What doesn't kill you will only make you more risk-loving: Early-life disasters and CEO behavior[+]

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Abstract

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Keywords: CEO Behavior, Risk-taking, Formative Experiences, Managerial Style

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Abstract

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"I know of no one who has achieved something significant without also in their own lives experiencing their share of hardship, frustration, and regret…if you're like me and you occasionally want to swing for the fences, you can't count on a predictable life."
Tim Cook, CEO of Apple Inc., Auburn University Spring 2010 Commencement

1. Introduction

Chief executive officers' (CEO) managerial styles explain a large fraction of the variation in firm capital structure, investment, compensation, and disclosure policies (e.g., Bertrand and Schoar, 2003, Bamber, Jiang, and Wang, 2010, Graham, Li, and Qiu, 2012). Moreover, the evidence indicates that at least part of the heterogeneity in CEOs' managerial styles reflects the variation in individual life and career experiences (e.g., Graham and Narasimhan, 2005, Malmendier and Tate, 2005, Malmendier, Tate, and Yan, 2011, Benmelech and Frydman, 2014, Lin, Ma, Officer, and Zou, 2014, Schoar and Zuo, 2013, and Dittmar and Duchin, 2014).[1]

A common thread underlying this line of research is the existence of a monotonic relation between treatment and effect. Specifically, existing studies posit that exposure to a particular macroeconomic, personal, or career-specific event has a unidirectional effect on risk-taking by the CEO and consequently on corporate policies. In this study, we test whether the *intensity* of early-life experiences has a non-monotonic impact on CEOs' attitudes toward risk and thus on the corporate policies that they influence. In medical terms, this is the possibility that the strength of the dosage, in addition to whether a treatment is administered, also affects the outcome of the treatment. This hypothesis, relatively unexamined in the finance and economics literature, is a standard prediction in the psychiatry literature (e.g., Yerkes and Dodson, 1908).

To test this conjecture, we examine the relation between CEO early-life exposure to natural disasters and subsequent corporate financial and investment policies adopted by the firms that employ the CEOs. Specifically, we identify the name, date, and place of birth of 1,711 U.S.-born CEOs in a sample of S&P1500 firms from 1992 to 2012. We also assemble a unique database of U.S. county-level natural disaster events over the period 1900–2010, including earthquakes,

[1] In a similar vein but different setting, Cronqvist, Siegel, and Yu (2014) show that life course theory-based factors explain individuals' investment styles.

volcanic eruptions, tsunamis, hurricanes, tornadoes, severe storms, floods, landslides, and wildfires. Then we combine the two databases to infer the CEOs' likely exposure to the consequences of natural disasters during their formative years, i.e., age 5 to 15.[2]

There are two potential concerns with our approach. First, exposure to natural disasters during childhood may have only short-term effects that do not carry over to decision-making in adulthood. Second, even if that is not the case, it is not obvious that an individual executive's exposure to natural disasters would carry over to corporate policies.

The available evidence, however, suggests otherwise. With respect to the first concern, medical studies show that early-life adverse experiences have long-term effects on behavior. Indeed, past traumas cause high stress levels long after the event (e.g., Holman and Silver, 1998) and, consistent with our analysis, Elder (1999) finds that individuals are most affected by early-life exposure to disaster events. With respect to the second concern, there is mounting evidence that exposure to natural disasters affects the *financial* decision-making of both individuals (e.g., Cameron and Shah, 2013; Cassar, Healy, and von Kessler, 2011; Bucciol and Zarri, 2013) and firms (e.g., Ramirez and Altay, 2011; Dessaint and Matray, 2013). Moreover, we focus on CEOs because they are presumably among the most influential decision-makers in the firm (e.g., Graham, Harvey, and Puri, 2012, 2013).

Recent medical research suggests a possible mechanism underlying these patterns. First, neuroscience and epigenetics studies indicate that adverse experiences affect subsequent behavior at least partly due to permanent physiological and biological changes in the brain (e.g., Lyoo et al., 2011; Labonté et al., 2012; Mehta et al., 2013). Second, evolutionary biologists argue that biological systems with an original function commonly adapt to different functions, a phenomenon known as 'co-option' (Futuyma, 1998). Hence, if brain development and function are physiologically altered by trauma, it is plausible that the brain functions affected by non-economic risk may be subsequently co-opted to deal with economic risk.[3]

[2] The forgetting curve in adults recalling childhood memories suggests that most people have no memory prior to three years and few memories between three to six years of age (Nelson, 1993).

[3] For example, Kelly (2013) suggests that emotions of disgust evolved to keep people from exposing themselves to germs (in rotting meat, for example) and were later co-opted to judge moral behavior.

Early-life exposure to the consequences of environmental risk may affect a CEO's risk-taking in several ways. CEOs with exposure to fatalities from natural disasters may be more sensitized to the consequences of risk, and therefore be wary of decisions that increase firm risk. However, it is plausible that exposure to natural disasters may give the CEOs salient experience in dealing with risky situations and increase their confidence when making decisions involving firm risk. In fact, the effect of exposure to natural disasters on subsequent behavior may be non-monotonic, as Castillo and Carter (2011) find with respect to trust and reciprocity between individuals. CEOs with disaster experience that is not significantly fatal would develop a higher risk tolerance, whereas those with exposure to major fatal disasters would be sensitized to the negative consequences of risk and therefore tend to behave more conservatively.

We employ three different measures to test these alternative hypotheses. First, we group CEOs into three categories based on the average number of disaster-related fatalities scaled by population in their county of birth during the formative years of their childhood. Alternatively, we define an indicator *Blasé* as equal to 1 if the CEO has experienced a high number of disaster events but has not experienced a "major" disaster, and equal to 0 for those CEOs who have experienced at least one "major" disaster.[4] Lastly, our third measure of CEO early-life disaster experience is simply the number of "minor" disasters experienced in the relevant 10-year period.

We then examine the relation between the three measures of CEO early-life disaster experience and four firm decisions and outcomes: financial leverage, cash holdings, stock volatility, and acquisitiveness. Our empirical results provide a consistent picture across all four firm decisions and outcomes on which CEOs typically have a large influence (e.g., Graham, Harvey, and Puri, 2012, 2013).

First, we find that there is an inverse U-shaped relation between a CEO's early-life exposure to fatal disasters and firm leverage. All else equal, firms whose CEOs experienced a "medium" level of fatalities from disasters have a 3 percentage point *higher* leverage ratio than firms whose

[4] Apple Inc. CEOs, Tim Cook and Steve Jobs, are examples of these two types. Tim Cook, born in Mobile, Alabama in 1960, witnessed "only" 1.15 deaths across 57 natural disaster events between the age 5-15. By our empirical classification, Tim Cook has a 'blasé' attitude toward risk. Steve Jobs, born in San Francisco, California in 1955, witnessed 31.6 deaths across 39 natural disasters during the relevant early years of his life.

CEOs experienced no fatal disasters, a magnitude comparable to the "Depression Baby" effect documented in Malmendier and Nagel (2011). In contrast, firms whose CEOs experienced "extreme" levels of fatalities from disasters have a 2.9 percentage point *lower* leverage ratio than firms whose CEOs have no fatal disaster experience, and hence a 5.9 percentage point lower leverage ratio than firms whose CEOs have a "medium" level of fatal disaster experience.[5]

Second, we find a similar non-linear relation when we examine firms' cash holdings. Compared to firm-CEOs with no fatal disaster experience, firms with "medium" fatality experience CEOs hold 0.6 percentage points *less* cash, while firms with "extreme" fatality experience CEOs hold 3.1 percentage points *more* cash as percentage of book assets. Furthermore, the 3.7 percentage point difference in cash holdings between the "medium" and "extreme" fatal disaster experience CEOs is statistically significant at the 1% level.

Third, we also document an inverse U-shaped relation between CEO disaster experience and the firm's stock volatility and acquisitiveness. Firm-CEOs with an "extreme" level of fatality experience are associated with a 2.5 percentage point lower firm stock volatility and a 7.7 percentage point lower probability of announcing an acquisition than both firm-CEOs with no fatal disaster experience and firm-CEOs with a "medium" level of disaster experience.

We find consistent effects when we use our two other measures of CEO disaster experience. For example, firms whose CEOs have experienced an above average number of "minor" disasters but no "major" disasters (i.e. *Blasé* CEOs) are associated with higher leverage, lower cash holdings, higher stock price volatility and higher acquisitiveness as compared to firms with CEOs who experienced at least one "major" disaster.

Overall, across all the corporate policies and outcomes that we study, our results are consistent with the hypothesis that experiencing natural disasters without extremely negative consequences desensitizes a CEO to the negative consequences of risk. However, if a CEO experienced an extreme level of fatal disasters, he or she witnessed the downside potential of risky situations and appears to be more cautious in his or her approach to risk when at the helm of

[5] As an illustration, Apple's book leverage in FY2013 is 8%, whereas it was 0 from 2004 to 2012. Apple started an aggressive buyback program only after Cook took over, at the same time that it added debt to its capital structure.

a firm. Although we do not aim to generalize our results to the population at large, we note that the CEOs in our sample have roughly the same likelihood of experiencing fatal natural disasters as a typical member of the US population. Hence, there does not appear to be a career selection issue a priori.

Our results are robust to including time, state of birth, and industry fixed effects. Moreover, all our regressions include a control for the historical probability of fatal disasters in the CEO's county of birth, computed over the period 1900-2010, allowing us to differentiate the effect of growing up in a "high-risk" county versus actually living through a disaster during the CEO's formative years. For example, a CEO who did not experience any major fatalities despite growing up in the "tornado belt" (states like Kansas, for example), may underestimate the expected costs of tornadoes (and by extension, other risky events).[6]

As is typical in this line of research, CEO-firm matching alone may explain our main findings. Following Bertrand and Schoar (2003), we repeat our tests while including firm fixed effects to control for the effect of matching between time-invariant firm style and CEO risk attitude. The results of these tests indicate that static-matching alone cannot explain our findings. Furthermore, to assess whether there is any causal impact of CEOs' risk attitude on firm policies, we conduct a difference-in-difference analysis on a small set of exogenous CEO turnover events available in our sample where the risk tolerance of the incoming and old CEOs are different. Although we cannot rule out that CEOs' risk preferences as shaped by early-life exposure to natural disasters determine the dynamic matching between changing firm styles and CEOs, the evidence from the difference-in-difference tests is consistent with a causal impact of CEOs' risk preferences on corporate policies.

In our main tests, we employ panel data while our explanatory variable of interest is fixed for each CEO, raising concerns about over-sampling of certain CEOs in the panel structure. However, our results are robust to using one observation for each CEO-firm by averaging firm policy choices and risk proxies over the tenure of each CEO at the firm.

[6] This is consistent with recounts from survivors of recent tornado strikes – see Ganucheau and Fernandez, "Where Tornadoes Are a Known Danger, the One That Hits Home Still Stuns", *New York Times*, April 30 2014, page A1.

