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Corporate Response to Catastrophic Events: An Analysis of Executive Compensation Strategies Following Hurricane Katrina disasters

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ABSTRACT

Purpose: While extensive research has examined the impacts of natural disasters on the economy and financial markets, there is limited insight into how these events influence CEO pay structures. This study, as such, aims to explore the adjustments in CEO compensation following major natural disasters, such as Hurricane Katrina in the USA.

Methodology: Our analysis employs a comprehensive dataset of CEO compensation before and after Hurricane Katrina. We utilize various econometric methods, including the difference-in-differences model, entropy balancing and generalized method of moment (GMM) techniques, to ensure the robustness of our findings against various selection bias and endogeneity issues, considering different disaster scenarios and their proximity to the affected companies.

Findings: The results indicate that CEOs tend to receive higher compensation, primarily in the form of cash (salaries and bonuses), following a disaster like Hurricane Katrina. This trend is more pronounced when the disaster occurs closer to the company's operations and is particularly evident among female CEOs, who generally prefer less risky compensation packages.

Practical Implications: These findings suggest that companies may need to reconsider their compensation strategies in light of increasing natural disaster risks. Understanding the adjustments in CEO pay following disasters can help corporations better prepare and adapt their governance practices to meet these challenges effectively.

Originality/Value: This research contributes to the limited literature on the effect of natural disasters on executive compensation. By highlighting the tendency of firms to adjust CEO pay in response to catastrophic events, this study enriches the broader discourse on corporate governance and executive compensation strategies in the context of major external shocks.

Keywords: Natural disaster, Hurricane Katrina, Executive Compensation, Gender, human capital theory, contracting theory.

1. INTRODUCTION

Natural disasters represent a critical test for firms, challenging their operational resilience, strategic decision-making, and leadership. This study examines the impact of Hurricane Katrina, one of the most devastating natural disasters in U.S. history, on CEO compensation strategies. Specifically, it explores how CEO cash and equity compensation adjusts in response to disasters and investigates the role of CEO gender in shaping these adjustments. This study offers novel insights into how catastrophic events influence executive pay, a relatively underexplored area of research (Bourdeau-Brien & Kryzanowski, 2017; Dai et al., 2020).

The study is motivated by two significant gaps in the literature. First, while extensive research has examined the economic and financial consequences of natural disasters, limited attention has been given to their impact on corporate governance and CEO compensation (Bernile et al., 2017; Dessaint & Matray, 2017; Dai et al., 2020). Second, although gender is recognized as a critical dimension of leadership and decision-making, its influence on executive compensation in disaster contexts remains underexplored (Adams & Ferreira, 2009; Huang & Kisgen, 2013; Wu et al., 2021). Addressing these gaps, this research provides a unique contribution to understanding how firms adapt their executive compensation strategies in response to external shocks.

The focus on CEOs is justified by their pivotal role in strategic decision-making and crisis management (Bernile et al., 2017; Dessaint & Matray, 2017). CEOs bear the ultimate responsibility for navigating their firms through disaster recovery, making them central to the firm's ability to adapt and thrive post-crisis. Prior research suggests that the quality of CEO decision-making significantly affects firm performance in the aftermath of disasters (Widener, 2006; Basker & Miranda, 2018). CEO compensation, as a reflection of their contribution and risk exposure, provides a critical lens for examining corporate responses to disasters (Bebchuk & Fried, 2003, 2004; Ntim et al., 2015; Tosi et al., 2000).

This study concentrates on CEO gender as a key variable due to its influence on risk preferences and decision-making styles. Existing research highlights that female CEOs are generally more risk-averse, preferring stable, predictable compensation structures, particularly in volatile environments (Adams & Ferreira, 2009; Huang & Kisgen, 2013). In contrast, male CEOs often exhibit a higher tolerance for risk and a stronger preference for equity-based compensation (Jeong & Harrison, 2017; Wu et al., 2021). Furthermore, firms with female leaders tend to adopt more conservative financial and risk management practices, making gender a critical determinant of compensation preferences during disasters (Bear et al., 2010; Liao et al., 2015). By examining these gender-specific differences, this study sheds light on how CEO gender characteristics influence corporate governance practices in disaster contexts.

The value added by this research lies in its focus on the intersection of natural disasters, CEO compensation, and gender. It builds on theoretical frameworks such as Optimal Contracting Theory (OCT) and the Managerial Power Hypothesis (MPH) (Bebchuk & Fried, 2003; Ntim et al., 2015; Adu et al., 2022). OCT suggests that CEO compensation is designed to align with firm performance, particularly during crises when managerial expertise becomes critical (Murphy, 2013; Frydman & Jenter, 2010). Conversely, MPH emphasizes the role of CEO power in shaping compensation, especially during periods of heightened uncertainty (Bebchuk & Fried, 2004; Song & Wan, 2019). By integrating insights from finance, organizational behavior, and gender studies, this research provides a comprehensive understanding of how firms adapt their executive compensation strategies to address the challenges posed by external shocks (Bernile et al., 2017; Raker et al., 2019).

This paper proceeds as follows: The next section outlines the theoretical framework and literature review, followed by the development of hypotheses. The subsequent sections detail the research methodology, present and discuss empirical results, and conclude with a discussion of the findings and their implications.

3. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

3.1 Theoretical Framework This study examines the effects of natural disasters on CEO compensation through two complementary theoretical perspectives: Optimal Contracting Theory (OCT) and the Managerial Power Hypothesis (MPH). Together, these frameworks provide a balanced lens for understanding the relationship between CEO compensation, disaster risk, and executive decision-making.

Optimal Contracting Theory (OCT) posits that CEO compensation is designed to align executives' interests with those of shareholders by incentivizing performance, especially during periods of heightened risk. Compensation contracts aim to reward firm-specific skills, risk management capabilities, and long-term value creation (Murphy, 2013; Frydman & Jenter, 2010). During crises like natural disasters, firms are expected to adjust compensation structures to retain and motivate executives capable of navigating uncertainties (Widener, 2006; Kyung et al., 2021). For instance, CEOs may receive higher pay following crises to offset the risks and responsibilities associated with managing recovery efforts (Adu et al., 2022; Ntim et al., 2015).

A key strength of OCT lies in its emphasis on market-driven efficiency and rational contract design. However, it assumes that compensation structures are entirely free of influence by power dynamics, an assumption that often fails in real-world governance contexts. This limitation necessitates the incorporation of the Managerial Power Hypothesis (MPH).

Managerial Power Hypothesis (MPH) highlights the role of power asymmetries in shaping CEO compensation. It argues that executives with significant bargaining power can influence their pay packages, prioritizing their interests over those of shareholders (Bebchuk & Fried, 2003, 2004). This behavior is especially pronounced during crises, where CEOs may

exploit the perception of indispensability to negotiate favorable terms, leading to potential misalignments between pay and performance (Tosi et al., 2000; Ntim et al., 2019).

MPH provides critical insights into how power dynamics affect CEO compensation during disasters, explaining why powerful CEOs may negotiate increased cash-based pay or reduced performance-linked incentives. Additionally, the theory underscores gender-based disparities, suggesting that female CEOs, who are often underrepresented in corporate leadership, may have limited bargaining power and exhibit distinct compensation preferences (Wu et al., 2021).

By integrating OCT and MPH, this study adopts a comprehensive framework for understanding CEO compensation in disaster contexts. While OCT emphasizes efficient contract design to manage risks, MPH critiques potential misalignments driven by power asymmetries. Together, these perspectives explain how natural disasters influence executive pay and highlight the interplay between risk, power, and gender in shaping compensation outcomes.

3.2 Empirical Literature Review

Extensive research has explored the determinants of CEO compensation, yet studies specifically examining the role of natural disasters as external shocks remain scarce. Existing evidence suggests that disasters impose significant operational and financial challenges, increasing uncertainty and necessitating strong leadership to mitigate risks (Dessaint & Matray, 2017; Altay & Ramirez, 2010).

In disaster contexts, firms often adjust CEO compensation structures, favoring cash-based pay over equity-based incentives. This aligns with OCT's prediction that firms use stable compensation mechanisms to retain leadership during periods of volatility (Widener, 2006; Brei & Strobl, 2019). Conversely, MPH highlights that powerful CEOs may actively negotiate

for higher cash-based pay during crises, leveraging their critical role in recovery efforts (Song & Wan, 2019).

Gender-specific dynamics in CEO compensation have also been well-documented. Female CEOs are generally more risk-averse than their male counterparts, favoring stable compensation structures like cash salaries and bonuses over equity-linked incentives (Huang & Kisgen, 2013; Wu et al., 2021). These preferences are strengthened in disaster contexts, where equity compensation becomes less attractive due to increased stock volatility (Bachmann et al., 2023). These findings underscore the interplay of risk tolerance, bargaining power, and gender in determining compensation structures.

3.3 Contextual Insights

Natural disasters, such as Hurricane Katrina, represent exogenous shocks with profound implications for firms and executives. These events disrupt operations, decrease firm performance, and impose psychological and operational stress on leaders (Bernile et al., 2017; Raker et al., 2019). For CEOs, these disasters increase the challenges of managing recovery efforts, increasing their perceived value to the firm, and justifying higher compensation.

The geographical context of disasters also plays a critical role. CEOs in disaster-affected or neighboring areas face unique challenges, including heightened risks and uncertainty, which influence their compensation dynamics (Deng & Gao, 2013; Dessaint & Matray, 2017). For example, firms near disaster zones may shift towards cash-based compensation to mitigate risks associated with volatile equity markets, aligning with OCT's predictions (Dai et al., 2020; Bachmann et al., 2023).

Gender-specific dynamics further shape compensation outcomes. Female CEOs are less likely to leverage power to secure higher pay, reflecting their generally lower representation

and influence in corporate hierarchies (Adams & Ferreira, 2009; Huang & Kisgen, 2013). These differences highlight the need for comprehensive compensation strategies that consider gender-specific preferences and risks.

3.4. Hypotheses Development

Building on the OCT and the MPH, this study explores how natural disasters influence CEO compensation, with a particular focus on the role of gender. Each hypothesis is formulated based on prior empirical findings and theoretical considerations.

3.4.1. Natural disasters and CEO compensation packages:

Natural disasters impose significant operational and financial challenges on firms, heightening uncertainty and risk (Dessaint & Matray, 2017; Altay & Ramirez, 2010). CEOs play a pivotal role in managing these challenges, overseeing recovery strategies, and ensuring firm resilience. According to OCT, firms adjust compensation packages during crises to retain and incentivize top executives, particularly in roles requiring critical decision-making (Murphy, 2013; Kyung et al., 2021). Empirical evidence supports this notion, showing that CEOs receive increased cash and equity compensation following major crises to offset the psychological and financial risks associated with their roles (Dai et al., 2020; Brei & Strobl, 2019).

