effect of pay gap has significantly weakened since the financial crisis. The results suggest that the financial crisis may have changed the attitude of top executives away from tournament incentives and more towards reluctance in dealing with risk-increasing behaviors. Specifically, as deteriorating economic conditions can adversely affect job security and intensify the competition among managerial team members, more senior managers would rather choose to enjoy a quiet life and be reluctant or discouraged to deal with cognitively difficult decisions involved in risk-increasing activities. Our results are robust to different proxies for pay gaps and OLS and firm fixed effect regressions.

Our paper makes contributions to both the managerial compensation research and the current public policy debate on executive compensation. Our study is among the first to provide new evidence on the differential effect of pay gap on risk-taking in financial firms between the pre-financial crisis and post-financial crisis periods. We also provide an insight into this new evidence by highlighting the trade-off faced by senior executives between the motivational benefits and the job security related cost in competing for promotion-based rewards with risk-taking. Our work also adds to the literature by suggesting the importance of including senior executives below the rank of the CEO in studying firm policy choices.

Our findings are timely and relevant to policy makers, regulators and investors. In response to the financial crisis, Congress passed The Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank Act). A section of the act requires companies to provide additional disclosures to the SEC with respect to executive compensation. Specifically, companies should provide the ratio of CEO annual compensation to the median annual compensation of employees[6]. Our findings suggest that these additional disclosures with respect to executive compensation are informative and useful. Regulators should not only pay attention to the level or structure of compensation for individual executives, but also to pay gaps between executives, as this can also impact bank risk-taking behaviors. In particular, during normal economic periods when excessive risk-taking usually does not cause a serious concern, managerial pay gaps should actually be closely monitored, as promotion tournaments are more likely to motivate senior executives to undertake riskier investment under good economic conditions.

[6] The Wall Street Reform and Consumer Protection Act of 2010, Pub. L. No. 111-203, 124 Stat. 1376 (2010), Section 953.

Appendix I. Variable Definitions

Variable	Definitions
Total Risk	The log of the standard deviation of daily stock returns over the year.
Systematic Risk	The log of the standard deviation of the predicted value of stock return from the market model (with a constant term) using daily returns over the year.
Idiosyncratic risk	The log of the standard deviation of the residual of stock return from the market model (with a constant term) using daily returns over the year.
Asset Return Risk (ARR)	The standard deviation of the daily stock returns times the ratio of market value of equity to market value of total assets times square-root of 250.
Total Gap	The log of the difference between the CEO's total compensation and the median total compensation of top four executives for any given firm-year.
ST Gap	The log of the difference between the CEO's short-term total compensation and the median short term total compensation of top four executives for any given firm-year.
LT Gap	The log of the difference between the CEO's long-term total compensation and the median long-term total compensation of top four executives for any given firm-year.
CEO pay slice (CPS)	The fraction of the aggregate compensation of the top five executives captured by the CEO.
DISPAY	The coefficient of variation of total compensation across the top five executives.
CEO Tenure	The log of CEO tenure in years. CEO tenure in a given year is determined as the length of time between the date when the person became the CEO ("becameceo" in EXECUCOMP) and the current year.
CEO Delta	The log of one plus the sensitivity of CEO option and stock portfolio value to a 1% change in stock price, where the estimation of the average exercise price and remaining time-to-maturity for outstanding options follows Core and Guay (2002)'s "one-year approximation" (OA) method. Specifically, for the inputs for stock return volatility, dividend yield, and risk-free rate, we use the annualized standard deviation of monthly stock returns over the past 60 months, the average dividend yield over the past three years, and the yield-to-maturity of Treasury bonds matched by the maturities closest to options, respectively.
CEO Vega	The log of one plus the sensitivity of CEO option portfolio value to a 0.01 change in the annualized standard deviation of stock returns. We follow Core and Guay (2002)'s OA method for the estimation of the average exercise price and remaining time-to-maturity for outstanding options. Specifically, for the inputs for stock return volatility, dividend yield, and risk-free rate, we use the annualized standard deviation of monthly stock returns over the past 60 months, the average dividend yield over the past three years, and the yield-to-maturity of Treasury bonds matched by the maturities closest to options, respectively.
Size	The log of the inflation-adjusted total assets (with year 1992 as the basis year).
ROA	Operating income before depreciation divided by total assets.
Leverage	Debt in current liabilities plus long-term debt scaled by total assets.
Sales Growth	The percentage increase in net sales from year t-1 to year t.
Tobin's Q	The market value of assets divided by the book value of assets.
D_2007	A dummy variable that equals one if the year is in the post-financial crisis period (2007-2009), and zero otherwise.

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