Another potential concern with our empirical method is that we do not directly observe a CEO's disaster experience, but infer it based on the CEO's county and year of birth. It is possible that the CEO did not actually live in the county of birth for fifteen years after birth. We address this concern in three ways. First, we verify that our results are robust to using alternative windows to measure a CEO's early life experiences, e.g. years 5-10 after birth. Second, we show that our results are robust to restricting our sample to CEOs for whom we can verify that the county of birth is in the state where they also received their Social Security number – typically in their teenage years according to Yonker (2012).[7] Third, we conduct a placebo test where we assign a random birth county to each CEO and find no statistically significant effects of the correspondingly random disaster experience on our outcome variables. Overall, our robustness tests indicate that even though we do not directly measure each CEO's disaster experience, whatever measurement error may exist is most likely random noise.

We finally note that all our results are robust to controlling for CEO overconfidence, as measured by the CEO's propensity to hold vested in-the-money stock-options (Malmendier and Tate, 2005).[8] Thus, our main explanatory variable is not merely a manifestation of CEO overconfidence. In fact, it seems reasonable to speculate that a CEO's early-life disaster experience should predate or at least help shape the overconfidence of the executive.

Our analysis contributes to the literature that examines how managerial styles relate to CEOs' life experiences such as marital status (Roussanov and Savor, 2013), holding a pilot license (Cain and McKeon, 2014), political affiliation (Hutton, Jiang, and Kumar, 2014), military experience (Malmendier, Tate, and Yan, 2011), and past career experiences (Schoar and Zuo, 2013). To various degrees, all the events analyzed in these studies are endogenous, which makes drawing a causal link with respect to CEOs' risk preferences a challenge. An appealing feature of our empirical setting is that early-life exposure to natural disasters is unlikely to be a choice variable, providing a sensible exogenous source of variation in an individual's life. In this sense,

[7] We thank Scott Yonker for graciously providing us with these data, which indicate that 75% of CEOs in our sample received their SSN in the same state as their birth county.
[8] We thank Mark Humphery-Jenner and Steve McKeon for generously providing us with these data.

an important contribution of our analysis is that it identifies an exogenous primitive in a CEO's life that determines rather than manifests his or her attitude toward risk.

Since we infer CEO early-life experiences based on the date and county of birth, our approach is similar to the cohort-based studies that examine the effect of early-life experiences, e.g., having lived through the U.S. Great Depression (Malmendier and Tate, 2005; Malmendier and Nagel, 2011; Malmendier, Tate and Yan, 2011). However, our approach exploits both time-series and cross-sectional (geographic) variation in exposure to risk factors, which should provide for sharper identification of CEOs' early-life experiences. In addition, given the nature of our measures, we are able to examine how the *intensity* of early-life disaster experience affects subsequent risk-taking behavior and show for the first time that exogenous non-economic events shape CEOs' attitude toward economic risk later in life.

Beyond the literature on managerial style, our results may be important for research on investor behavior. Knüpfer, Rantapuska, and Sarvimäki (2014) show that workers who experience adverse labor market conditions during the Finnish Great Depression are significantly less likely to subsequently invest in risky assets. Guiso, Sapienza, and Zingales (2013) find that the risk aversion in a sample of bank clients from Italy increases following the 2008 European financial crisis. Kim and Lee (2013) show that the impact of early-life exposure to the Korean War is associated with higher investor's risk aversion. These papers focus on the linear relation between risk exposure and investor behavior. Our results suggest that examining non-linear consequences of risk exposure could be fruitful in the context of investor behavior.

The rest of the paper is organized as follows. Section 2 provides a literature review and articulates our testable hypotheses. Section 3 describes the data and summary statistics. Section 4 discusses our main empirical results. Section 5 presents the results of additional tests complementary to our main analysis along with robustness checks and Section 6 concludes.

2. Related Literature and Testable Hypotheses

2.1 Managerial style in corporate policies

Survey evidence in Ben-David, Graham, and Harvey (2007) indicates that a manager's ability to assess and cope with risk has pervasive effects on corporate decision-making. Research in management science has long posited the existence of differences in managerial styles across individuals at the helm of corporate entities (e.g., Hambrick and Mason, 1984; Lieberman, Lau, and Williams, 1990). Consistent with this notion, recent finance and accounting studies document that CEO fixed effects explain a large portion of the observed variation in corporate policies and outcomes, which traditional firm-level determinants cannot explain. Bertrand and Schoar (2003) find time-invariant manager-effects across a range of firm investment and financial decisions, and show that the correlations among those effects are consistent with 'managerial style'. Bamber, Jiang, and Wang (2010) and Graham, Li, and Qiu (2011) document CEO fixed-effects in disclosure and compensation policies, respectively, that also are consistent with the existence of managerial styles.

Expanding on the insight that personal proclivities affect firm policies, a growing number of studies examine how CEOs' preferences arise and manifest in corporate behavior. These studies typically investigate whether demographic characteristics and formative experiences can explain managers' unique cognitive styles and values. A recurring finding is that the CEO's birth cohort and early-life experiences matter to managerial style in corporate policies (e.g., Bertrand and Schoar, 2003; Bamber, Jiang, and Wang, 2010; Graham and Narasimhan, 2004; Malmendier and Tate, 2005; Malmendier, Tate, and Yan, 2011). Older CEO cohorts, especially those who experienced the U.S. Great Depression, adopt more conservative policies.[9]

More recent evidence shows that living through economic downturns is salient in shaping managers' attitudes even when those experiences occur later in life (e.g., Dittmar and Duchin, 2013; Schoar and Zuo, 2013). Similarly other formative experiences in adulthood such as educational, military, and professional backgrounds also partly account for the observed

[9] Similarly, Cronqvist, Siegel, and Yu (2014) find that individuals who grew up during the Depression era, or in relatively less wealthy families, develop a more value-oriented investment style later in life.

managerial styles.[10] For example, CEOs who hold MBA degrees tend to engage in more aggressive corporate practices (e.g., Bertrand and Schoar, 2003; Malmendier and Tate, 2005; Bamber, Jiang, and Wang, 2010; Dittmar and Duchin, 2013).[11] Firms run by CEOs with military backgrounds use less financial leverage, invest less, and are less likely to engage in wasteful mergers (e.g., Benmelech and Frydman, 2014; Lin, Ma, Officer, and Zou, 2014). Firms run by CEOs who experienced financial distress in their previous employment issue less debt, save more cash, and invest less than other firms (Dittmar and Duchin, 2014).

Across several corporate policies and a diverse set of formative events, there is a growing consensus that past life experiences affect CEOs' attitudes toward risk. A unifying thread among these studies is the existence of a monotonic relation between treatment and effect. They posit that exposure to a particular life experience has a unidirectional effect on a CEO's risk-taking propensity and hence on corporate policies.

2.2 Medical literature on the long-term effects of early-life trauma

In the psychology literature, the original empirical relation between arousal and performance was developed by Yerkes and Dodson (1908). Their analysis shows that performance increases with physiological or mental arousal, but only up to a point. When levels of arousal become too high, performance decreases, giving rise to an inverted U-shaped relation between arousal and performance. Kleim and Ehlers (2009) and Hammarberg and Silver (1994) find evidence for this non-monotonic relation among assault survivors and war veterans. Colville and Cream (2009) find similar effects in post-traumatic stress of parents after a child's admission to intensive care. Holman and Silver (1998) investigate the relation between temporal orientation and long-term psychological distress in three samples of traumatized individuals: adult victims of childhood incest, Vietnam War veterans, and residents of two southern California communities devastated

[10] In a related but different vein, other studies indicate that a CEO's attitude toward risk affects decisions consistently whether in a corporate setting or not. For example, Hutton, Jiang, and Kumar (2014) find that a conservative political affiliation is associated with a more conservative attitude in corporate decision-making. Cain and McKeon (2013) find that CEOs who are licensed small aircraft pilots have larger appetite for risk in the form of higher financial leverage, stock volatility, and propensity to engage in risky acquisitions. Roussanov and Savor (2013) find that unmarried CEOs also display larger propensities to take on risk.

[11] Similarly, Chevalier and Ellison (1999) find that fund managers with MBAs tend to take on more systematic risk.

by fire. They find that the tendency to focus on prior life experiences is correlated with high stress levels long after the trauma had passed.

Exposure to early-life trauma has also been shown to have direct biological effects on region-specific brain utilization patterns. Lyoo et al. (2011), for example, examine a sample of direct survivors in a South Korean subway disaster and show that trauma-exposed individuals had greater dorsolateral prefrontal cortical (DLPFC) thickness 1.42 years after trauma relative to controls who were unaffected by trauma. Greater DLPFC thickness was associated with greater posttraumatic stress disorder symptom reductions and better recovery. Further, the available evidence shows that the interaction between the environment and DNA is crucial in determining a subject's resistance to stress, whereby environmental factors affect the human genome permanently through epigenetic mechanisms. For example, Labonté et al. (2012) and Mehta et al. (2013) find evidence that childhood trauma is associated with epigenetic alterations in the promoters of several genes in hippocampal neurons.[12]

It is thus reasonable to expect that early-life experiences of natural disasters can have long-term effects on an individual's psyche, neurobiology, and decision-making.[13]

2.3 Exposure to natural disasters and economic decision-making

Recent studies in economics and finance indicate that exposure to natural disasters affects risk-taking. Cameron and Shah (2013) conduct a controlled experiment with randomly selected individuals in rural Indonesia. They find that individuals more recently exposed to flood- or earthquake-related losses are more risk-averse, consistent with a heightened perception of risk. Cassar, Healy, and von Kessler (2011) report similar findings for Thai villagers affected by the

[12] Labonté et al. (2012) identified 362 differentially methylated promoters in individuals with a history of trauma and found that genes involved in cellular/neuronal plasticity were among the most significantly differentially methylated and, among these, Alsin (ALS2) most significantly. Mehta et al. (2013) examined the impact of early-life experiences on DNA methylation in peripheral blood cells of subjects with posttraumatic stress disorder. They found that, compared with adult trauma-exposed control subjects, the gene-expression profiles of PTSD patients with similar clinical symptoms and matched adult trauma exposure but different childhood adverse events were almost completely non-overlapping (98%). See also Sapienza and Masten (2011) for a review of studies on neurobiological and epigenetic processes.

[13] In fact, a recent study by Cronqvist et al. (2014) indicates that even *prenatal* environmental factors such as testosterone exposure and birth weight explain heterogeneity in risk taking propensities much later in life.

2004 Asian tsunami disaster. Bucciol and Zarri (2013) examine household portfolios of retirees using survey data and find that retirees who experienced a natural disaster (or death of a child) in adulthood are less likely to undertake risky investments as compared to other retirees who did not experience such events. In contrast, they find no evidence that other events such as a serious illness, a robbery, or the loss of a job affect investment behavior. In a related but different vein, Castillo and Carter (2011) investigate the impact of exposure to natural disasters on trust and reciprocity in 30 small Honduran communities diversely affected by Hurricane Mitch in 1998. They find that subsequent behavior is nonlinearly related to the severity of the shock affecting the community.