Conversely, MPH suggests that powerful CEOs may negotiate higher pay packages during crises by emphasizing their indispensable role in navigating the firm's recovery (Bebchuk & Fried, 2004; Ntim et al., 2019). The confluence of these theoretical perspectives suggests that natural disasters create conditions under which CEO compensation is likely to increase.

H1: *CEO compensation increases following severe natural disasters like Hurricane Katrina in their proximity.*

3.4.2. Cash versus equity compensation preferences:

Natural disasters disrupt financial markets, creating volatility that diminishes the attractiveness of equity-based compensation. OCT predicts that in such scenarios, firms rely more heavily on cash-based pay to provide stability and reduce risk for executives (Widener, 2006; Dittmann et al., 2010). Empirical studies corroborate this, demonstrating that firms in disaster-affected areas are more likely to increase cash compensation to ensure leadership retention and motivation (Dai et al., 2020; Brei & Strobl, 2019).

MPH further supports this hypothesis by highlighting how CEOs, particularly those with significant bargaining power, may prefer cash-based pay over equity during crises to safeguard their personal financial stability (Ntim et al., 2019; Song & Wan, 2019). Together, these insights suggest that cash compensation becomes a preferred mechanism for rewarding CEOs during disasters.

H2a: *CEOs' cash compensation increases following a natural disaster in their proximity.*

Equity-based compensation is inherently tied to firm performance and market valuation, which can become highly volatile following a natural disaster. According to OCT, firms may reduce reliance on equity-based incentives in these contexts to mitigate the risks associated with stock price fluctuations and align compensation with CEOs' preferences for stability (Murphy, 2013; Kyung et al., 2021). Empirical evidence supports this, showing that disasters often result in reduced equity grants for executives due to increased uncertainty (Brei & Strobl, 2019; Huang et al., 2017).

MPH complements this view by suggesting that CEOs with significant power may actively negotiate to reduce equity-based pay components in favor of cash compensation, particularly in volatile environments (Ntim et al., 2019; Bebchuk & Fried, 2004). These dynamics suggest a decrease in equity-based compensation following natural disasters.

H2b: *CEOs' equity-based compensation decreases following a natural disaster in their proximity.*

3.4.3. The role of CEO gender:

Gender differences in risk preferences and decision-making styles are well-documented in the literature. Female CEOs are generally more risk-averse than their male counterparts, leading them to favor stable forms of compensation, such as cash, over equity (Adams & Ferreira, 2009; Huang & Kisgen, 2013). OCT suggests that firms design compensation packages that align with the individual risk preferences of executives, making this effect more pronounced for female CEOs during periods of heightened uncertainty (Frydman & Jenter, 2010; Jeong & Harrison, 2017).

Empirical studies further indicate that female CEOs are less likely to leverage power dynamics to secure equity-based pay, reflecting their underrepresentation and relatively lower influence in corporate hierarchies (Bear et al., 2010; Wu et al., 2021). MPH supports this by highlighting how power asymmetries may disadvantage female CEOs in negotiating compensation structures. These insights suggest that natural disasters strengthen the differences in compensation preferences between male and female CEOs.

H3: *The decrease in preference for equity-based compensation is more pronounced for female CEOs in disaster-prone areas than for their male counterparts.*

Figure 1 below shows the conceptual framework of this study, which explains how Hurricanes affect CEOs' compensation from the perspectives of both the Optimal Contracting Theory and the Managerial Power Hypothesis.

[Insert Figure 1 Here]

4. RESEARCH METHODS

4.1 Data Description

We acquired executive compensation data from the ExecuComp database, financial data from the Compustat database, and Hurricane Katrina data from the Spatial Hazard Events and Losses Database for the United States (SHELDUS). Our primary focus is on 2005's highly impactful Hurricane Katrina. Utilizing Hurricane Katrina as a testing ground, this study aims to investigate whether CEOs exhibit responsiveness to non-business events in their overall compensation. Notably, Hurricane Katrina is recognized for potentially posing personal safety risks to executives and amplifying the level of uncertainty these executives face.

This study utilized a final sample of 8,635 firm-year observations with available CEO identifiers. To arrive at this sample, we excluded 2,437 firm-year observations related to financial and utility firms. The final sample includes financial data from 1,950 unique firms in the Compustat database, and we used a firm-year panel dataset from 2003 to 2007. Additionally, we winsorized all firm-year continuous variables at the 1% and 99% confidence intervals to address extreme outliers.

4.2 Variable Measurement

4.2.1 Dependent Variable

To estimate the impact of natural disasters on CEOs' compensation, the dependent variable total pay ($Totalcp_{iyc}$) is measured as the natural logarithm of CEOs' total compensation at time *t+1*. Total compensation comprises salary, bonuses, the value of option grants, long-term incentive payouts, and the value of restricted stock grants (Dai et al., 2020)[1]. For robustness, an alternative total compensation measure is estimated as the natural logarithm of the summation of salary, bonus, the value of restricted stock grants, other cash compensation, the

[1] Black and Scholes (1973) value of option grants

value of stock options granted, long-term incentive payouts, and all other totals at time *t+1* (Balsam et al., 2018).

In analyzing the effect on the compensation structure, we followed Dai et al. (2020) and Murphy and Sandino (2020) by adopting two sets of variables. We further classified the various components into two main forms: First, cash pay ($Cashcp_{iyc}$), which captures the natural logarithm of the sum of salary and bonus at time *t+1*. The final variable is equity-based pay ($Equitycp_{iyc}$), which is measured as the natural logarithm of the sum of the value of restricted stock and the value of option grants at time *t+1*.

4.2.2 Independent Variable

In the present study, the variable *Neighbour* serves as the primary explanatory factor. Defined as a binary variable, *Neighbour* assigns a value of one to firms situated in close proximity to the region impacted by Hurricane Katrina, thereby identifying those within the adjacent areas. This variable encapsulates a dynamic indicator, *Post dummy* × *treatment*, which assumes a value of one for the treatment firms subsequent to Hurricane Katrina's event and zero for all other firms across the United States that do not fall within this category. Employing a Difference-in-Differences analytical framework, the *Neighbour* variable delineates the variations in CEO compensation before and after Hurricane Katrina's occurrence, comparing the treatment group—namely, the firms located in the directly affected or the neighboring areas—with the control group, which comprises the remaining U.S. firms.

Drawing upon the insights of Balasubramaniam (2021), the investigation acknowledges the significant impact of disasters on individuals and entities in areas adjacent to those directly affected by such calamities. The rationale for selecting *neighboring* firms as the focal point of this study stems from the direct repercussions of the hurricane event on the compensation dynamics of CEOs within the neighboring zones. It posits that the hurricane event potentially serves as a direct source of cash inflow for CEOs in the disaster-stricken area. Consequently,

the observed fluctuations in compensation in the wake of the hurricane are likely to mirror the immediate aftermath of the disaster rather than being attributable to renegotiations prompted by an augmented risk exposure, perceived risk, or the effects on subjective well-being, particularly when focusing on firms situated in the disaster zone.

4.2.3 Control Variables

Building upon the foundational work of previous studies (Huang et al., 2022; Dai et al., 2020; Dessaint & Matray, 2017), this research integrates a comprehensive set of control variables pertinent to compensation practices. These variables encapsulate both characteristics unique to the firm and distinct attributes related to CEOs. In estimating firm size, this study adopts the natural logarithm of a company's total assets, a method consistent with established academic precedents. The Return on Total Assets (ROA) is calculated as net income prior to the consideration of extraordinary items and operations that have been discontinued, divided by the total assets, offering a measure of profitability.

In alignment with the methodology outlined by Carter et al., (2007), this investigation incorporates a control for Earnings Volatility, which is computed as the variance in ROA. This variance is meticulously estimated over the decade leading up to the year under scrutiny. Furthermore, the Market-to-Book Ratio (MTB ratio) is derived by dividing the market value per share by the book value per share, where the market value is ascertained from the product of the closing price over a twelve-month period and the total number of common stocks outstanding. Leverage is quantified as the ratio of long-term debt to total assets, providing insight into the financial structure of the firm.

To elucidate stock performance, this study also integrates control for annual stock returns, following the methodology of Custódio et al. (2013). Additionally, the ratio of capital expenditure to total assets (Capex/Asset) and the ratio of cash to total assets (Cash/Asset) are included to offer further financial insights.

CEO-specific characteristics explored include the CEO's age, ownership, tenure, and managerial ability. The ExecuComp database's variable for age serves as the metric for CEO age, which, as posited by Yim (2013), acts as a proxy for the executive's horizon problem, potentially influencing their compensation package preferences. The prevailing academic discourse suggests that older CEOs, perceived as more risk-averse, may favor a lesser proportion of long-term incentives (David et al., 1998). CEO ownership, defined as the percentage of shares held by the CEO in the company, is scrutinized in light of Core et al.'s (1999) findings, which suggest a substitution effect between executive ownership and annual compensation, positing an inverse relationship with compensation. CEO tenure, calculated as the duration of service at the firm, is considered a reflection of firm-specific human capital, potentially influencing compensation structures (Roulstone, 2003; Carter et al., 2007). Moreover, longer tenures may confer increased influence over the board, facilitating the acquisition of preferred forms of compensation (Finkelstein & Hambrick, 1989; David et al., 1998). CEO managerial ability, as measured by Demerjian et al. (2012), is incorporated to assess its impact on compensation dynamics.

To account for characteristics uniquely attributed to the firm and temporal variations in compensation practices across the dataset, this study employs firm-fixed and year-fixed effects. The robustness of the analytical framework is further ensured by clustering standard errors at the firm level, adhering to rigorous statistical standards. This approach not only aligns with but also extends the methodologies of prior research, offering a nuanced understanding of the determinants of executive compensation.

4.3 Model Specification

The study employs a Difference-in-Differences (DiD) approach to assess the causal effect of Hurricane Katrina on CEO compensation structures. This method is particularly appropriate for leveraging the natural experiment created by the disaster, as it provides an

exogenous variation in treatment assignment (Bertrand, Duflo, & Mullainathan, 2004). By comparing firms in affected (treatment) and unaffected (control) zones before and after the disaster, the DiD approach effectively isolates the disaster's impact from other confounding factors.

Hurricane Katrina serves as an ideal natural experiment due to its abrupt and geographically localized impact, which is independent of firm-specific characteristics or compensation strategies (Dessaint & Matray, 2017). This setup allows for a quasi-experimental design that controls for unobserved, time-invariant heterogeneity and minimizes omitted variable bias. The approach is particularly robust in identifying causal effects in corporate finance and governance research (Roberts & Whited, 2013; Atanasov & Black, 2016).