Other studies analyze firms' responses to natural disasters. Miao and Popp (2013) examine the reaction of firm investment in innovation and document a spike in risk-mitigating innovation activities following natural disasters. Ramirez and Altay (2011) and Dessaint and Matray (2013) examine how firms' cash holdings change following natural disasters. Both studies document a greater propensity by firms to hoard cash following disasters, consistent with a heightened perception of risk by the corporate decision-makers. However, while Dessaint and Matray find that these effects are temporary, the evidence in Ramirez and Altay suggests longer lasting effects – i.e., lasting more than two years.

All these studies conclude that exposure to natural disasters in adulthood is salient and has a unidirectional effect on subsequent risk-taking. Moreover, while the analyses of individual decisions suggest that the effects of disaster exposure persist over various horizons, the analyses of corporate policies focus on short(er) term effects.

2.4 Testable Hypotheses

Based on the previous discussion, we examine the following three hypotheses:

> *HP 1.a: Linear Treatment Effect 1* – Early-life exposure to natural disasters desensitizes a CEO to the negative consequences of risk and is associated with riskier corporate policies and outcomes.

HP 1.b: Linear Treatment Effect 2 – Early-life exposure to natural disasters sensitizes a CEO to the negative consequences of risk and is associated with less risky corporate policies and outcomes.

HP 1.c: Non-linear Dosage Effect – Early-life exposure to natural disasters *without* extremely negative consequences desensitizes a CEO to the negative consequences of risk and is associated with *greater* risk-taking. Early-life exposure to natural disasters *with* extremely negative consequences sensitizes a CEO to the negative consequences of risk and is associated with *less* risk-taking.

3. Data description

3.1 CEO's birth dates and places

We collect names of CEOs from Compustat's Execucomp database, which covers firms in the S&P1500 from 1992 to 2012. We use Execucomp's "is_ceo" field to identify the CEO of each company in the database from 1992 to 2012. For each CEO, we search biographical information regarding birth place and birth year from publicly available sources. Specifically, we retrieve CEO biographical data from Marquis Who's Who, Standard and Poor's register of Directors and Executives, and US Executive Compensation database on Lexis-Nexis, or NNDB.com, or in the last instance, via Google searches of other public data sources. We are able to obtain reliable place and date of birth information for 2,102 CEOs of the 6,804 CEOs in the initial database. Of these, 255 are born outside the U.S. and we are unable to obtain information on the county or city of birth for an additional 136 CEOs. We are thus able to retrieve the date, city, and state of birth for 1,711 U.S.-born CEOs of firms in the S&P1500 from 1992-2012.

Table 1 reports summary statistics for the firm-years and CEOs in our sample. Since we cannot obtain the birthplace for all CEOs in Execucomp, we begin by assessing the differences between CEOs and firms in our sample versus those in Execucomp and Compustat universes (not tabulated for brevity).[14] Compared to the typical Compustat-firm, the average firm in our sample

[14] Table A.1 in the Internet Appendix reports the results of this comparison.

is significantly larger – about 7 times larger; has more fixed assets; uses more financial leverage; holds less cash; is more likely to pay dividends; and has lower stock return volatility.

The differences between the two samples are not surprising given that CEOs of larger, more prominent firms are more likely to have news sources documenting their biography and birth place. We thus acknowledge an inherent bias in our data collection leading to some CEOs being omitted, and do not take a stand on how generalizable our results may be *out-of-sample*. However, we see no obvious reason why these differences should imply that our inferences regarding the effects of CEO's early-life exposure to natural disasters would be biased *within the sample* that we can obtain.

3.2 List of U.S. County-level Natural Disasters

The set of natural disaster events that we use comprises earthquakes, volcanic eruptions, tsunamis, hurricanes, tornadoes, severe storms, floods, landslides, and wildfires. For each event, we collect county-level data on the date of the event; the reported number of injuries and fatalities; and the estimated dollar losses related to crop and property damage (in 2009 dollars).

Our database of U.S. county-level natural disaster events spans the period 1900–2010. To construct the natural disaster database, we begin by retrieving all available records from the United States Spatial Hazard Events and Losses Database (SHELDUS™) of the University of South Carolina for the period 1960-2010.[15] This is a county-level dataset that includes the beginning date, U.S. county location, property losses, crop losses, injuries, and fatalities associated with various natural hazard event types. However, because a majority of CEOs in our sample are born prior to 1960, we use available historical records to construct a county-disaster event database equivalent to SHELDUS™ that spans the period 1900-1959.

For *earthquakes*, *floods*, and *landslides*, our main data sources are the United States Geological Survey (USGS), which provides a list of events going back to 1900, and the National

[15] Hazards & Vulnerability Research Institute (2013). The Spatial Hazard Events and Losses Database for the United States, Version 12.0. Columbia, SC: University of South Carolina. Available from http://www.sheldus.org

Geophysical Data Center (NGDC).[16, 17, 18] For each earthquake in the USGS database, we collect all available information. If USGS or NGDC do not provide a complete record of a specific event (i.e., missing details on county location, or damages, or injuries/fatalities), we perform a web-search with the following parameters to retrieve related news articles or historical records: "earthquake or flood or landslide + state location + event year". The USGS and NGDC are also our main source of information for *volcanic eruptions*,[19] which we supplement with Science Daily's database on volcanic events. If none of these sources provide a complete record of the event, we perform a web-search with the following parameters to retrieve related news articles or historical records: "volcano + state location + event year".

For *tsunamis*, we obtain data on the location and date of the event, as well as all other relevant information from two main sources: Tsunamis.findthedata.org and the NGDC website.[20] If we cannot retrieve all relevant information for a recorded tsunami event, we perform a web-search with the following parameters to retrieve related news articles or historical records: "tsunami + state location + event year".

For *hurricanes*, *tornadoes*, and *severe* storm events, our main data sources are the data archive of the National Climatic Data Center (NCDC) and National Weather Service (NWS) of the National Oceanic and Atmospheric Administration.[21,22] For each recorded event, we track the affected counties and retrieve the relevant information available from these sources. If we cannot obtain all relevant information for a recorded event, we perform a web-search with the following

[16] See also Lynn M. Highland and Robert L. Schuster, "Significant Landslide Events in the United States" , USGS. Graphic presentation by Margo L. Johnson, at http://landslides.usgs.gov/docs/faq/significantls_508.pdf
[17] See also Engdahl and Villaseñor (2002).
[18] See also C.A. Perry, "Significant Floods in the United States During the 20th Century - USGS Measures a Century of Floods", USGS.
[19] See also Harpel, C. J., and J. W. Ewert, "Bibliography of literature from 1900-1997 pertaining to Holocene and fumarolic Pleistocene volcanoes of Alaska, Canada, and conterminous United States", USGS.
[20] At http://www.ngdc.noaa.gov/hazard/tsu_db.shtml.
[21] At http://www.ncdc.noaa.gov/oa/reports/weather-events.html#hist and http://www.nhc.noaa.gov/data/. In addition, we used the 2011 NOAA Technical Memorandum NWS NHC-6 "THE DEADLIEST, COSTLIEST, AND MOST INTENSE UNITED STATES TROPICAL CYCLONES FROM 1851 TO 2010 (AND OTHER FREQUENTLY REQUESTED HURRICANE FACTS)" by Eric S. Blake, Christopher W. Landsea, and Ethan J. Gibney.
[22] See also http://bangladeshtornadoes.org/UScases.html.

parameters to retrieve related news article or historical records: "hurricane or tornado or severe storm + state location + event year".

For *wild fires*, our main sources are the lists of events available through Wikipedia (http://en.wikipedia.org/wiki/List_of_fires and http://en.wikipedia.org/wiki/List_of_wildfires) and GenDisasters (at http://www.gendisasters.com/fires/index.htm).[23] If we cannot obtain the relevant information for a recorded event from these sources, we perform a web-search with the following parameters to retrieve related news article or historical records: "fire + state location + event year". In all the cases above, we record all relevant information only if the web search is successful. Otherwise we discard the event from the database.

Panel A of Table 2 provides summary statistics of the natural disasters in our sample. While most disasters in our sample are weather-related (i.e. floods, thunderstorms, hail, etc.), the most fatal disasters are earthquakes, fires, and hurricanes, with about 21% of hurricanes and 24% of earthquakes in our sample classified as "major" disasters.[24]

3.3 CEO's Early-life Disaster Experience

We employ three different measures of early-life disaster experience, all based on the disasters in the CEO's county of birth starting 5 years and ending 15 years after the CEO's birth year. We focus on this period because research shows that the formation of lasting childhood memories tends to start around the 5th birthday, while the 15th birthday is a natural stopping time for "early childhood" memories (Nelson, 1993). The results are robust to using alternative windows to calculate our measure, e.g. [t+5,t+10].

Starting from the county-disaster event database, for each county-year, we first calculate the total of all fatalities from natural disasters and divide by the population of that county in that year. We calculate the mean of this variable for each CEO-county over the relevant 10 year period after birth.

[23] In general, we were able to find historical records with relevant information for most disaster types in our dataset from GenDisasters at http://www3.gendisasters.com.

[24] In Section 3.3, we define a disaster as "minor" if it resulted in less than 1 fatality per county and property damage was less than $10,000 (inflation-adjusted to 2009) and a disaster as "major" if it resulted in more than 5 fatalities per county and property damage was greater than $1 million (inflation-adjusted to 2009).

Our first measure of a given CEO's disaster experience is a categorical variable that groups CEOs into three categories based on the 10-year disaster-related average fatality measure. Those who experience no fatal disasters in their county of birth during the relevant years are in the "no fatality" group. CEOs in the top decile of the distribution of our measure are in the "extreme fatality" group, while all the others are in the "medium fatality" group. Of the 1,711 CEOs in our sample, 568 (33%) are in the "no fatality" group, 958 (56%) in the "medium fatality" group, and 185 (11%) in the "extreme fatality" group.[25]

The indicator variables above reflect the *average* number of annual disaster-related fatalities experienced by a CEO during the relevant ten-year period. However, it may also be important to take into account the amount of damage and fatalities for any given disaster over the relevant 10-year period. In addition, it seems plausible that the more disaster events a CEO experiences without witnessing major consequences, the more likely he is to underestimate the effects of extreme events and take a blasé view of risk. Hence, we classify a county-disaster as "minor" ("major"), if it caused less (more) than one (five) fatality and 2009 inflation-adjusted property damage less (greater) than $10,000 ($1 million) in the county.[26] By comparison, the average (median) number of fatalities and property damage for a county-disaster are 0.12 (0) and $884,115 ($6,031), respectively. Based on our classification, 367,052 out of 657,919 disasters from 1900-2010 (55.8%) are classified as "minor", and 6,452 (0.98%) as "major".

Our second measure of a given CEO's disaster experience is also a categorical variable that compares CEOs who experienced at least one "major" disaster to those who experienced a high number of disaster events but never a "major" disaster. In particular, we define an indicator variable *I*(*Blasé*) equal to 1, if the CEO experienced an above median number of "minor" disaster events during the relevant 10-year period and *did not* experience a "major" disaster. *I*(*Blasé*) is

[25] While all our results are robust to using a continuous linear and a squared term for fatalities as the main independent variables (see section 5.3), grouping CEOs in this manner allows for a natural interpretation of CEO "types".

[26] In the disaster database, fatalities from disasters that span multiple counties are split evenly among the relevant counties in some cases where no county-level details are available. Therefore, it is possible to have fatalities between 0 and 1 for a given county-disaster.

equal to 0, if the CEO experienced at least one "major" disaster regardless of the number of events during the relevant 10-year period.

Lastly, our third measure of early-life disaster experience is simply a count of the total number of "minor" disaster events experienced by each CEO during the relevant ten-year period. It is important to note that while the first measure categorizes CEOs into three groups based on the percentage of fatalities relative to the county population, our last two measures are based on the absolute number of fatalities and the inflation-adjusted dollar value of property damage.

Panel B of Table 2 reports the top ten birth-states of CEOs in our sample and the distribution of disaster experience of CEOs from those states. The modal birth state is New York, accounting for 290 of the 1,711 CEOs (16.95%). Of these, 14.48% did not experience any fatal disasters between the ages of 5 and 15 in their birth county, 5.52% experienced "extreme" levels of fatal disasters, while the remaining 80% fall in the "Medium" fatality experience group. While the distribution of CEO birth states is not uniform, there is considerable variation in the disaster experiences of CEOs from the same birth state. Of note is Texas, accounting for 71 CEOs (4.15% of our sample) who are split roughly equally between the "extreme", "medium", and "no fatal disaster" experience groups.

While it is not our intent to generalize to the population at large, we gauge how our sample CEOs' disaster experience compares with the general American population. We start by using the annual population of each county and calculate the fraction of U.S. residents that experienced each type of disaster in a given year. We then calculate the weighted average of this percentage over 1900-2010 by weighting each year by the total U.S. population. In a given year, 21.09% of the population experienced at least one disaster in our database, 10.7% experienced a fatal disaster, 8.5% a minor disaster, and 3.6% experienced a major disaster. Over a typical ten year period, the probability of not experiencing any disasters is 9.3% ($(1-21.09\%)^{10}$) which implies that the probability of experiencing at least one disaster over the ten year period is 90.7%. 80.2% of the CEOs in our sample experienced at least one disaster in the ten year period (from year 5 to 15), lower than the population incidence. Similarly, the CEO incidence of experiencing a minor disaster (51.79%) is lower than the incidence for the population at large (58.9%). However, CEOs are just as likely to experience a fatal disaster over the ten year period as the US population

(66.80% versus 67.86%). We obtain similar results using an equally-weighted average, implying that while our CEOs have a lower likelihood of experiencing minor disasters or disasters in general, they have roughly the same likelihood of experiencing fatal natural disasters as a typical member of the population.[27]

Panel C of Table 2 provides information on the birth states of CEOs categorized by their disaster experience. Of note, New York is in the 1st or 2nd ranking across all three disaster experience categories. Other states like Texas are also in the top ten across all three categories, while Massachusetts and Missouri are in the top ten for two of the three categories. The upshot of Panels B and C is that there is considerable disaster experience variation for CEOs of the same birth state, and geographic variation in the birth states of CEOs within a particular disaster experience category.

4. Results

In this section, we explore the relation between CEO attitude toward risk, as captured by early-life natural disaster experiences, and various firm decisions and outcomes: leverage, cash holdings, stock volatility, and acquisitiveness. All empirical models presented include year, industry (Fama-French 49), and CEO's state of birth fixed effects. Since our main explanatory variable (early-life disaster experience) is a constant for each executive, our standard errors are clustered at the executive level.[28] In addition, all models control for the average fatality risk of the CEO's birth county during the period 1900-2010. This control should account for certain counties being more disaster prone and, therefore, the occurrence of fatal disasters during a particular 10 year period that a CEO resides there should be effectively random.[29]

[27] Table A.2 in the Internet Appendix reports the results of this comparison.
[28] All our results are robust to clustering at the firm level, and to two-way clusters at the firm and year level.
[29] This assumption rests on the stationarity of disaster risk. The stationarity assumption is supported by findings in the meteorology literature (see Elsner and Bossak, 2001; Pielke, Wigley, and Green, 2008).

4.1. Financial Leverage

Table 3 reports the results of a pooled OLS regression where the dependent variable is the book leverage for each firm-year in the sample. The evidence reveals a non-linear relation between CEOs' experiences with fatal disasters during childhood and firm leverage. Compared to CEOs with no disaster experience, "medium" fatal disaster experience is associated with significantly higher financial leverage, while "extreme" fatal disaster experience with lower leverage.

All else equal, firms whose CEOs have experienced a "medium" level of fatalities from natural disasters have a 3 percentage point higher financial leverage than firms whose CEOs have no fatal disaster experience. The economic magnitude is large and comparable to the effect of the "Depression Baby" indicator, albeit in the opposite direction. In contrast, firms whose CEOs have experienced an "extreme" level of fatalities from disasters have a 2.9 percentage point *lower* financial leverage than firms whose CEOs have no fatal disaster experience, and 5.9 percentage points lower leverage than firms whose CEOs have a "medium" level of fatal disaster experience. All else equal, the predicted book leverage is 24.0%, 27.0%, and 21.1% for firms whose CEOs are in the "none", "medium" and "extreme" fatal disaster experience groups, respectively.

We next analyze the effect of the number of "minor" disasters CEOs experienced during their early years. CEOs who experienced many "minor" disasters but no "major" disaster may be desensitized to the potential consequences of risky events. They have experienced supposedly risky events (natural disasters) without any major consequences (a very low level of fatalities and property damage), and so may underestimate the negative consequences of risky choices.

Column 2 in Table 3 reports the results of such a test. We compare CEOs who experienced an above median number of "minor" disasters but no "major" disaster (i.e., *Blasé* = 1) to those who experienced at least one "major" disaster regardless of the number of "minor" disasters experienced (*Blasé* = 0).[30] For this specification, we do not consider the set of CEOs who have not experienced a "major" disaster *and* have experienced a below median number of minor disasters, because it is less clear that they would take a blasé view of risk.

[30] See Section 3.3 for our classification of disasters as "minor" and "major".

The results indicate that the leverage of firms with *Blasé* CEOs is 8.8 percentage points higher than the leverage of firms whose CEOs have experienced at least one "major" disaster. The magnitude of the effect is twice that of the "Depression Baby" indicator (a 4.4 percentage point decrease).

In column 3, we explore the average impact of minor disaster frequency by controlling for the natural log of the number of CEO-county minor disasters. We restrict the sample to the CEOs who did not experience a "major" disaster, since our earlier findings indicate that these two groups respond differently to disaster experience. The coefficient estimates imply that a one standard deviation increase in the number of minor disasters experienced by a CEO (with no major disaster experience) is associated with a 1.3 percentage point higher leverage ratio.

Overall, the results in Table 3 indicate a non-linear, inverse-U shaped relation between fatal disaster experience and firm leverage. Some fatal disaster experience is associated with higher leverage, while "extreme" levels are associated with lower leverage. We observe these effects both in the categorical sorting of CEOs into broad groups, as well as in the average effect of minor disaster frequency. These results are consistent with the notion that CEOs with experience of risky events that have *ex-post* minor consequences may be desensitized to the negative consequences of risky behavior and take on more financial leverage when at the helm of a firm.

4.2. Cash Holdings

Table 4 reports the results of a pooled OLS regression where the dependent variable is the firm-year cash-to-asset ratio. Mirroring the results for leverage, there is a non-linear, U-shaped relation between CEO's fatal disaster experience and firm's cash holdings. All else equal, firms whose CEOs experienced an "extreme" level of fatalities from natural disasters hold 3.1 percentage points more cash than firms whose CEOs experienced no fatal disasters. Even though the point estimate on "medium" fatality CEOs is negative, as predicted, the coefficient is not statistically significant. However, the difference in the coefficients between "medium" and "extreme" fatality CEOs is statistically significant at the 1% level.

In column 2, the results indicate that the cash-to-asset ratio of firms with *Blasé* CEOs is 5.8 percentage points lower than the cash-to-asset ratio of firms with CEOs that were exposed to

"major" disasters. Furthermore, the results in column 3 indicate that a one standard deviation increase in the log-number of minor disasters experienced by the CEO is associated with a 1.4 percentage point lower level of cash holdings, and is significant at the 1% level.

The evidence in Table 4 is consistent with a non-linear relation between CEO's early-life fatal disaster experience and attitude toward risk. Exposure to natural disasters without experiencing the downside consequences of those events is associated with lower cash holdings, supporting the notion that those CEOs may be desensitized to risk. In contrast, CEOs who experienced extreme consequences from natural disasters appear to be more wary of potential risk and tend to hold more cash, consistent with a precautionary savings motive.

4.3. Firm Equity Volatility

Table 5 reports the results of pooled OLS regressions where the dependent variable is the annualized volatility of daily firm stock returns over the fiscal year.[31] Consistent with the financial leverage results, the evidence shows a non-linear relation between fatal disaster experience and the firm's stock volatility.

Firms whose CEOs experienced "medium fatality" disasters are associated with a 1.615 percentage point higher annual stock volatility than firms in the no fatal disaster group. On the other hand, firms whose CEOs experienced "extreme fatality" disasters are associated with a 2.464 percentage point lower stock volatility than firms in the no fatal disaster group. Hence, on average, firm stock volatility is higher for firm-CEOs with a "medium" level of fatality experience as compared to both firm-CEOs with no fatal disaster experience *and* firm-CEOs with an "extreme" level of disaster experience.

From column 2, firms with *Blasé* CEOs are associated with 2.737 percentage point higher stock return volatility than firms with CEOs who have experienced major disasters. The third column of Table 5 further explores this effect using the number of minor disasters experienced, focusing on the sample of CEOs who have not experienced any major disasters. The results are

[31] Results are robust to calculating annual volatility using monthly returns.

qualitatively consistent with our earlier findings. However, while the coefficient on "Ln(# of minor disasters)" is positive, it is not statistically significant.

4.4. Merger Activity

A large literature argues that CEOs exert significant decision-making power in the context of mergers and acquisitions. In addition, due to empire building motivations or managerial hubris, CEOs may derive some personal utility from engaging in acquisition activity. We thus explore whether CEO attitude toward risk, as measured by early childhood experiences of fatal disasters, has a material impact on the acquisitiveness of the firm.

Table 6 reports the results of a probit model where the dependent variable is equal to 1 if the firm announced a merger in the current year, and 0 otherwise. The coefficients are reported as the marginal effect of an increase in the independent variable at its mean on the probability of a merger announcement.

The coefficient on "Extreme Fatality" disaster experience indicates that firms with CEOs of this type are 7.7% less likely to attempt an acquisition in a given year than firms with CEOs without any disaster experience. In addition, firms whose CEOs have a "Medium Fatality" disaster experience are 2.2% more likely to engage in acquisitions as compared to firms whose CEOs did not experience any early-life fatal disasters. The difference between the "Medium" and "Extreme" groups is statistically significant at the 1% level.