Our methodology delineates three distinct geographical categories for analysis, predicated upon the relative spatial proximities between the firms and the epicenter of hurricane landfall. These categories are delineated as follows: *disaster or affected zone*, the *neighbourhood area*, and *all the remaining U.S. mainland*. The *disaster zone* represents those counties struck and affected by hurricane events; the neighbourhood zone captures a group of five neighbouring counties not directly affected by the event and *all the remaining U.S. mainland*.

The segmentation of firms into directly affected, neighboring, and unaffected zones adds granularity to the analysis, enabling the study to capture varying degrees of impact and providing robustness to the estimates.

$$Totalcp_{iyc} = \alpha_{i} + \delta_{y} + \gamma X_{iyc} + \beta Neighbour_{yc} + \varepsilon_{iyc}$$

In the model, i represents the firm, y represents the year, and c represents the county location. Totalcp_{iyc} is the total compensation to CEOs at the end of year y; α_i is the firm fixed effect, δ_y is the time fixed effect, γX_{iyc} represents all control variables, *Neighbour* is a dummy

variable which equals one if the county location of the firm is in the neighbourhood of an area hit by a hurricane event in the past two years and zero if not. β is the primary coefficient of interest in the model.

To test for our second hypothesis relating to the CEO'' preference for cash compensation over equity compensation, we introduced cash pay ($Cashcp_{iyc}$) and equity pay ($Equitycp_{iyc}$) into the main model and hence specified the second regression models as follows:

$$Cashcp_{iyc} = \alpha_i + \delta_y + \gamma X_{iyc} + \beta Neighbour_{yc} + \varepsilon_{iyc}$$

$$Equitycp_{iyc} = \alpha_i + \delta_y + \gamma X_{iyc} + \beta Neighbour_{yc} + \varepsilon_{iyc}$$

To further test our last prediction that the decrease in CEO'' equity compensation will be more pronounced for female CEOs in the neighbourhood zone than their male counterparts, we introduced a dummy variable Gender, which equals one for female CEOs and zero if male in the model. We further interacted with the *Gender* variable with the independent variable *Neighbour* to arrive at our new dummy variable, *GenderNeigh.* This dummy variable, *GenderNeigh*, has a value of one for female CEOs in the neighbourhood zone and zeroes for male CEOs within the neighbourhood zone. We, therefore, present our third regression model as follows:

$$Equitycp_{iyc} = \alpha_i + \delta_y + \gamma X_{iyc} + \beta Neighbour_{yc} + \mu Gender_{yc} + \sigma(GenderNeigh)_{yc} + \varepsilon_{iyc}$$

4.4. Addressing Endogeneity Concerns

Endogeneity represents a significant methodological challenge in observational studies, as it can bias estimates and compromise the validity of causal inferences. This study adopts a comprehensive approach to mitigate endogeneity concerns, including addressing issues of omitted variable bias, reverse causality, and selection bias.

First, the exogeneity of Hurricane Katrina as a natural experiment is central to the study's methodology. The disaster represents an unexpected external shock, uncorrelated with firm-specific characteristics or pre-existing compensation structures. This randomness in the

treatment assignment ensures that any observed effects on CEO compensation can be credibly attributed to the disaster itself, rather than confounding factors. Previous studies have highlighted the value of such natural experiments in isolating causal effects in corporate finance contexts (Dessaint & Matray, 2017).

To further enhance the robustness of causal inference, the study incorporates firm and year fixed effects in the econometric model. Firm fixed effects control for unobservable, time-invariant characteristics that could influence CEO compensation, such as governance structures, historical trends, or regional economic conditions. Year fixed effects, on the other hand, capture broader temporal factors, including macroeconomic shifts or policy changes, that might simultaneously affect all firms in the sample. Together, these fixed effects ensure that the variation attributed to Hurricane Katrina is not confounded by either firm-specific or temporal influences (Wooldridge, 2010).

Recognizing the potential for selection bias, the study employs entropy balancing to achieve covariate balance between the treatment and control groups. Entropy balancing reweights observations to ensure that the groups are similar across key baseline characteristics, such as firm size, leverage, and market-to-book ratio. This preprocessing step minimizes the risk of bias in treatment effect estimates and ensures that the results are not driven by systematic differences between the groups prior to the disaster (Hainmueller, 2012).

To address concerns of reverse causality between CEO compensation and firm performance, the study utilizes a two-step Generalized Method of Moments (GMM) estimator. Reverse causality poses a risk when compensation adjustments influence firm outcomes, rather than the other way around. By employing instrumental variables, such as lagged compensation data, the two-step GMM isolates exogenous variation in the independent variables, thus mitigating simultaneity bias. This approach has been widely recognized for its ability to address endogeneity in dynamic panel data settings (Arellano & Bond, 1991).

Finally, the study includes a comprehensive set of control variables that capture firm-level characteristics known to influence CEO compensation. These include ROA, leverage, firm size, and market-to-book ratio, which are consistently identified as key determinants in prior literature (Core, Guay, & Larcker, 2003; Murphy, 2013). Robustness checks further validate the findings, with alternative definitions of treatment zones and placebo tests confirming that the observed effects are unique to Hurricane Katrina and not artifacts of the empirical design.

By integrating these strategies—leveraging the exogeneity of the natural experiment, applying fixed effects, employing entropy balancing, and using two-step GMM—the study ensures that the results are robust to endogeneity concerns. This rigorous methodological framework strengthens the credibility of the findings and provides a nuanced understanding of how natural disasters influence CEO compensation strategies.

5. EMPIRICAL RESULTS

5.1 Descriptive Statistics and Correlation Analysis

This study uses a detailed dataset to examine how natural disasters affect companies. It focuses on CEO pay and how firms perform based on their location in disaster-hit areas. Using descriptive statistics, it highlights important data on compensation, company debt, and other performance indicators.

Table 1 provides a close look at the main factors being studied. It shows that, on average, CEOs are paid $8.0 million, a figure that highlights the large pay packages CEOs receive in the U.S. Average CEO cash and equity compensations are around $6.8 million and $7.4 million, respectively, showing a mix of pay types. Companies in the study generally see a 3.0% return on assets, have a debt ratio of 18%, and trade at market-to-book ratios of 3.0, indicating they are large, stable, and good at creating value for shareholders.

[Insert Table 1 Here]

Table 2 divides companies into three groups based on their location in relation to areas hit by Hurricane Katrina, including directly affected areas, neighboring areas, and the rest of the U.S. mainland. This setup allows the study to compare companies in different situations: those directly hit by disasters, those nearby, and those far away.

[Insert Table 2 Here]

The study finds that CEOs in the neighboring zone (treatment group) receive the highest average pay at $8.1 million. Cash compensation patterns are similar, but equity compensation is more common in companies that are not in the treatment or directly affected zones. This suggests changes in how companies compensate their CEOs after disasters. Based on return on assets, companies directly hit by disasters are more profitable. The treatment group's companies also tend to rely more on debt (20% on average) and have higher market-to-book ratios, indicating the market sees them as creating more value. The study also looks at company size, cash on hand, spending on investments, and how volatile their stock prices are, offering insights into how companies adjust operationally and strategically after disasters.

Table 3 shows how CEO compensation is related to other variables. There is a positive link between CEO pay and cash/equity compensation, return on assets, debt levels, and market-to-book ratios. However, there is a negative relationship between stock volatility and CEO ownership, hinting at complex dynamics between company performance and how CEOs are paid. This suggests CEOs may choose between holding more equity or receiving higher pay.

[Insert Table 3 Here]

Figure 2 clearly outlines the different zones considered in the study—those directly affected by Hurricane Katrina, neighboring zones, and the rest of the U.S. This visual figure helps understand the geographic impact of disasters on companies and highlights the varied effects on company strategy and performance based on location.

[Insert Figure 2 Here]

Overall, this analysis reveals how natural disasters lead companies to change their compensation strategies and affect other aspects of their operations, including debt and profitability, and how the market values them, depending on their proximity to disaster areas.

5.2. Baseline Empirical Findings

This study aims to understand how severe natural disasters affect the risks and uncertainties faced by corporate leaders. It suggests that CEOs, being generally risk-averse, might seek higher compensation to counterbalance the increased risk and psychological stress caused by such disasters. Specifically, we explore how events like Hurricane Katrina can push CEOs to demand higher total compensation. Before diving into our results, we present a graph (see Figure 3[2]) showing an increase in CEO compensation in areas close to the disaster after the event. This graph compares compensation trends between affected/neighboring firms (the treatment group) and unaffected U.S. mainland firms (the control group) before and after the 2005 hurricane, showing a notable shift in compensation practices afterward.

[Insert Figure 3 Here]

We then present the main results from our Difference-in-Differences (DiD) regression model. A key focus is the *Neighbour* variable, which helps us understand how CEO compensation changes due to disasters. By incorporating controls for firm and CEO characteristics from the literature, we aim to ensure that our findings are not skewed by other factors. Our analysis also accounts for fixed effects at the firm and year levels to control for unobserved characteristics and time-related influences, respectively.

[2] Figure 3 visually represents the changes in CEO total compensation over time for both a treatment group and a control group of firms. The total compensation for CEOs is calculated as the natural logarithm, encompassing various components such as the value of option grants, restricted stock grants, salaries, bonuses, and long-term incentive payouts at time t+1. This graph is critical for conducting a parallel trend test and essential for confirming the validity of the pre-treatment parallel assumption. The treatment group, indicated by a red line, comprises firms within the neighbourhood zone. Meanwhile, the control group, represented by a blue line, includes firms within the disaster-affected zone and other U.S. firms situated further from the hurricane's landfall.

The findings, detailed in Table 4, show a significant increase in compensation for CEOs in areas affected by the hurricane, with the *Neighbour* variable coefficient at 0.041, significant at the 5% level (p-value < 0.05). This indicates that CEOs near disaster zones received a 4.1% higher compensation on average compared to their counterparts in unaffected regions. This finding implies that H1 has been statistically supported. Consistent with a stream of previous studies (e.g., Deng and Gao, 2013; Roback, 1982; Carter et al., 2007; Focke et al., 2017; Dai et al., 2020), our results suggest that CEOs perceive natural disasters as intensifying operational risks and personal pressures (Kahneman & Tversky, 1979).

In relation to the statistical significance derived from the coefficients for the variable *Neighbour* in Table 4, along with the average value of Total (pay t+1) shown in Table 1, it can be observed that a rise in the impact of hurricanes leads to a 3.95% increase in CEO total pay (t+1), calculated as ((0.041/1.038) × 100). This finding aligns with the managerial power hypothesis (Bebchuk & Fried, 2003, 2004), suggesting that CEOs with strong bargaining positions extract compensation premiums as a risk buffer during crises.