In column 2, the results imply that "Blasé" CEOs are 11.6% more likely to pursue acquisitions in a given year than CEOs who have experienced at least one major disaster. Given an average probability of approximately 30% with a standard deviation of 46%, the incremental effects in columns 1 and 2 appear to be economically meaningful. This effect is qualitatively consistent with the result in column 3 where the coefficient on the number of minor disasters experienced is positive as predicted, but not statistically significant.

5. Alternative Explanations and Robustness Tests

5.1 CEO and Firm Matching

The results presented thus far do not necessarily identify a causal effect of a CEO's risk preferences. Our evidence is consistent with CEOs matching to certain types of firms based on their disaster experience, or with CEO risk preferences stemming from disaster experience influencing the firm's risk-taking. Following earlier studies (e.g., Bertrand and Schoar, 2003), we first attempt to tease out these two channels by including firm fixed effects in our tests. We report the results in Table 7. The firm fixed effect absorbs a time-invariant firm "type" and the coefficients can be interpreted as the average effect of a within-firm change in the independent variable over time. Of interest for our purposes, the coefficients on the disaster variables reflect how differences in childhood disaster experience across CEOs of the same firm affect the firm's risk-taking decisions and outcomes.

Almost all of our results hold after the inclusion of firm fixed effects. By and large, when a CEO is more risk tolerant than other CEOs of the same firm, the firm takes on more financial leverage, holds less cash, and experiences higher stock volatility. We again find evidence of a non-linear relation, whereby CEOs with no fatal disaster or with "extreme" disaster experience during childhood behave more conservatively than CEOs with "medium" exposure to fatal disasters. We do not explore firm fixed effects on the probability of an acquisition because this would require an extremely large number of indicator variables in a probit regression, leading to inconsistent estimates (Greene, 2004).

Notwithstanding the robustness of our results to the inclusion of firm fixed effects, we recognize that the latter only absorb time-invariant factors and the timing of CEO turnover is not typically exogenous. Hence, dynamic matching of CEOs to firms remains a potential concern, to the extent that firm style changes significantly over time and any resulting CEO turnover depends on the executives' risk preferences as captured by our measures.

Second, to further pin down the causal effect of CEOs' attitude toward risk, we examine exogenous CEO turnover events as classified in Eisfeldt and Kuhnen (2013).[32] Of 678 CEO turnover events in our sample, 85 are classified as exogenous and have non-missing observations over a 2-year window around the event. We analyze the changes in firms' industry-adjusted book leverage, cash-to-asset ratio, and stock volatility around these exogenous turnover events. Specifically, for each firm-year, we subtract the industry median for that year based on Fama-French 49 classification from the firm's leverage, cash-to-asset ratio, and stock volatility. For each industry-adjusted variable and turnover event in year *t*, we then subtract the average value over years [t-2,t] from the average value over years [t+1,t+2].

We then test whether the changes in firm policies around exogenous turnover events imply higher risk-taking when the new CEO is more risk-tolerant versus turnover events where the new CEO is less risk-tolerant relative to the old CEO. Using our CEO early-life disaster experience classification, we define a "More Risk-Tolerant" CEO turnover event as one where the CEO's experience changes from "No Fatality" to "Medium Fatality", "Extreme Fatality" to "Medium Fatality", or "Extreme Fatality" to "No Fatality". There are 28 such events (out of the 85 exogenous CEO turnovers) in our sample. A "Less Risk-Tolerant" CEO turnover event is one where the change in CEO's early-life disaster experience goes in the opposite direction. There are 20 such events in our sample.

Despite the small sample sizes, the evidence in Table 8 supports the notion that CEOs' risk tolerance as shaped by early-life disaster experience has a causal effect on firm risk-taking. The mean difference of changes in industry-adjusted book leverage around "More Risk-Tolerant" versus "Less Risk-Tolerant" CEO turnover events is positive, 5.13 percentage points, with a t-statistic of 1.96. Similarly, the mean difference of changes in industry-adjusted stock volatility across the two exogenous turnover samples is also positive, 7.78 percentage points, and significant, t-stat=2.37. The results for the changes in cash holdings are qualitatively similar (i.e., an increase in cash holdings for "Less Risk-Tolerant" versus "More Risk-Tolerant" CEO turnover

[32] We thank Camelia Kuhnen for providing the data on her website at http://public.kenan-flagler.unc.edu/faculty/kuhnenc/research/research.html.

events), but only marginally significant statistically, with a t-statistic of -1.586 (p-value=0.11). It is worth noting that because the variables of interest are adjusted by industry-year medians, the results cannot be explained by industry or time trends that may be correlated with CEO turnover.

Overall, the evidence in Tables 7 and 8 provides compelling evidence that early-life disaster experiences shape CEOs' attitudes toward risk and in turn affect the risk taking of the firms that they lead. While it is plausible that CEOs' risk preferences as shaped by their early-life exposure to natural disasters determine the dynamic matching between firms and CEOs, on balance, the evidence for the sample of exogenous CEO turnover events appears consistent with a causal impact of CEOs' risk preferences on corporate policies.

5.2 Panel Data Structure

Our main explanatory variable (CEOs' early-life disaster experiences) is constant for each CEO. However, we employ a panel data structure to explain firm choices, like leverage, since these firm choices change every year. A concern may be that over-sampling would lead to biased results as CEOs with longer tenures account for more observations.

To allay such concerns, we repeat our baseline tests using only one observation for each CEO-firm pair. Specifically, we average the dependent and independent variables over the entire tenure of each CEO at a given firm. Of course, our main explanatory variable is a constant for each CEO, as are some other explanatory variables like the "Depression Baby" indicator and CEO gender. As we can no longer include year fixed effects, we only include a fixed effect for each industry (Fama-French 49) and state of CEO's birth. We cluster the standard errors at the state of birth level, since clustering at the executive level would only leave a small number of clusters with multiple observations.

Table 9 indicates that the results are robust to such a cross-sectional analysis. Overall, CEOs who have experienced "extreme" levels of early-life fatal disasters are associated with lower firm leverage, higher cash holdings, lower stock volatility, and are less likely to engage in acquisitions over the entire tenure at a given firm as compared to CEOs who did not experience any disasters. In line with our prior findings, we find the opposite relation for CEOs who have experienced

"medium" levels of early-life fatal disasters. This evidence suggests that our baseline results are not due to CEO over-sampling in the panel of firm-years.

5.3 Omitted Variables

A second concern is the potential systematic link between certain U.S. regions and our measure of CEOs' risk preferences, given that certain regions of the country are more exposed to natural disasters (hurricanes in Florida or earthquakes in California, for example). This could result in a spurious effect of our measure of a CEO's disaster experience, if the latter is systematically correlated with non-disaster related characteristics of the birth-county such as economic conditions, crime rate, or quality of education.

A related concern is that, although the decision to live in a disaster-prone area is not taken by the child, it may reflect the parents' risk preferences. Less risk-averse parents would be more likely to choose to live in high risk areas and pass on those preferences to their children. So it would not be the disaster experience, but rather the child's upbringing that explains the higher risk appetite of the medium exposure CEOs.

In our tests, we address these concerns in three ways. First, we note that all models include a control for the average disaster fatality risk of the CEO's county of birth from 1900-2010. The addition of this control ensures that the results are not merely due to CEOs with fatal disaster experience hailing from high risk counties. This control also addresses concerns of non-disaster related omitted variables at the county or state of birth level. Even if CEOs cluster by region on any number of characteristics, after controlling for the average time-series disaster risk of the county of birth, the existence of fatal disasters during a particular 10 year period that a CEO resides there should be effectively random.[33] Second, all models include fixed effects for the CEO's state of birth, which absorb time-invariant factors at the state-level – for example, consistently better public education or economic conditions in a state.

Lastly, in an attempt to further absorb time or geographic effects, we conduct supplemental tests to isolate the effect of major disasters focusing only on the difference between affected

[33] As noted earlier, this assumption rests on the stationarity of disaster risk.

versus neighboring counties. Specifically, we define a "Treatment" group as the set of CEOs that experienced a major disaster (as defined before) in their county of birth over the period [t+5,t+15] years. We define the "Control" group in two ways. The first categorization of the "Control" group is the set of CEOs who did not experience a major disaster in their birth county, but were within the age of 5 to 15 years old in *unaffected* counties located within 100 miles from the major disaster. The second categorization of the "Control" group is same as the first, but with the further restriction that the CEOs in the "Control" group also experienced at least one minor disaster in their birth county.

The evidence in Table 10 shows that our main findings are unchanged, and in some instances become stronger, when analyzing the difference in our outcome variables between the "Treatment" and "Control" group CEOs. CEOs that experienced a major disaster in their birth county are associated with lower leverage, higher cash holdings, and lower stock volatility and acquisitiveness as compared to CEOs who resided in unaffected counties located within 100 miles of the disaster zone.

5.4 Alternative measure of non-linearity

An additional concern with our results is that our classification of CEOs into "No fatality", "Medium", and "Extreme" fatality groups may appear arbitrary. We therefore replicate our analyses using a continuous measure of the fatalities per county population over the ten-year window and its square, instead of indicator variables. This is the same variable that we use to identify the three categories of CEOs ("No fatality", "Medium", and "Extreme" fatality experience).

All our results are robust to using the alternative specification based on the continuous measure of disaster experience.[34] The coefficient estimate on the linear term is statistically significant and its sign is consistent with more risk-taking behavior (positive for leverage, volatility, acquisitiveness, while negative for cash holdings). The coefficient on the squared term is also statistically significant but of the opposite sign. Most important, the in-sample maxima

[34] Table A.3 in the Internet Appendix reports the results of this analysis.

(minima in the case of cash holdings) are very close to the cutoff levels we use for our "Extreme" fatality experience classification. For example, for leverage, the implied maximum is at a fatalities rate of 0.04% of county population – while our cutoff for "Extreme" experience is at 0.05%. We obtain similar results if we restrict our tests to CEOs who experience at least one fatality or include indicators for the three CEO categories along with the continuous variable and its square. However, due to the ease of interpretation of the categorical indicator variables, we use those as our main testing variables.

5.5 Measurement of CEO Early-Life Experience

Another concern is that we do not in fact know whether the CEO lived in the county of birth during years 5-to-15 of his or her life. While it may be the case that we incorrectly measure the CEO's location of residence during the relevant time period, this should only introduce noise, but no bias, in our results. For it to introduce bias, it must be the case that the incorrect measurement of location is correlated with their disaster experience. However, given the non-linear nature of our results, it is difficult to imagine how the incorrect measurement would also have the same non-linear correlation with disaster experience.

Nevertheless, we attempt to alleviate any such concern in three ways. First, we use varying time windows after birth to measure a CEO's disaster experience. In our main analysis, we use the window [t+5, t+15] years after birth to capture disaster incidence. We repeat our earlier tests but use a shorter window instead, [t+5, t+10], where such measurement error should be smaller. In unreported results, we find that by and large the significance of our results (and to a certain extent even the magnitudes of our coefficients) are unchanged.[35] This provides some more confidence in not only our mapping between a CEO and the county where he/she grew up, but also the robustness of our selected time window for capturing natural disaster experience.

Second, in Table 11, we report an alternative robustness check of our baseline results. In particular, we restrict our sample to those CEOs for whom we can verify that they resided in their birth-state when they obtained their social security number (SSN), typically when they were

[35] Table A.4 in the Internet Appendix reports the results of this analysis.

around the age of 15.[36] As discussed in Yonker (2012), the first five digits of the SSN reflect where the CEO grew up, since in the 1950s and 1960s (when most of the CEOs in the sample obtained their SSNs), SSNs were issued primarily for drivers' registration or employment purposes. For 75% of our initial sample, the CEO's birth-state and SSN-state coincide. In this sample, our empirical approach to identifying CEOs' early-life experience should lead to lower measurement error.

Across the board, our empirical results become stronger both statistically and economically when we restrict the sample to CEOs whose early-life experiences are measured with lower measurement error. All of our tests indicate that there is a strong and robust non-linear relation between a firm's risk-taking propensity and its CEO's early-life exposure to natural disasters.

Third, we conduct a placebo test where we randomly assign (with replacement) a birth county to each CEO based on the sample distribution of CEO birth counties. We measure the disaster experience at this randomly generated county, re-run the analysis from Tables 3-6, and repeat the exercise 500 times. If this random assignment is pure noise, then we should reject the null of a zero coefficient at the 5% significance level, 5% of the time. Table 12 reports the average coefficient for the main independent variable over the 500 sample regressions and the percent that are significant at the 5% level in brackets. Indeed, roughly 5% of the coefficients are significant at the 5% level. This evidence provides strong indication that our measure of early-life disaster experiences reflects an economically meaningful characterization of CEOs' risk attitudes, rather than just random noise.

5.6 CEO Overconfidence

We interpret our findings as differences in the risk aversion parameter that would affect discount rates for each CEO. However, an alternate explanation may be that early-life disaster experience is correlated with biases in forecasting future cash flows, which would manifest as CEO overconfidence. Using vested in-the-money CEO stock-option holdings as a proxy, overconfident CEOs have been shown to engage in acquisitions more often (Malmendier and Tate, 2008) and

[36] We are indebted to Scott Yonker for sharing the SSN-based data that allowed us to perform these robustness tests (see Yonker, 2012, and Pool, Stoffman, and Yonker, 2012 for details on these data).

less likely to issue equity (Malmendier, et. al. 2011). It is thus important to differentiate these two interpretations for our results.

We attempt to differentiate the two interpretations by including the option-based measure of overconfidence as an additional control in our regressions. We employ the "Holder 67" measure developed in Malmendier and Tate (2005) as the measure of CEO overconfidence.[37] We find that our earlier findings are quantitatively and qualitatively robust to this additional control. Thus, our main explanatory variable is not merely a manifestation of CEO overconfidence.

6. Conclusions

A growing body of literature on managerial fixed effects attributes at least part of these effects to managerial life experiences. These papers typically posit a monotonic relation between a CEO's life experience and corporate policies, showing that exposure to specific macroeconomic, personal, or professional events have a single unidirectional effect on a CEO's decision-making.

We conjecture that the intensity of life experiences can result in non-linear effects on subsequent behavior. Consistent with our main conjecture, we find that there is a non-linear relation between CEOs' early-life exposure to natural disasters and several corporate policies including leverage, cash holdings, stock volatility, and acquisitiveness. Our results support the hypothesis that experiencing natural disasters without extremely negative consequences desensitizes CEOs to the negative consequences of risk. In contrast, if the CEO experienced "extreme" levels of fatal disasters, he or she has witnessed the downside potential of risky situations and appears to be more cautious in approaching risk when at the helm of a firm.

Our results are robust to including firm fixed effects and controls for non-disaster related omitted variables at the county or state of birth level. Moreover, the results from difference-in-difference tests that we conduct on a set of exogenous turnover events show that exogenous increases in CEO risk tolerance result in higher leverage and volatility, and lower cash holdings.

[37] Table A.5 in the Internet Appendix reports the results of this analysis. We thank Mark Humphery-Jenner and Steve McKeon for generously providing us with the measure of CEO overconfidence based on unexercised in-the-money stock options.

Therefore, although it is plausible that CEOs' risk preferences as shaped by early-life natural disasters determine the matching between firm and CEO styles to some extent, on balance, the evidence appears to indicate a causal impact of CEOs' risk attitude on corporate policies.

We conduct several robustness exercises to provide confidence in our measure of a CEO's early life disaster experience. Our results are robust to alternative definitions of "early-life" time-windows, and are stronger when we analyze only CEOs who reside as teenagers in the same state where their birth county is located. Similar to our main results, we find significant differences between the CEOs who experienced major disasters and those who grew up in geographically contiguous areas in the same time period, but did not experience a major natural disaster. Finally, a placebo test with random assignment of CEO birth counties reveals no correlation between randomly drawn disaster experiences and corporate policies.

Our results also have important implications for the growing literature on investor experiences and portfolio allocation, which makes similar binary assumptions regarding the effect of risk exposure on subsequent behavior. Examining non-linearities between the intensity of investors' life experiences and risk taking may be an equally promising endeavor for future research.

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Table 1 – Summary Statistics

This table reports summary statistics for various CEO and firm-related variables. Panel A summarizes variables at the firm-year level. *M/B* is defined as the market value of equity divided by the book value of equity at fiscal year-end. *Book Leverage* is the sum of long-term debt and current liabilities divided by book assets. *Fixed Assets* is the sum of PP&E and investments divided by book assets. *R&D* is set to 0 if the value reported in Compustat is missing. *ROA* is defined as net income divided by book equity. *Stock volatility* is the annualized volatility (%) calculated from the standard deviation of daily stock returns during the fiscal year. *Announced Acquisition* is an indicator variable equal to 1 if the firm announced a merger or acquisition in the current fiscal year. Panel B summarizes time-invariant CEO-level characteristics. *Extreme Fatality Experience* is an indicator variable equal to 1 for CEOs who are in top decile for the number of disaster-related fatalities per capita experienced in their birth-county, and 0 otherwise. *Medium Fatality Experience* is an indicator variable equal to 1 for CEOs who experienced some disaster-related fatalities in their birth-county but are not in the *Extreme Fatality Experience* group, and 0 otherwise. *No Fatality Experience* is an indicator variable equal to 1 for CEOs who experienced no disaster-related fatalities in their birth-county, and 0 otherwise. *Blasé* is an indicator variable equal to 1 for CEOs who are above the median for the number of "minor" disaster events experienced *and* have never experienced a "major" disaster, and 0 otherwise. A disaster is classified as "minor" if it resulted in less than 1 fatality per county and property damage was less than $10,000. A disaster is classified as "major" if it resulted in more than 5 fatalities per county and property damage was greater than $1 million. All dollar values are inflation-adjusted to 2009. In all cases, the time window for measuring disaster-related experiences is between 5 and 15 years after the CEO birth, inclusive. Following Malmendier et. al. (2011), *Depression Baby* is an indicator variable equal to 1 for CEOs born between 1920 and 1929, inclusive, and 0 otherwise.

Panel A – Firm/Year Variables	*N*	*Mean*	*Std. Dev.*	Panel B – CEO-specific Variables	*N*	*Mean*	*Std. Dev.*
Book Assets ($M)	9,598	28,342	109,534	I(No Fatality Experience)	1,711	0.332	0.471
M/B	9,598	1.865	1.475	I(Medium Fatality Experience)	1,711	0.558	0.497
Book Leverage	9,598	0.254	0.182	I(Extreme Fatality Experience)	1,711	0.110	0.314
Fixed Assets	9,598	0.300	0.245	I(Blasé)	1,711	0.399	0.492
Cash/Assets	9,598	0.112	0.147	No. of Disasters Experienced	1,711	25.867	41.86
I(Dividend Paying)	9,598	0.726	0.446	No. of "Major" Disasters Experienced	1,711	0.436	0.757
R&D/Assets	9,598	0.089	1.666	No. of "Minor" Disasters Experienced	1,711	14.347	25.343
ROA	9,598	0.144	0.131	No. of Fatal Disasters Experienced	1,711	3.906	5.408
Stock Volatility (%)	9,598	35.05	22.720	Total Fatalities Experienced	1,711	15.708	38.515
CEO Age	9,598	56.828	6.951	Avg. Fatalities as % of County Population	1,711	0.004	0.017
I(Announced Acquisition)	9,598	0.298	0.457	I(Depression Baby)	1,711	0.065	0.247

Table 2 – Natural Disaster Characteristics

Panel A reports descriptive statistics for our sample of natural disasters in the United States from 1900-2010. We define a disaster as "minor" if it resulted in less than 1 fatality per county and property damage was less than $10,000 (inflation-adjusted to 2009) and a disaster as "major" if it resulted in more than 5 fatalities per county and property damage was greater than $1 million (inflation-adjusted to 2009). Note that fatalities for disasters that span multiple counties are split evenly among the relevant counties, so it is possible to have fatalities between 0 and 1 for a given county for a disaster. Panel B reports the top 10 birth states over all the CEOs and their distribution into the three disaster experience categories. For example, 290 CEOs, or 16.95% of all CEOs, are born in New York. 14.48% of the 290 CEOs born in New York did not experience any fatal disasters during the ages of 5-15 and are categorized in the "No Fatality" group. Panel C reports the top 10 birth states for CEOs in the "No Fatality", "Medium Fatality" and "Extreme Fatality" groups, and the number of CEOs from that state that belong to that disaster experience group. For example, Pennsylvania is the modal birth state for CEOs in the "No Fatality" group. 43 CEOs in the "No Fatality" group were born in Pennsylvania.