[Insert Table 4 Here]

The ability of CEOs to extract higher compensation following Hurricane Katrina may not be uniform but influenced by their bargaining power. The strike of the disaster also impacts CEOs' well-being and psychology, which may cause powerful CEOs to demand higher pay. From the managerial power hypothesis perspective (e.g., Ntim et al., 2019; Song et al., 2019; Abernethy et al., 2015; Bebchuk & Fried, 2003, 2004), our findings indicate that CEO power enhances their capacity to secure compensation premiums in response to negative shocks affecting non-monetary factors that impact their quality of life.

Similarly, the negative impact of Hurricane Katrina on firms heightens the risk of financial distress, and the resulting uncertainty may lead to greater dependence on executives to implement more conservative and strategic corporate policies to ensure the firm’s recovery or

survival. Thus, from an optimal contracting theory perspective, our findings imply that the compensation premium awarded to CEOs reflects the confidence of those overseeing firm governance in the executive's capacity to achieve exceptional firm performance after the event (Harris & Helfat, 1997; Tosi et al., 2000; Ntim et al., 2015).

5.3 The Effect of Natural Disasters on CEOs' Preference for Cash Pay or Equity Pay

Furthermore, we explored how Hurricane Katrina influenced the makeup of CEO compensation, showing a clear trend towards higher cash compensation and lower equity shares in the affected areas. This result gives statistical credibility to H2a and H2b, with the coefficient for cash pay showing an increase of 0.038 (p-value < 0.05) and equity pay a decrease of 0.012 (p-value < 0.10) in the DiD analysis. As evidenced in Table 5, this adjustment aligns with prior empirical findings on the impacts of disasters on financial markets (Tavor & Teitler-Regev, 2019; Vigdor, 2008).

The significant reduction in equity-based compensation reflects the heightened volatility in stock values post-disaster, as observed in prior studies (Rasmussen, 2004). CEOs' preference for cash compensation mitigates the potential losses associated with equity volatility, indicating a strategic realignment in compensation structures. This adjustment reflects an adaptive response by CEOs to safeguard their financial well-being during periods of elevated uncertainty.

[Insert Table 5 Here]

5.4 The Role of CEO Gender on Compensation Preferences Following Severe Natural Disasters

Additionally, we investigate gender differences in post-disaster compensation, finding that female CEOs in disaster zones receive significantly less equity-based compensation than their male counterparts, as shown in Table 6. The *GenderNeigh* variable exhibits a significant

negative coefficient (-0.158, p-value < 0.05). This trend appears to be driven by the heightened risk aversion characteristic of female CEOs (Wu et al., 2021), further supported by the uncertainties introduced by disasters.

Our findings align with upper-echelon theory (Hambrick & Mason, 1984), suggesting that female CEOs' heightened preference for risk-averse compensation structures is protective against elevated risks. These findings further support existing academic debates on gendered risk tolerance and its influence on executive compensation structures (Dah et al., 2020).

[Insert Table 6 Here]

5.5 Robustness Check and Endogeneity Analysis

5.5.1. The Role of CEO Human Capital – Generalists vs. Specialists:

This section investigates the influence of CEO human capital, particularly general managerial skills, on compensation outcomes in the aftermath of Hurricane Katrina. We hypothesize that generalist CEOs, equipped with diverse experiences and skill sets, are better positioned to guide firms through crisis situations, leading to a higher compensation premium compared to specialist CEOs. Drawing on Custódio et al. (2013), we operationalize the CEO General Ability Index (GAI) as a proxy for human capital. The GAI assigns a value of one to CEO-year observations with an index score above the annual median and zero otherwise.

The critical importance of general managerial skills for a CEO's market value has been consistently emphasized in prior literature (Custódio et al., 2013; Falato and Milbourn, 2015; Schoar and Zuo, 2016). Custódio et al. (2013) observed that generalist CEOs earn approximately 19% more than specialists. However, the implications of this pay premium are debated. Li and Patel (2019) identified a negative relationship between generalist CEO experience and firm performance, suggesting that the compensation premium may reflect CEOs' bargaining power rather than their actual contributions. Conversely, Song and Wan (2019) argued that

higher compensation for generalist CEOs rewards superior managerial human capital, rather than rent extraction.

As shown in Table 7, our findings indicate that generalist CEOs received a significantly higher compensation premium post-Hurricane Katrina compared to specialists. The regression results reveal statistically significant coefficients for both generalist and specialist CEOs, with a more pronounced effect for generalists ($\beta = 0.053$, p-value < 0.05). This suggests that the increased compensation reflects not only psychological stress and risk management demands but also the premium placed on the broad skill sets of generalists in navigating crisis conditions.

[Insert Table 7 Here]

5.5.2. Comprehensive Robustness Analysis:

Alternative Metrics of CEO Compensation: To validate the integrity of our results, we reassessed our regression analysis using alternative compensation metrics. Specifically, we refined the measurement of total, cash, and equity compensation by incorporating ExecuComp variables. Table 8 demonstrates that the consistency of our results across diverse operational definitions underscores the robustness of our findings. For instance, the significant increase in total compensation for CEOs in disaster zones persisted ($\beta = 0.047$, p-value < 0.05), irrespective of the metric used, indicating that the observed trends are not contingent upon specific variable definitions.

[Insert Table 8 Here]

Compensation Trends Within the Disaster Zone: To further probe the localized effects of Hurricane Katrina, we examined compensation trends for CEOs of firms situated directly in the disaster zone. Using an affected dummy variable to represent firms in counties directly hit by the hurricane, we find that compensation increases are even more pronounced for these

CEOs. Table 9 shows a significant rise in total compensation ($\beta = 0.059$, p-value < 0.01), driven primarily by cash pay ($\beta = 0.051$, p-value < 0.01), with smaller but still significant increases in equity-based pay. These results reinforce the hypothesis that CEOs in the most affected areas renegotiated their compensation to reflect the heightened challenges they faced.

[Insert Table 9 Here]

Varied Definitions of Neighbour: To test the sensitivity of our findings to the operationalization of the *Neighbour* variable, we expanded its definition to include firms within three and seven counties surrounding the disaster zone. Table 10 reveals that the results remain robust across these broader geographical scopes, with coefficients for total compensation consistently significant ($\beta = 0.042$, p-value < 0.05 for three counties; $\beta = 0.039$, p-value < 0.05 for seven counties). This confirms the resilience of our conclusions to variations in geographical definitions.

[Insert Table 10 Here]

Alternative Measure of Time: To address concerns about temporal specificity, we employed a placebo test using a random year (2004) prior to Hurricane Katrina. As shown in Table 11, the placebo test yielded insignificant results for all compensation measures, confirming that the observed compensation adjustments are uniquely attributable to the disaster's impact rather than coincidental temporal effects (Hartman and Hidalgo, 2018; Eggers et al., 2023).

[Insert Table 11 Here]

5.5.3. Endogeneity Mitigation:

Entropy Balancing: Following recent advances in empirical research (McMullin and Schonberger, 2020; Tübbicke, 2022), we applied entropy balancing to address potential endogeneity issues. This technique ensures the distributional equivalence of covariates across treatment and

control groups, thereby reducing biases stemming from the research design (Hainmueller, 2012). Table 12 presents the results of the balanced sample analysis, which show no significant changes in the variables. Panel B reveals a positive and statistically significant association between natural disasters and CEO total pay ($\beta = 0.157$, $t = 3.762$), reinforcing the validity of our conclusions.

[Insert Table 12 Here]

Two-Step System GMM: To further address endogeneity concerns, we utilized a two-step System Generalized Method of Moments (GMM) approach, which is asymptotically efficient and well-suited for dynamic panel data. As shown in Table 13, our results remain consistent, with the coefficient for *Neighbour* indicating a significant increase in CEO total compensation post-disaster ($\beta = 0.048$, p-value < 0.05). Diagnostic tests confirm the robustness of the model: AR(1) test (-0.023, p-value < 0.05) confirms first-order serial correlation, while AR(2) test (p-value > 0.1) indicates the absence of second-order serial correlation. Additionally, the Sargan ($\chi^2 = 3.515$, p-value > 0.1) and Hansen ($\chi^2 = 3.16$, p-value > 0.1) tests validate the instrument's appropriateness and confirm no over-identification issues.

[Insert Table 13 Here]

6. DISCUSSION

This study explores the impact of severe natural disasters, such as Hurricane Katrina, on the risks and uncertainties faced by corporate leaders, particularly CEOs. Our findings reveal that natural disasters exacerbate both operational challenges and psychological stress for CEOs, resulting in increased compensation demands. These outcomes are grounded in the frameworks of Optimal Contracting Theory (OCT) and the Managerial Power Hypothesis (MPH), providing a robust explanation of post-disaster executive compensation adjustments.

Aligned with the Managerial Power Hypothesis (MPH), our results indicate that CEOs with substantial influence over their boards leverage the elevated risks and uncertainties following disasters to negotiate higher compensation as a risk premium. This aligns with Bebchuk and Fried (2004), who argue that powerful executives capitalize on their bargaining power to extract rents during organizational vulnerabilities. The crisis environment created by natural disasters appears to amplify this rent-extraction behavior, as boards become increasingly reliant on CEO leadership to manage recovery efforts. These findings extend prior research (Ntim et al., 2019; Song et al., 2019), which demonstrates that managerial power dynamics are particularly pronounced under conditions of external shocks, enabling executives to secure favorable compensation outcomes.

From the perspective of Optimal Contracting Theory (OCT), our findings highlight the strategic adjustments made by boards to align CEO incentives with organizational objectives during crises. The significant increase in CEO compensation post-disaster reflects the confidence placed in executives to navigate the complexities of post-disaster recovery. This observation is consistent with the literature emphasizing that boards reward executives perceived as essential for managing adverse external shocks (Tosi et al., 2000; Ntim et al., 2015). Moreover, the shift towards cash-based compensation and away from equity-based incentives aligns with OCT principles, as boards aim to mitigate the impact of market volatility on executive compensation. This finding is supported by prior studies (Tavor & Teitler-Regev, 2019; Vigdor, 2008; Rasmussen, 2004), which suggest that risk-averse behavior leads executives to prioritize immediate, tangible rewards over deferred, equity-based incentives.

Our findings also highlight the role of gender in shaping compensation preferences during natural disasters, underscoring a stronger inclination among female CEOs toward cash-based pay over equity-based incentives. From an OCT perspective, this preference may reflect

a strategic alignment of compensation structures with the heightened risk aversion and unique psychological toll experienced by female executives during crises, as documented by Dah et al. (2020) and Wu et al. (2021). Boards may opt for cash-based incentives to ensure female CEOs remain focused and motivated in disaster recovery scenarios. Simultaneously, MPH offers a complementary explanation, suggesting that female CEOs, who often face systemic biases and less bargaining power compared to their male counterparts, may prioritize more secure and immediate forms of compensation to mitigate personal and professional uncertainties exacerbated by disasters. This gendered divergence in compensation structures aligns with insights from Dah et al. (2020), who emphasize the distinct risk tolerance levels between male and female executives, and Hambrick and Mason's (1984) upper-echelon notion, which highlights the role of individual characteristics in shaping executive decision-making under uncertainty.