Panel A: Descriptive Statistics for U.S. Natural Disasters 1900-2010

Disaster Type	N	Mean No. of Fatalities	Mean Fatalities per capita	Mean Property Damage (2009$, Mil.)	% Minor	%Major
Earthquake	806	4.7455	0.0605	87.677	14.52%	24.32%
Hurricane	9,665	2.4280	0.0482	17.376	20.67%	21.50%
Severe Weather	237,930	0.0581	0.0004	0.400	53.05%	0.81%
Urban Fire	2,466	6.0815	0.0164	10.295	7.06%	10.58%
Volcano	9	0.5556	0.1370	17.742	0.00%	0.00%
Weather	404,837	0.0490	0.0003	0.505	58.74%	0.47%
Wild Fire	2,206	0.0633	0.0002	7.949	34.41%	3.45%
All	*657,919*	*0. 115*	*0.001*	*0.884*	*55.79%*	*0.98%*

Panel B: Top 10 Birth States for all CEOs and Distribution of Disaster Experience

Top 10 Birth States for all CEOs	No. of CEOs	% of all CEOs	% in "No Fatality"	% in "Medium Fatality"	% in "Extreme Fatality"
New York	290	16.95%	14.48%	80.00%	5.52%
Illinois	130	7.60%	18.46%	80.00%	1.54%
Pennsylvania	123	7.19%	34.96%	63.41%	1.63%
Ohio	89	5.20%	39.33%	51.69%	8.99%
California	85	4.97%	8.24%	78.82%	12.94%
Massachusetts	83	4.85%	3.61%	81.93%	14.46%
New Jersey	73	4.27%	36.99%	61.64%	1.37%
Texas	71	4.15%	32.39%	32.39%	35.21%
Missouri	52	3.04%	38.46%	42.31%	19.23%
Mississippi	47	2.75%	36.17%	59.57%	4.26%

Panel C: Top 10 Birth States Across Disaster Experience Categories

Top 10 Birth States for "No Fatality" CEOs	No. of CEOs	Top 10 Birth States for "Medium Fatality" CEOs	No. of CEOs	Top 10 Birth States for "Extreme Fatality" CEOs	No. of CEOs
Pennsylvania	43	New York	232	Texas	25
New York	42	Illinois	104	New York	16
Ohio	35	Pennsylvania	78	Georgia	14
Iowa	32	Massachusetts	68	Massachusetts	12
New Jersey	27	California	67	California	11
Illinois	24	Ohio	46	Missouri	10
Texas	23	New Jersey	45	Connecticut	9
Indiana	23	Mississippi	28	Ohio	8
Missouri	20	Texas	23	Alabama	8
Wisconsin	19	Missouri	22	Mississippi	6

Table 3 – Relation between CEO Early-Life Disaster Experience and Firm Financial Leverage

This table reports OLS regression estimates of models where the dependent variable is the firm's financial book leverage ratio at the end of the fiscal year. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses. See Table 1 for the definitions of variables.

	Dependent Variable: Book Leverage		
	(1)	(2)	(3)
I(Medium Fatality)	0.030***		
	(0.010)		
I(Extreme Fatality)	-0.029**		
	(0.014)		
I(Blasé)		0.088***	
		(0.013)	
Ln(# of minor disasters)			0.013***
			(0.003)
Average Fatality Risk of County 1900-2010	0.758	1.951	0.880
	(2.752)	(2.446)	(3.478)
I(Depression Baby)	-0.025**	-0.044*	-0.027*
	(0.011)	(0.028)	(0.014)
Ln(Book Assets)	0.022***	0.013***	0.025***
	(0.003)	(0.004)	(0.003)
Market-to-Book	-0.015***	-0.008**	-0.014***
	(0.003)	(0.004)	(0.004)
Fixed Assets/Book Assets	0.147***	0.166***	0.140***
	(0.026)	(0.033)	(0.027)
Dividend Paying	-0.032***	-0.037***	-0.040***
	(0.010)	(0.013)	(0.011)
ROA	-0.208***	-0.290***	-0.214***
	(0.042)	(0.051)	(0.049)
Sales Growth	-0.006	-0.004	-0.010
	(0.006)	(0.003)	(0.010)
CEO Age	-0.003	-0.012	-0.003
	(0.006)	(0.008)	(0.006)
CEO Age^2	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
CEO is Female	0.015	0.026	0.030
	(0.031)	(0.034)	(0.037)
Constant	0.169	0.427*	0.135
	(0.159)	(0.228)	(0.167)
Observations	8,659	4,905	7,611
Adjusted R-squared	0.326	0.374	0.316
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 4 – Relation between CEO Early-Life Disaster Experience and Firm Cash-to-Asset Ratio

This table reports OLS regression estimates of models where the dependent variable is the firm's cash-to-asset ratio at the end of the fiscal year. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses. See Table 1 for the definitions of variables.

	Dependent Variable: Cash-to-Asset Ratio		
	(1)	(2)	(3)
I(Medium Fatality)	-0.006		
	(0.007)		
I(Extreme Fatality)	0.031***		
	(0.011)		
I(Blasé)		-0.058***	
		(0.009)	
Ln(# of minor disasters)			-0.014***
			(0.002)
Average Fatality Risk of County 1900-2010	0.725	2.583	0.659
	(1.421)	(2.446)	(1.279)
I(Depression Baby)	-0.008	0.025*	-0.003
	(0.016)	(0.014)	(0.013)
Ln(Book Assets)	-0.016***	-0.005**	-0.017***
	(0.002)	(0.002)	(0.003)
Market-to-Book	0.028***	0.034***	0.025***
	(0.003)	(0.006)	(0.003)
Fixed Assets/Book Assets	-0.156***	-0.098***	-0.155***
	(0.019)	(0.018)	(0.020)
Dividend Paying	-0.031***	-0.028***	-0.028***
	(0.007)	(0.008)	(0.007)
ROA	-0.003	-0.029	-0.007
	(0.035)	(0.038)	(0.039)
Sales Growth	0.001	0.001	-0.001
	(0.002)	(0.002)	(0.004)
CEO Age	-0.008**	-0.001	-0.010***
	(0.004)	(0.004)	(0.004)
CEO Age^2	0.000**	0.000	0.000***
	(0.000)	(0.000)	(0.000)
CEO is Female	0.020	0.027	0.004
	(0.018)	(0.019)	(0.015)
Constant	0.460***	0.210*	0.559***
	(0.106)	(0.114)	(0.114)
Observations	8,685	4,922	7,632
Adjusted R-squared	0.460	0.515	0.462
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 5 – Relation between CEO Early-Life Disaster Experience and Firm Equity Volatility

This table reports OLS regression estimates of models where the dependent variable is the firm's stock volatility from daily returns during the fiscal year. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses. See Table 1 for the definitions of variables.

	Dependent Variable: Annualized Stock Volatility		
	(1)	(2)	(3)
I(Medium Fatality)	1.615**		
	(0.665)		
I(Extreme Fatality)	-2.464**		
	(1.060)		
I(Blasé)		2.737**	
		(1.072)	
Ln(# of minor disasters)			0.096
			(0.221)
Average Fatality Risk of County 1900-2010	109.197	259.777	-19.253
	(109.075)	(161.375)	(124.226)
I(Depression Baby)	-1.296**	-4.204*	-0.564
	(0.611)	(2.223)	(1.343)
Ln(Book Assets)	-3.247***	-3.274***	-3.055***
	(0.252)	(0.317)	(0.283)
Market-to-Book	0.265	-0.109	0.197
	(0.245)	(0.361)	(0.292)
Book Leverage	11.478***	10.548***	11.446***
	(2.262)	(3.051)	(2.281)
Fixed Assets/Book Assets	0.969	0.611	3.040
	(2.035)	(2.766)	(2.141)
Cash/Assets	18.725***	19.801***	22.568***
	(2.799)	(4.226)	(3.278)
Dividend Paying	-8.247***	-7.776***	-8.786***
	(0.886)	(1.181)	(0.960)
ROA	-30.776***	-39.575***	-33.667***
	(4.207)	(6.509)	(5.268)
Sales Growth	0.828	1.094	1.056
	(0.657)	(0.972)	(1.076)
CEO Age	0.226	-0.623	0.154
	(0.429)	(0.666)	(0.489)
CEO Age^2	-0.002	0.005	-0.002
	(0.004)	(0.006)	(0.004)
CEO is Female	1.679	-0.420	2.921
	(2.152)	(2.006)	(2.447)
Constant	48.953***	71.691***	48.178***
	(12.609)	(18.680)	(14.591)
Observations	8,636	4,894	7,589
Adjusted R-squared	0.536	0.534	0.539
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 6 – Relation between CEO Early-Life Disaster Experience and Firm Acquisition Propensity

This table reports Probit regression estimates of models where the dependent variable is an indicator equal to 1 if the firm announces at least one merger or acquisition during the year, and 0 otherwise. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses.

	Dependent Variable: Firm Announced A Merger		
	(1)	(2)	(3)
I(Medium Fatality)	0.022*		
	(0.013)		
I(Extreme Fatality)	-0.077**		
	(0.031)		
I(Blasé)		0.116***	
		(0.031)	
Ln(# of minor disasters)			0.006
			(0.007)
Average Fatality Risk of County 1900-2010	9.477	21.280***	9.424
	(7.214)	(4.638)	(7.705)
I(Depression Baby)	0.042	-0.076**	0.025
	(0.053)	(0.035)	(0.052)
Ln(Book Assets)	0.045***	0.049***	0.044***
	(0.007)	(0.010)	(0.007)
Tobin's Q	-0.003	-0.014	-0.004
	(0.007)	(0.012)	(0.007)
Book Leverage	0.008	-0.033	0.026
	(0.053)	(0.072)	(0.054)
I(Net Income < 0)	-0.063***	-0.047*	-0.066***
	(0.017)	(0.025)	(0.017)
Dividend Yield	-1.131**	-1.536**	-1.175**
	(0.455)	(0.711)	(0.461)
Free Cash Flow	0.118*	0.181*	0.116*
	(0.067)	(0.108)	(0.066)
CAPX	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Sales Growth	0.028***	0.021**	0.027***
	(0.010)	(0.010)	(0.011)
CEO Age	0.042***	0.043**	0.042***
	(0.013)	(0.022)	(0.013)
CEO Age^2	-0.000***	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)
CEO is Female	-0.039	-0.079	-0.047
	(0.054)	(0.054)	(0.055)
Observations	7,675	4,217	7,675
Adjusted R-squared	0.12	0.13	0.11
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 7 - Effect of CEO Early-Life Disaster Experience Controlling for Firm Fixed Effects

Each row of this table reports OLS regression estimates of models that include firm fixed effects and whose dependent variable is indicated in each panel title. The main independent variable for each regression is indicated in the column title. All standard controls (from earlier tables) are included, but not shown for brevity. All models also include fixed effects for the states of CEO's birth and years. Standard errors, clustered at the executive level, are reported in parentheses.