The integration of OCT and MPH provides a comprehensive framework for understanding these dynamics. While OCT explains the strategic alignment of compensation structures to motivate effective crisis management, MPH underscores how powerful CEOs exploit heightened uncertainty to negotiate advantageous pay packages. Together, these theories illuminate both the rational and opportunistic dimensions of executive compensation adjustments following natural disasters.

In conclusion, our findings contribute to the broader literature on executive pay by demonstrating how external shocks influence compensation outcomes through the dual lenses of OCT and MPH. These results advance our understanding of how governance structures and power dynamics interact to shape compensation policies under conditions of heightened uncertainty, echoing insights from Bebchuk and Fried (2004), Ntim et al. (2019), and Song et al. (2019), among others.

7. CONCLUSION

This study critically examines how nonmonetary factors, particularly natural disasters, influence CEO compensation policies through the theoretical lenses of Optimal Contracting Theory (OCT) and the Managerial Power Hypothesis (MPH). Using data from significant U.S. hurricanes and CEO compensation records spanning 2003 to 2007, the research sheds light on the transformative effects of external shocks on executive remuneration strategies. The findings reveal that natural disasters lead to an 8% increase in total CEO compensation, driven by elevated personal safety risks, heightened uncertainty, and psychological stress. These adjustments are marked by a strategic shift toward more immediate and risk-averse compensation structures, such as cash payments, accompanied by a 16% reduction in equity-based incentives. This highlights how firms adapt to crises by reconfiguring executive pay structures, illustrating the complex interplay between environmental disruptions and compensation practices.

From the perspective of MPH, the study underscores the influence of CEO bargaining power in shaping post-disaster compensation outcomes. It suggests that powerful CEOs leverage the psychological and operational challenges of natural disasters to negotiate higher pay, demonstrating their ability to capitalize on nonmonetary shocks. At the same time, the findings align with OCT, as boards strategically adjust compensation to reward CEOs for their crisis management capabilities and recovery efforts. This dual interpretation positions the findings within broader debates on executive compensation, offering comprehensive insights into how external shocks challenge conventional pay-for-performance frameworks.

A gendered analysis of CEO compensation further enriches the discussion by highlighting differences in risk tolerance and pay preferences. Female CEOs, who tend to exhibit higher risk aversion, favor cash-based compensation over equity-based incentives, reflecting a protective response to heightened uncertainty. This finding aligns with OCT, as firms appear to tailor

compensation structures to match the psychological and strategic needs of female executives during crises (Dah et al., 2020; Wu et al., 2021). Similarly, the observed premium for generalist CEOs underscores the value of managerial versatility in navigating complex crises, reinforcing the importance of adaptability and broad skill sets in disaster scenarios.

The implications of this research are significant from both theoretical and practical perspectives. Theoretically, the study contributes to executive compensation literature by integrating nonmonetary factors—specifically natural disasters—into discussions of pay structures. It challenges traditional pay-for-performance models by demonstrating how contextual and environmental shocks influence compensation strategies, thereby extending the theoretical frameworks of MPH and OCT. Practically, the findings offer actionable insights for corporate governance and policymaking. Firms can enhance resilience by integrating disaster preparedness into executive remuneration policies, aligning pay structures with crisis management responsibilities. Additionally, addressing observed gender disparities through more inclusive compensation frameworks can promote equity and reduce inherent biases in executive pay systems. For policymakers, the research underscores the importance of transparency in executive compensation reporting, aligning with global initiatives such as the Task Force on Climate-related Financial Disclosures (TCFD) and IFRS S2 Climate-related Disclosures.

By providing actionable insights for scholars, managers, and policymakers, it underscores the need to reevaluate executive compensation policies to balance short-term risk mitigation with long-term strategic objectives. These findings contribute to broader discussions on corporate governance and sustainability, highlighting the necessity of innovative and adaptive responses to the challenges posed by catastrophic environmental events.

Despite its robust findings, the study has limitations. The exclusive focus on U.S. hurricanes and the 2003–2007 period restricts the generalizability of its conclusions, as different

disaster types and global contexts may yield varied compensation dynamics. Additionally, the exclusion of variables such as CEO personality traits, firm culture, and industry-specific shocks leaves unexplored dimensions that could influence the observed trends. The limited timeframe also constrains the ability to assess the long-term implications of natural disasters on executive pay structures, presenting opportunities for future research.

Future research should expand the scope of analysis to include diverse disaster types, global contexts, and extended timeframes. Investigating the intersection of gender, leadership traits, and compensation dynamics could provide deeper insights into how personal attributes shape executive pay strategies during crises. Additionally, exploring the integration of sustainable practices into compensation frameworks could reveal how firms balance climate risk mitigation with corporate accountability. Finally, examining the long-term strategic impacts of disasters on executive pay structures would offer a more comprehensive understanding of how firms navigate evolving challenges related to environmental, social, and governance (ESG) imperatives.

Conflict of Interest: No

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Appendix 1:
Operational Definition of Research Variables

Variable	Definition
Dependent Variables:	
Total pay (Totalcp$_{iyc}$)	Is the natural logarithm of salary, bonuses, the value of restricted stock, the value of option grants and Long-term incentive Plans (item *TDC1* in ExecuComp)
Cash pay (Cashcp$_{iyc}$)	Is the natural logarithm of the sum of salary and bonuses. (item *SALARY and BONUS* in ExecuComp)
Equity pay (Equitycp$_{iyc}$)	Is the natural logarithm of the sum of restricted stocks and value of option grant (item *RSTKGRNT* and *OPTION_AWARDS_BLK_VALUE* in ExecuComp)
Independent Variable:	
Neighbour	Is a dummy variable which is equal to one if the firm is within the neighbourhood of the hurricane events within the past two years
GenderNeigh is a dummy variable equal to one if the CEO is a female of a firm	within the neighbourhood of the hurricane events within the past two years.

Control Variables:	
Return on Assets (ROA)	Net income before extraordinary items and discontinued operation divided by total assets (item *IB/AT* in Compustat)
Market to Book Ratio (MTB ratio)	Market value per share divided by the book value per share, with market value obtained as the twelve-month period closing price multiplied by the number of common shares outstanding.
Earnings Volatility	Square of the standard deviation of ROA, where the standard deviation of ROA is calculated over ten years period prior to the year of interest.
Leverage	Estimated as the long-term debt divided by total assets. *(*item *DLTT/AT)* in Compustat*)*
Capital Expenditure to Total Assets	Capital expenditure divided by total assets *(*item *CAPX/AT)* in Compustat*)*
Cash to Total Assets	Cash and Marketable securities divided by total assets (item *CHE/AT)* In Compustat)
Stock returns	Annual stock Returns [Compustat item. (prcc_f(t)/ajex(t) + dvpsx_f(t)/ajex(t))/(prcc_f(t-1)/ajex_f(t-1))].
Firm size	Estimated as the natural logarithm of a firm total assets (item *AT* in Compustat*)*
CEO ability	CEO managerial ability *(CEO ability)* as measured by Demerjian et al. (2012)
CEO age	CEO's age from ExecuComp
CEO ownership	Is the percentage of shares held by the CEO in the shares.
CEO tenure	Is the number of years the CEO has been in the position (if missing, the number of years in the firm) for firm *i* as at the end of time *t*

TABLES AND FIGURE

Table 1: Summary statistics for all sampled firms

	N	Mean	St.Dev	Min	Median	Max
Neighbour	8635	0.595	0.491	0	1	1
Compensation						
Total pay $_{t+1}$	8635	8.005	1.038	5.511	8.031	11.442
Cash pay $_{t+1}$	8635	6.841	0.708	4.991	6.792	08.845
Equity pay $_{t+1}$	8635	7.439	1.250	3.858	7.536	10.289
Firm Characteristics						
ROA	8635	0.030	0.138	-.0713	0.053	0.289
Leverage	8635	0.180	0.182	.000	.149	.897
MTB ratio	8635	2.935	3.215	-7.526	2.250	20.094
Cash/Assets	8635	0.173	0.183	.001	.103	.790
Capx/Assets	8635	0.051	0.052	.002	.034	.288
Firm size	8635	7.206	1.594	3.429	7.074	11.515
Stock returns	8635	0.156	0.276	.003	0.101	2.241
Earnings volatility	8635	0.006	0.022	0	.001	0.106
CEO Characteristics						
CEO ownership	8635	0.023	0.057	.000	.004	0.341
CEO ability	8635	0.015	0.140	-.212	-.016	0.519
CEO age	8635	55.042	7.457	39	55	75
CEO tenure	8635	6.766	7.407	0	4	36

See the Appendix 1 for the definition of the variables.

Table 2: Summary Statistics for various Geographic Group

	Affected zone	**Neighbourhood zone**	**Remaining U.S. Firms**
Compensation			
Total pay t+1	7.925	8.061	7.996
Cash pay t+1	6.840	6.890	6.824
Equity pay t+1	7.307	7.416	7.465
Firm Characteristics			
ROA	0.039	0.035	0.027
Leverage	0.196	0.200	0.178
MTB ratio	2.754	3.084	2.908
Cash/Assets	0.133	0.151	0.186
Capx/Assets	0.046	0.052	0.052
Firm size	7.134	7.289	7.187
Stock returns	0.136	0.164	0.156
Earnings volatility	0.003	0.007	0.006
CEO Characteristics			
CEO ownership	0.026	0.024	0.023
CEO ability	0.001	0.01	0.019
CEO age	55.248	54.886	55.035
CEO tenure	6.877	5.999	6.916
N	**755**	**1,996**	**5,884**

Table 3: Correlation Coefficients between Variables

Variables	Neighbour	Total Pay$_{t+1}$	Cash Pay$_{t+1}$	Equity Pay$_{t+1}$	ROA	Leverage	MTB Ratio	Cash/ Asset	Capx/ Asset	Firm size	Stock returns	Earnings volatility	CEO ability	CEO ownership	CEO age	CEO tenure
Neighbour	1.000															
Total Pay$_{t+1}$	0.183***	1.000														
Cash Pay$_{t+1}$	0.073***	0.841***	1.000													
Equity Pay$_{t+1}$	0.004	0.935***	0.577***	1.000												
ROA	-0.040***	0.102***	0.156***	0.188***	1.000											
Leverage	0.004	0.121***	0.172***	0.063***	-0.162***	1.000										
MTB Ratio	-0.030***	0.049***	0.020	0.187***	0.229***	-0.101***	1.000									
Cash/Assets	0.022**	-0.157***	-0.286***	-0.033*	-0.081***	-0.336***	0.141***	1.000								
Capx/Assets	0.002	-0.039***	-0.024**	-0.042**	0.101***	0.039***	0.019*	-0.194***	1.000							
Firm size	-0.026**	0.460***	0.592***	0.594***	0.199***	0.242***	0.016	-0.371***	0.031***	1.000						
Stock returns	0.017	0.127***	0.085***	0.087***	0.042***	0.001	0.085***	0.017	-0.021*	0.009	1.000					
Earning volatility	0.009	-0.044***	-0.053***	-0.027	-0.077***	-0.015	-0.015	0.051***	-0.014	-0.037***	-0.008	1.000				
CEO ability	0.012	0.100***	0.084***	0.205***	0.040***	-0.129***	0.106***	0.208***	-0.065***	0.114***	-0.004	-0.011	1.000			
CEO ownership	0.012	-0.119***	-0.116***	-0.101***	0.031***	-0.052***	0.008	0.051***	0.041***	-0.149***	0.012	-0.008	-0.023**	1.000		
CEO age	-0.020*	0.056***	0.117***	-0.028	0.048***	0.035***	-0.052***	-0.125***	-0.011	0.094***	-0.004	-0.014	-0.043***	0.162***	1.000	
CEO tenure	0.009	-0.029**	-0.023*	-0.046**	0.059***	-0.051***	-0.009	0.039***	0.012	-0.061***	-0.012	-0.001	-0.003	0.377***	0.400***	1.000

*** *p<0.01, ** p<0.05, * p<0.1* . See the Appendix 1 for the definition of the variables.

Table 4:
The Impact of Natural Disasters on CEOs' Compensation

Dependent Variable: Total pay $_{t+1}$		
	coefficients	t-statistics
Neighbour (*treat* × *post*)	0.041**	(2.100)
Affected zone	-0.096	(-1.028)
ROA	-0.001	(-0.035)
Leverage	-0.032	(-0.303)
MTB ratio	0.003	(0.506)
Cash/Assets	0.013	(0.095)
Capx/Assets	-0.092	(-0.238)
Firm size	0.096**	(2.044)
Stock returns	0.000***	(3.410)
Earnings volatility	3.804**	(2.572)
CEO ability	-0.012	(-0.126)
CEO ownership	-1.374***	(-2.951)
CEO age	0.004	(0.984)
CEO tenure	-0.003	(-0.754)
Constant	8.407***	(21.661)
Year Fixed Effects	YES	
Firm Fixed Effects	YES	
Cluster by Firm	YES	
Adjusted R-squared	0.672	
Observations	8,635	

Table 4 presents the estimated coefficient from a difference-in-difference regression of the impact of natural disasters on CEOs' compensation. The responding variable is estimated as the natural logarithm of CEO compensation at time t+1. The neighbor variable, being the independent variable, is a dummy variable that is equal to one if a firm is within the neighborhood zone for the last two years after the occurrence of the catastrophe. The affected zone is also a dummy variable that is equal to one for firms that are within the disaster area for two years after the occurrence of the disaster. we clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research Variables are operationally defined in Appendix 1.

Table 5:
Effects of Natural Disasters on the Structure of CEOs' Compensation

Dependent variable:	Cash pay $_{t+1}$		Equity pay $_{t+1}$	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**
Neighbour	0.034**	(2.392)	-0.157**	(-2.114)
Affected zone	0.020	(0.390)	-0.147	(-0.643)
ROA	-0.095	(-1.246)	0.124***	(3.168)
Leverage	-0.214*	(-1.934)	-0.104	(-0.194)
MTB ratio	-0.002	(-0.568)	0.022*	(1.788)
Cash/Assets	-0.041	(-0.440)	-0.104	(-0.211)
Capx/Assets	-0.452	(-1.516)	-1.868	(-1.631)
Firm size	0.036	(0.956)	0.144	(0.945)
Stock returns	-0.001	(-0.793)	0.010	(1.560)
Earnings volatility	0.184	(0.365)	0.000	(1.467)
CEO ability	-0.020	(-0.279)	0.243	(1.076)
CEO ownership	-0.824**	(-2.308)	4.610**	(2.502)
CEO age	0.003	(0.944)	0.011	(1.058)
CEO tenure	-0.002	(-0.716)	0.022	(1.223)
Constant	6.439***	(19.897)	4.583***	(4.583)
Year Fixed Effects	YES	-	YES	-
Firm Fixed Effects	YES	-	YES	-
Clustered by Firm	YES	-	YES	-
Adjusted R-squared	0.755	-	0.626	-
Observations	8,635	-	8,635	-

Table 5 presents the coefficient from a difference-in-difference regression of the effects of natural disasters on the composition of CEOs' compensation. The responding variable, cash compensation, is the natural logarithm of the sum of salary and bonus at time t+1. The second responding variable, equity-based compensation, is the sum of the value of restricted stock and the value of option grant at time t+1. The neighbour is a dummy variable that is equal to one for firms in the neighbourhood zone within the next two years after the occurrence of the catastrophe. All control variables are measured as discussed under variables measurement. We clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 6: The Impact of Natural Disasters on Female CEOs Risk-Aversion and Equity-Based Compensation

Dependent Variable: Equity-based pay$_{t+1}$		
	coefficients	t-statistics
Neighbour	-0.158**	(-2.123)
Affected zone	-0.147	(-0.644)
Gender	1.784***	(3.779)
GenderNeigh	-1.694***	(-9.712)
ROA	0.121**	(2.981)
Leverage	-0.156	(-0.205)
MTB ratio	0.022*	(1.796)
Cash/Assets	-0.102	(-0.205)
Capx/Assets	-1.867	(-1.622)
Firm size	0.136	(0.889)
Stock returns	0.000	(1.459)
Earnings volatility	-1.092	(-0.361)
CEO ability	0.246	(1.091)
CEO ownership	4.586**	(2.473)
CEO age	0.011	(1.056)
CEO tenure	0.022	(1.203)
Constant	5.787	(4.617)
Year Fixed Effects	YES	
Firm Fixed Effects	YES	
Cluster by Firm	YES	
Adjusted R-squared	0.641	
Observations	8,635	

Table 6 shows the regression results of the effects of natural disasters on stock-based compensation through the increase in risk aversion for female CEOs. The responding variable, stock-based compensation, is the natural logarithm of the sum of restricted stock and the value of option grants at time t+1. The neighbour variable is a dummy variable that is equal to one for firms in the neighbourhood zone within the next two years after the occurrence of the catastrophe. Gender is a dummy variable that is equal to one if a female CEO and zero if a male CEO. The variable *GenderNeigh* is also a dummy variable, which is equal to one for female CEOs and zero for male CEOs within the neighbourhood zone. All control variables are measured as discussed under control variables measurement. We clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 7: The role of CEO Human Capital on the relationship between Natural Disasters and CEO Compensation

Dependent variable: Total Pay t+1	**Generalists CEO**		**Specialists CEO**	
	coefficients	t-statistics	coefficients	t-statistics
Neighbor	0.098***	(3.025)	0.089**	(2.320)
Affected Zone	-0.015	(-0.092)	-0.118	(-1.069)
ROA	-0.280*	(-1.805)	0.043	(0.997)
Leverage	-0.003	(-0.690)	0.010	(0.622)
MTB	0.001	(0.274)	0.000	(0.237)
Cash/Assets	-0.175	(-0.757)	0.293	(1.253)
Capx/Assets	0.104	(0.118)	-0.003	(-0.005)
Firm Size	0.222***	(2.810)	0.339***	(3.435)
Stock return	0.005**	(2.571)	0.001***	(8.898)
Earnings Volatility	0.394	(1.511)	0.004*	(1.767)
CEO ability	-0.072	(-0.456)	0.062	(0.400)
CEO ownership	-0.067	(-0.056)	-0.457	(-0.664)
CEO age	0.010	(1.327)	0.005	(0.496)
CEO tenure	-0.017	(-1.625)	-0.003	(-0.345)
Constant	9.414***	(13.083)	9.814***	(11.369)
Observations	3,167		5,468	
Adjusted R-squared	0.312		0.473	
Year Fixed Effects	YES		YES	
Firm Fixed Effects	YES		YES	
Clustered by Firm	YES		YES	

Table 7 shows the regression results of the role of CEO human capital on the relationship between natural disasters and CEOs total pay. We create an indicator variable, the General Ability Index, which takes a value of one for CEO-year observations with an index above the yearly median and zero if otherwise. The neighbour variable is a dummy variable equal to one for firms in the neighbourhood zone within the next two years after the catastrophe. All control variables are measured as discussed under control variables measurement. We clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 8:
Impact of Natural Disasters on the Level and Composition of CEOs Compensation Using Alternative Measures.

Dependent variable:	Total pay $_{t+1}$		Cash pay $_{t+1}$		Equity pay $_{t+1}$	
	coefficient	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Neighbour	0.041**	(2.067)	0.038*	(1.728)	-0.096*	(-1.684)
Affected zone	-0.089	(-0.924)	0.016	(0.263)	-0.075	(-0.551)
ROA	0.028	(0.706)	-0.068	(-0.788)	0.079***	(3.584)
Leverage	-0.083	(-0.731)	-0.251**	(-2.102)	-0.209	(-0.097)
MTB ratio	0.003	(0.593)	-0.005	(-0.744)	0.011	(1.603)
Cash/Assets	-0.025	(-0.177)	-0.113	(-0.939)	-0.145	(-0.445)
Capx/Assets	0.027	(0.071)	-0.461	(-1.393)	-0.960	(-1.275)
Firm size	0.116**	(2.402)	0.066	(1.280)	0.177*	(1.852)
Stock returns	0.000***	(3.172)	-0.001	(-0.897)	-0.000	(-0.345)
Earnings volatility	2.146	(1.381)	-0.286	(-0.596)	1.551	(1.099)
CEO ability	0.019	(0.204)	0.051	(0.338)	0.064	(0.523)
CEO ownership	-1.148**	(-2.552)	-0.572	(-1.468)	1.387	(1.337)
CEO age	0.006	(1.464)	0.002	(0.471)	0.004	(0.723)
CEO tenure	0.000	(0.009)	0.001	(0.237)	0.022	(1.456)
Constant	8.502***	(21.581)	6.190***	(13.279)	7.190***	(4.287)
Year Fixed Effects	YES		YES		YES	
Firm Fixed Effects	YES		YES		YES	
Clustered by Firm	YES		YES		YES	
Adjusted R-squared	0.629		0.651		0.717	
Observations	8635		8635		8635	

Table 8 reports the estimated coefficient from a difference-in-difference regression of the impact of natural disasters on the level and composition of CEOs' compensation using alternative measures for the responding variables. The first responding variable, total compensation, is estimated as the natural logarithm of the sum of salary, bonuses, the value of restricted stock grants, other annual, the value of stock options grant, long-term incentive pay-out and all other totals at time t+1. Cash compensation is measured as the summation of salaries and bonuses t+1. The last responding variable is equity compensation, which is estimated as the natural logarithm of the sum of the value of the restricted stock, the value of option grants and long-term incentive at time t+1. The neighbour is a dummy variable equal to one for firms in the neighbourhood zone within the next two years after the event. The affected zone is also a dummy variable that is equal to one for firms that are within the disaster area for two years after the occurrence of the disaster. We clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 9:
The Impact of Natural Disasters on CEOs' Compensation Using the Affected Firms

Dependent variable:	Total pay $_{t+1}$		Cash pay $_{t+1}$		Equity pay $_{t+1}$	
	coefficient	**t-statistic**	**Coefficient**	**t-statistic**	**coefficient**	**t-statistic**
Affected Dummy	0.181***	(5.360)	0.082***	(3.811)	-0.019*	(-1.851)
ROA	-0.151*	(-1.787)	-0.143*	(-1.796)	0.037	(0.661)
Leverage	-0.253**	(-2.012)	-0.264**	(-2.299)	0.012	(0.180)
MTB ratio	-0.002	(-0.336)	-0.002	(-0.504)	0.003*	(1.864)
Cash/Assets	-0.069	(-0.514)	-0.054	(-0.574)	-0.082	(-1.154)
Capx/Assets	- 0.466	(-1.050)	-0.436	(-1.313)	-0.289*	(-1.845)
Firm size	0.050	(1.064)	0.064*	(1.681)	0.018	(0.964)
Stock returns	0.001***	(5.106)	0.000***	(2.893)	-0.000	(-0.866)
Earnings volatility	0.550	(0.714)	0.042	(0.068)	-0.126***	(-3.121)
CEO ability	-0.052	(-0.564)	-0.074	(-1.016)	0.024	(0.900)
CEO ownership	-0.108	(-0.218)	-0.280	(-0.787)	0.366*	(1.947)
CEO age	0.002	(0.334)	0.001	(0.405)	0.002	(1.374)
CEO tenure	0.002	(0.484)	-0.001	(-0.364)	0.001	(1.215)
Constant	6.429***	(14.579)	6.289***	(19.030)	5.700***	(4.627)
Year Fixed Effects	YES		YES		YES	
Firm Fixed Effects	YES		YES		YES	
Clustered by Firm	YES		YES		YES	
Adjusted R-squared	0.682		0.786		0.517	
Observations	8,635		8,635		8,635	

Table 9 shows the DiD regression results of the impact of natural disasters on CEOs' compensation of firms within the directly affected counties. The main predicted variable is measured as the natural logarithm of the sum of salary, bonuses, the value of restricted stock grants, the value of stock options grants and long-term incentive pay-outs at time t+1. CEO cash compensation is estimated as the natural logarithm of the sum of salary and bonus at time t+1, and equity-based compensation is measured as the sum of the value of restricted stock and the value of option grant at time t+1. All control variables used in the main analysis are also included in this regression analysis. We clustered standard errors at the firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 10:
The Impact of Natural Disasters on CEOs Compensation Using Alternative Measures of Neighbours

Dépendent variable: Total pay $_{t+1}$

	Three Counties		*Five Counties*		*Seven Counties*	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Neighbour	0.0065***	(2.851)	0.041**	(2.100)	0.064***	(3.380)
Affected zone	-0.092	(-0.986)	-0.096	(-1.028)	-0.085	(-0.085)
ROA	-0.001	(-0.038)	-0.001	(-0.035)	-0.005	(-0.145)
Leverage	-0.030	(-0.288)	-0.032	(-0.303)	-0.037	(-0.352)
MTB ratio	0.003	(0.552)	0.003	(0.506)	0.003	(0.516)
Cash/Assets	0.012	(0.089)	0.013	(0.095)	0.011	(0.084)
Capx/Assets	-0.092	(-0.239)	-0.092	(-0.238)	-0.099	(-0.258)
Firm size	0.097**	(2.068)	0.096**	(2.044)	0.096**	(2.061)
Stock returns	0.000***	(3.300)	0.000***	(3.410)	0.000***	(3.246)
Earnings volatility	3.738**	(2.527)	3.804**	(2.572)	3.753**	(2.522)
CEO ability	-0.012	(-0.128)	-0.012	(-0.126)	-0.012	(-0.126)
CEO ownership	-1.365***	(-2.922)	-1.374***	(-2.951)	-1.352***	(-2.923)
CEO age	0. 004	(0.987)	0.004	(0.984)	0.004	(0.983)
CEO tenure	-0.003	(-0.774)	- 0.003	(-0.754)	-0.003	(-0.769)
Constant	8.391***	(21.631)	8.407***	(21.661)	8.415***	(21.737)
Year Fixed Effects	YES		YES		YES	
Firm Fixed Effects	YES		YES		YES	
Clustered by Firm	YES		YES		YES	
Adj. R-squared	0.673		0.672		0.673	
Observations	8,635		8,635		8,635	

Table 10 reports the difference-in-difference regression estimations of the impact of natural disasters on CEOs' compensation using an alternative measure of the independent variable Neighbour. The responding variable is estimated as the natural logarithm of CEO compensation at time t+1. The new Neighbour variables included in this robustness check are all dummy variables. The first Neighbour dummy, which is in the regression output for Table 10 below, has a value of one if a firm is located within the next three unaffected counties after the disaster zone and operates in that area two years after the occurrence of the Hurricane event. The last Neighbour dummy, which is also in the regression output for Table 10 below, has a value of one if a firm is located within the next seven unaffected counties after the disaster zone and operates in that area two years after the occurrence of the Hurricane event. The affected zone is also a dummy variable that is equal to one for firms that are within the disaster area for two years after the occurrence of the disaster. All control variables are measured as discussed under control variables measurement. We clustered standard errors at firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 11:
Randomly Selected Event Date

Dependent variable: Total pay $_{t+1}$						
	Three Counties		***Five Counties***		***Seven Counties***	
	Coefficient	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Neighbour	0.018	(0.679)	-0.003	(-0.130)	-0.019	(-0.799)
Affected zone	-0.091	(-0.969)	-0.086	(-0.920)	-0.085	(-0.915)
ROA	-0.001	(-0.041)	-0.001	(-0.027)	0.001	(0.023)
Leverage	-0.034	(-0.324)	-0.035	(-0.336)	-0.035	(-0.337)
MTB ratio	0.002	(0.460)	0.002	(0.468)	0.002	(0.472)
Cash/Assets	0.011	(0.078)	0.011	(0.081)	0.011	(0.081)
Capx/Assets	-0.054	(-0.141)	-0.053	(-0.139)	-0.057	(-0.148)
Firm size	0.097**	(2.071)	0.096**	(2.050)	0.095**	(2.030)
Stock returns	0.000***	(3.596)	0.000***	(3.659)	0.000***	(3.719)
Earnings volatility	3.919***	(2.642)	3.889***	(2.626)	3.869***	(2.611)
CEO ability	-0.013	(-0.136)	-0.012	(-0.134)	-0.013	(-0.139)
CEO ownership	-1.357***	(-2.926)	-1.352***	(-2.921)	-1.350***	(-2.917)
CEO age	0.004	(0.985)	0.004	(0.969)	0.004	(0.957)
CEO tenure	-0.003	(-0.734)	- 0.003	(-0.750)	-0.003	(-0.752)
Constant	8.431***	(21.709)	8.445***	(21.744)	8.448***	(21.776)
Year Fixed Effects	YES		YES		YES	
Firm Fixed Effects	YES		YES		YES	
Clustered by Firm	YES		YES		YES	
Adj. R-squared	0.672		0.671		0.672	
Observations	8,635		8,635		8.635	

Table 11 reports details of the difference-in-difference regression estimations of the impact of natural disasters on CEOs compensation using a randomly selected event date. The responding variable is estimated as the natural logarithm of CEOs total compensation at time t+1. The Neighbour variable is a dummy variable that assumes a value of one if a firm is within the neighbourhood zone of the Hurricane event for the previous year. The affected zone is also a dummy variable which is equal to one for firms who are within the disaster area for two years after the occurrence of the disaster. We clustered standard errors at firm a level. *, **, and *** represents 10%, 5% and 1% significance level respectively. Research variables are operationally defined in Appendix 1.

Table 12: Entropy Balancing

Panel A: Proof that treatment and control group converge after entropy balancing

	Treated	Control	Treated	Control
	Before Balancing		After Balancing	
ROA	0.025	0.042	0.025	0.025
Leverage	0.183	0.182	0.183	0.183
MTB ratio	2.833	3.042	2.833	2.833
Cash/Assets	0.175	0.167	0.175	0.175
Capx/Assets	0.052	0.051	0.052	0.052
Firm size	7.212	7.285	7.212	7.212
Stock returns	0.579	0.695	0.579	0.579
Earnings volatility	0.003	0.003	0.003	0.003
CEO ownership	0.017	0.014	0.017	0.017
CEO ability	0.023	0.022	0.023	0.023
CEO age	54.95	55.26	54.95	54.95
CEO tenure	7.011	6.804	7.011	7.011

Panel B: Regression Estimate using Entropy Balancing

Dependent Variable: Total pay $_{t+1}$		
	coefficients	t-statistics
Neighbour	0.157***	(3.762)
Affected zone	-0.088	(-1.070)
ROA	0.031	(0.615)
Leverage	-0.105	(-1.129)
MTB ratio	0.006	(1.578)
Cash/Assets	-0.053	(-0.456)
Capx/Assets	-0.041	(-0.106)
Firm size	-0.113***	(-2.944)
Stock returns	0.000	(1.107)
Earnings volatility	3.033***	(2.826)
CEO ability	-0.021	(-0.234)
CEO ownership	-1.197***	(-3.128)
CEO age	0.007**	(2.335)
CEO tenure	-0.001	(-0.189)
Constant	8.058***	(23.394)
Year Fixed Effects	YES	
Firm Fixed Effects	YES	
Cluster by Firm	YES	
Adjusted R-squared	0.341	
Observations	8,635	

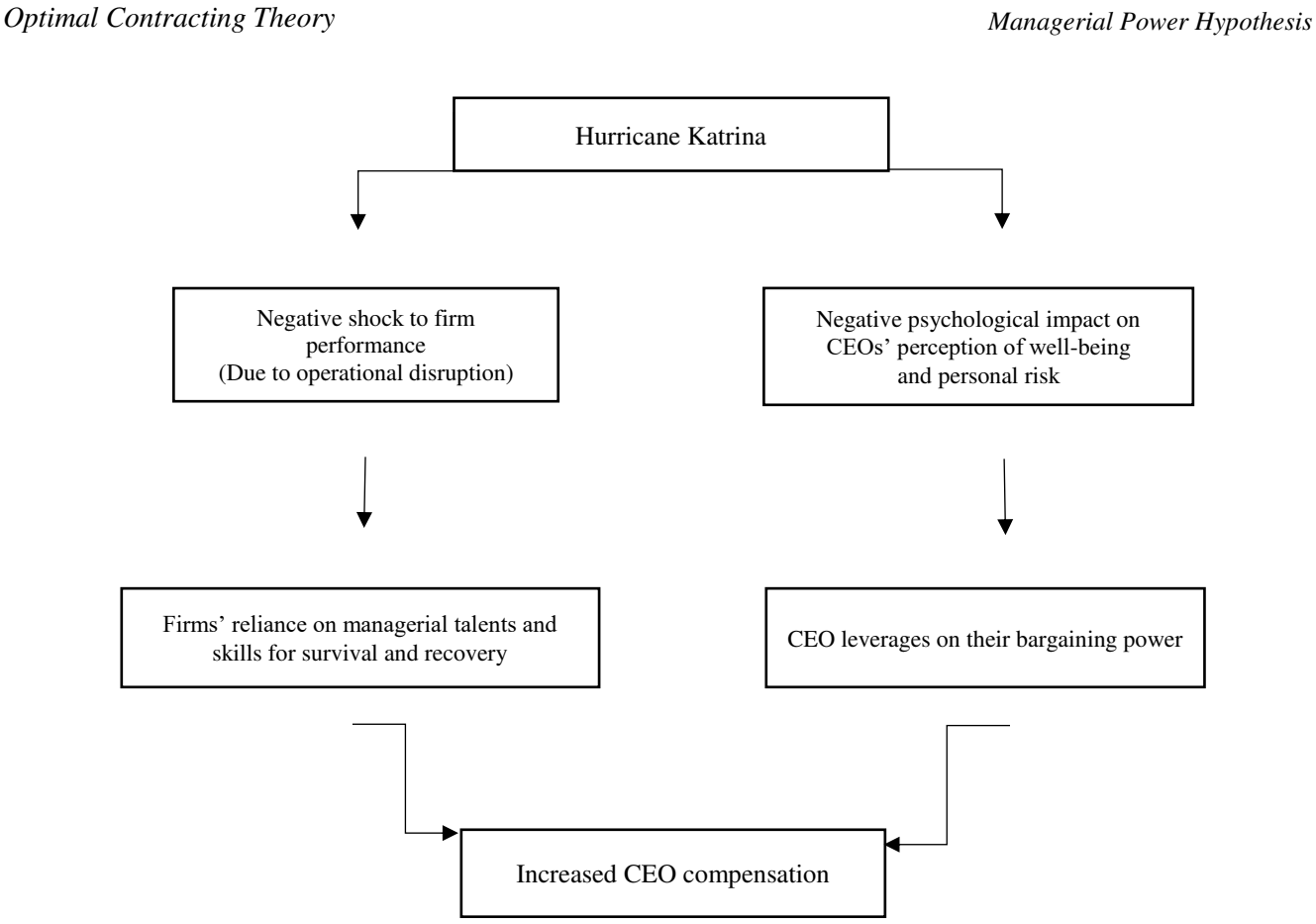
Table 10 Panel A and B present the regression results based on an entropy-balanced sample. In Panel A, it is evident that the treatment and control groups exhibit convergence in means when the entropy balancing estimates are employed. In Panel B, this study provides the regression analysis results, with the coefficients and robust t-statistics in parentheses. We clustered standard errors at a firm level. *, **, and *** represents 10%, 5% and 1% significance level respectively. For the definition of the variables, see Appendix 1

Panel C: Two-Step System GMM Regression

Variables	**Total pay $_{t+1}$**	
	coefficients	t-statistics
Lagged Total pay $_{t+1}$	0.147*	(1.708)
Neighbour	0.319***	(2.733)
Affected zone	-19.549	(-1.277)
ROA	-0.974	(-0.954)
Leverage	1.878***	(2.807)
MTB ratio	0.005	(0.155)
Cash/Assets	-0.020	(-0.010)
Capx/Assets	-6.724*	(-1.665)
Firm size	-0.166	(-1.139)
Stock returns	0.005	(0.935)
Earnings volatility	21.333***	(7.242)
CEO ability	0.303	(0.843)
CEO ownership	-0.017*	(-1.897)
CEO age	0.012	(0.988)
CEO tenure	-0.025**	(-2.446)
Constant	9.210***	(3.534)
Time dummies	YES	
Sargan Test	3.515	(0.061)
Hansen Test	3.160	(0.078)
AR (1)	-2.275	(0.023)
AR (2)	-0.638	(0.523)
Observations	4,388	

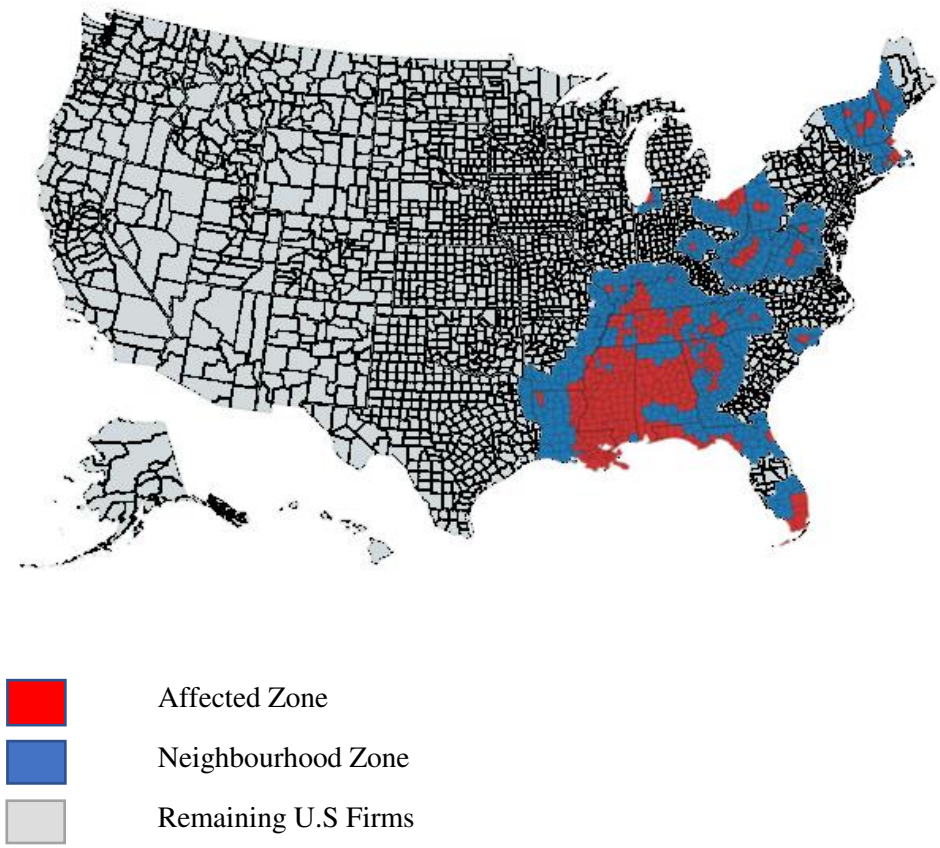
Panel C presents the regression output from a Two-stage system GMM estimation to examine the relationship between natural disasters and CEO compensation—an endogenous variable suitably instrumented. We clustered standard errors at firm a level.*, **, and *** represent the 10%, 5%, and 1% significance levels, respectively. For the definition of the variables, see Appendix 1.

Figure 1: The mechanism through which Hurricane affect CEOs' compensation



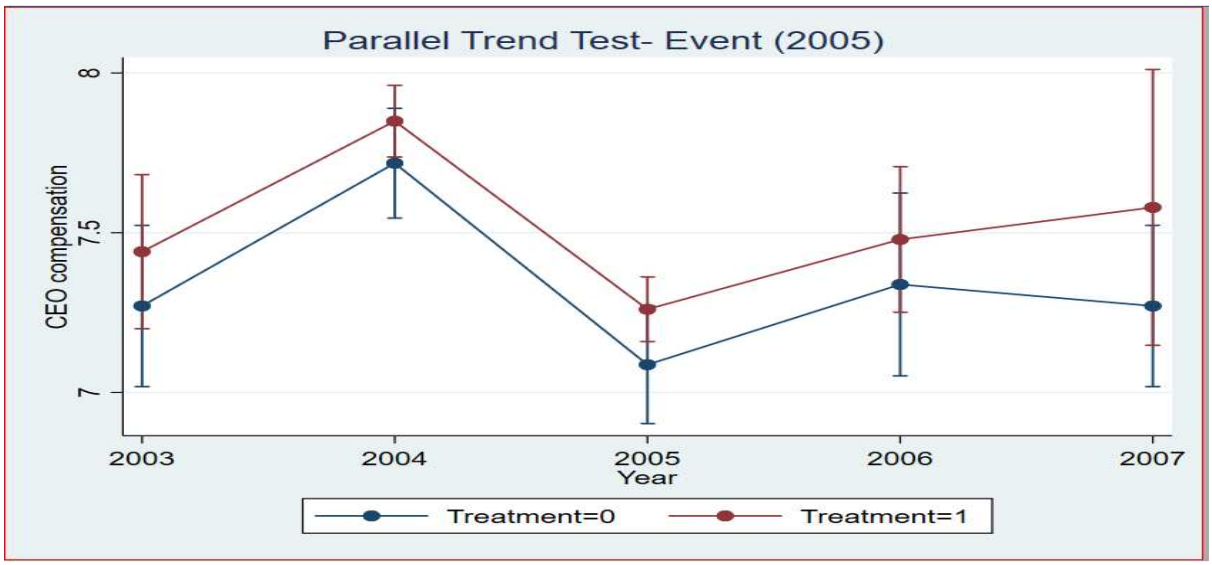
Notes: The hypothesis and mechanism via which Hurricane Katrina affected CEO compensation are depicted in this picture diagram, which is based on the causal diagram in Gow et al. (2016). Source(s): Authors' own work

Figure 2: Geographical Zone Identification for Treatment Group and Control Group



Source(s): Authors' own work

Figure 3: The Impact of Natural Disasters on CEO Compensation Levels



Source(s): Authors' own work