	CEO-Disaster Experience									
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# minor disasters)	Obs.	R-sq.	All Contr.	Year FE	Birth State FE	Firm FE
Dep. Var. = Book Leverage										
(1)	0.021**	-0.014**			8,674	0.813	Yes	Yes	Yes	Yes
	(0.008)	(0.007)								
(2)			0.026**		4,911	0.836	Yes	Yes	Yes	Yes
			(0.011)							
(3)				0.006**	7,625	0.806	Yes	Yes	Yes	Yes
				(0.003)						
Dep. Var. = Cash-to-Asset										
(4)	-0.016*	0.013*			8,700	0.836	Yes	Yes	Yes	Yes
	(0.009)	(0.007)								
(5)			-0.034**		4,928	0.837	Yes	Yes	Yes	Yes
			(0.017)							
(6)				-0.001	7,646	0.801	Yes	Yes	Yes	Yes
				(0.001)						
Dep. Var. = Annualized Stock Volatility										
(7)	3.179***	-4.025***			8,643	0.721	Yes	Yes	Yes	Yes
	(1.115)	(1.520)								
(8)			6.146***		4,895	0.722	Yes	Yes	Yes	Yes
			(2.144)							
(9)				0.315	7,596	0.723	Yes	Yes	Yes	Yes
				(0.341)						

*** p<0.01, ** p<0.05, * p<0.1

Table 8 – Changes in Firm Policies around Exogenous CEO Turnover

This table reports mean changes in industry-adjusted book leverage, cash-to-asset ratio, and stock volatility of firms that experience exogenous CEO turnover events. The sample of exogenous CEO turnovers is from Eisfeldt and Kuhnen (2013). For each turnover event occurring in year *t*, the change in the firm's industry-adjusted variable is calculated by subtracting the average industry-adjusted value of the variable over years [*t*-2,*t*] from the average industry-adjusted value over years [*t*+1,*t*+2]. The first column reports the mean changes around exogenous CEO turnover events where the incoming CEO is *more* risk-tolerant than the old CEO, as measured by their respective early-life disaster experiences. These include turnovers where the CEOs change from "No Fatality" to "Medium Fatality", "Extreme Fatality" to "Medium Fatality", or "Extreme Fatality" to "No Fatality". The second column reports the mean changes around exogenous CEO turnover events where the incoming CEO is *less* risk-tolerant than the old CEO. Column 3 reports the difference in mean changes of corporate policies between the two samples of exogenous CEO turnover events and Column 4 reports the corresponding *t*-statistic for the null hypothesis of no difference in means.

	(1)	(2)	(3)	(4)
	New CEO Risk Tolerance Relative to Old CEO			
	More Risk-Tolerant *(N=28)*	Less Risk-Tolerant *(N=20)*	(1) *minus* (2)	*t*-stat.
ΔIndustry-adjusted Book Leverage	0.0257	-0.0256	0.0513*	1.957
ΔIndustry-adjusted Cash/Assets	0.0001	0.0281*	-0.028	-1.586
ΔIndustry-adjusted Volatility (%)	4.1150**	-3.6636	7.7786**	2.367

Table 9 – One Observation per CEO/Firm

The table reports the results of OLS regressions where the dependent variable is indicated in each panel title. All dependent and independent variables are averaged across all yearly observations for every CEO-firm pair. The main independent variable is indicated in the column titles. All standard controls (from earlier tables) are included, but not shown for brevity. All models include fixed effects for state of CEO's birth and industry (Fama-French 49). Standard errors, clustered at the state of birth level, are reported in parentheses.

	CEO-Disaster Experience							
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# min. disasters)	Obs.	R-sq.	All Contr.	Year, Industry (FF-49) and Birth State FE
Dep. Var. = Book Leverage								
(1)	0.034***	-0.032**			1,724	0.366	Yes	Yes
	(0.011)	(0.014)						
(2)			0.098***		876	0.382	Yes	Yes
			(0.014)					
(3)				0.016***	1,434	0.363	Yes	Yes
				(0.003)				
Dep. Var. = Cash-to-Asset								
(4)	-0.002	0.030***			1,724	0.491	Yes	Yes
	(0.006)	(0.009)						
(5)			-0.054***		879	0.579	Yes	Yes
			(0.010)					
(6)				-0.012***	1,439	0.486	Yes	Yes
				(0.002)				
Dep. Var. = Annualized Stock Volatility								
(7)	3.354***	-1.166**			1,724	0.472	Yes	Yes
	(0.956)	(0.567)						
(8)			1.937*		875	0.461	Yes	Yes
			(1.083)					
(9)				0.821**	1,433	0.490	Yes	Yes
				(0.331)				
Dep. Var. = Acquisition Activity								
(10)	0.030**	-0.055*			1,724	0.170	Yes	Yes
	(0.015)	(0.032)						
(11)			0.086***		812	0.201	Yes	Yes
			(0.032)					
(12)				0.003	1,470	0.168	Yes	Yes
				(0.005)				

*** p<0.01, ** p<0.05, * p<0.1

Table 10 – Isolating the Effect of a Major Disaster between "Treated" and "Control" Birth Counties

This table reports the results of regressions where the dependent variable is indicated in the column title. The main dependent variable is an indicator equal to 1 for the CEOs whose county of birth experienced a major disaster over the time period [t+5, t+15] years after the CEO's birth ("Treatment" group). In the odd numbered columns, the indicator is equal to 0 for those CEOs who were also within the age of 5 to 15 years old in unaffected counties within 100 miles from the major disaster county ("Control" group). The even numbered columns further require that the CEOs in the "Control" group also experienced at least one fatal (minor) disaster at some point during years [t+5, t+15] after birth. All standard controls (from earlier tables) are included, but not shown for brevity. All models also include fixed effects for the states of CEO's birth and years. Standard errors, clustered at the executive level, are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	Book Leverage		Cash/Assets		Annualized Stock Volatility		I(Merger This Year)	
I(Experienced Major Disaster)	-0.042***	-0.049***	0.034***	0.036***	-3.418***	-4.136***	-0.075***	-0.060**
	(0.012)	(0.012)	(0.010)	(0.010)	(0.922)	(0.943)	(0.025)	(0.028)
Observations	7,203	4,886	7,675	5,166	7,632	5,144	7,130	4,744
Adj. R-squared	0.327	0.384	0.470	0.505	0.534	0.536	0.311	0.423
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 11 – Robustness: Two-Points-in-Time Measurement of CEO Early-Life Domiciles

The sample in this table includes only the CEOs where we are able to verify that the state of birth and the state where the first Social Security number was obtained (usually at age 15) is the same. Each row of this table reports regression estimates of models whose dependent variable is indicated in each panel title. OLS estimates are displayed in Rows 1-9 while Probit estimates are displayed in Rows 10-12. The main independent variable is indicated in the column titles. All standard controls (from earlier tables) are included, but not shown for brevity. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses.

	CEO-Disaster Experience							
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# min. disasters)	Obs.	R-sq.	All Contr.	Year, Industry (FF-49) and Birth State FE
Dep. Var. = Book Leverage								
(1)	0.051***	-0.035**			5,760	0.354	Yes	Yes
	(0.013)	(0.018)						
(2)			0.111***		3,234	0.405	Yes	Yes
			(0.015)					
(3)				0.021***	5,041	0.351	Yes	Yes
				(0.004)				
Dep. Var. = Cash-to-Asset								
(4)	-0.014*	0.041***			5,776	0.468	Yes	Yes
	(0.009)	(0.016)						
(5)			-0.066***		3,246	0.563	Yes	Yes
			(0.012)					
(6)				-0.016***	5,055	0.470	Yes	Yes
				(0.003)				
Dep. Var. = Annualized Stock Volatility								
(7)	4.677***	-2.784**			5,742	0.535	Yes	Yes
	(0.857)	(1.218)						
(8)			3.831***		3,224	0.541	Yes	Yes
			(1.257)					
(9)				0.993***	5,024	0.530	Yes	Yes
				(0.303)				
Dep. Var. = Acquisition Activity								
(10)	0.014	-0.102***			5,108	0.142	Yes	Yes
	(0.030)	(0.037)						
(11)			0.123***		2,713	0.110	Yes	Yes
			(0.040)					
(12)				0.019**	5,108	0.128	Yes	Yes
				(0.009)				

*** p<0.01, ** p<0.05, * p<0.1

Table 12 – Robustness: Placebo Test of Random Assignment of CEO Birth County

CEOs are randomly assigned a birth county based on the observed distribution of birth counties in our sample (with replacement). We replicate the regressions in Tables 3-6 with the randomly assigned birth county, record the coefficient and p-value, and repeat the procedure 500 times. Each row of this table reports the average coefficient for the main independent variable over the 500 sample regressions and the percent that are significant at the 5% level in brackets. The dependent variable is indicated in each panel title. The main independent variable is indicated in the column titles. All standard controls (from earlier tables) are included, but not shown for brevity. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors are clustered at the executive level.

	CEO-Disaster Experience					
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# min. disasters)	All Contr.	Year, Industry (FF-49) and Birth State FE
Dep. Var. = Book Leverage						
(1)	-0.013 [4.2%]	0.008 [4.1%]			Yes	Yes
(2)			0.075 [3.9%]		Yes	Yes
(3)				0.001 [5.2%]	Yes	Yes
Dep. Var. = Cash-to-Asset						
(4)	-0.005 [4.5%]	-0.003 [6.5%]			Yes	Yes
(5)			-0.001 [5.3%]		Yes	Yes
(6)				0.003 [5.1%]	Yes	Yes
Dep. Var. = Annualized Stock Volatility						
(7)	-0.865 [6.2%]	0.756 [4.9%]			Yes	Yes
(8)			0.963 [3.3%]		Yes	Yes
(9)				-0.561 [5.5%]	Yes	Yes
Dep. Var. = Acquisition Activity						
(10)	-0.032 [5.6%]	0.112 [4.2%]			Yes	Yes
(11)			0.546 [5.0%]		Yes	Yes
(12)				0.154 [5.9%]	Yes	Yes

Internet Appendix to

“What doesn’t kill you will only make you more risk-loving:

Early-life disasters and CEO behavior”

Abstract

This document provides supplementary material to the paper *What doesn’t kill you will only make you more risk-loving: Early-life disasters and CEO behavior*. In particular, this appendix presents tables that are referenced, but not reported in the paper.

Appendix Table A.1 – Comparison of CEO-disaster sample with full Compustat and ExecuComp sample

This table reports summary statistics for various firm-year variables. Panel A restricts the sample to those observations with available CEO birthplace and birthdate ("CEO-disaster sample"). Panel B reports the same for the full set of Compustat and ExecuComp firms. *M/B* is defined as the market value of equity divided by the book value of equity at fiscal year-end. *Fixed Assets* is the sum of PP&E and investments divided by book assets. *R&D* is set to 0 if the value reported in Compustat is missing. *ROA* is defined as net income divided by lagged book assets. *Stock volatility* is the standard deviation of monthly stock returns during the fiscal year. *Total Compensation* is item TDC2 in ExecuComp, and *Delta* and *Vega* are obtained from Lalitha Naveen's website. Following Malmendier et. al. (2011), *Depression Baby* is an indicator variable equal to 1 for CEOs born between 1920 and 1929, inclusive, and 0 otherwise. The last column reports the *t*-statistic for the difference in means between Panel A and Panel B.

	Panel A *CEO-disaster Sample*			*Panel B* *Full Compustat or ExecuComp Sample*			*t*-stat of Difference (Panel A – Panel B)
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
			Compustat Variables				
Book Assets	9,598	28,342.6	109,534.6	189,889	4,401.3	48,474.1	38.65***
M/B	9,598	1.865	1.475	189,889	1.839	9.047	0.24
Book Leverage	9,598	0.254	0.182	189,889	0.242	0.294	3.37***
Fixed Assets	9,598	0.300	0.245	189,889	0.286	0.249	4.88***
Cash/Assets	9,598	0.112	0.147	189,889	0.148	0.190	-16.38***
I(Dividend Paying)	9,598	0.726	0.446	189,889	0.523	0.499	34.24***
R&D/Assets	9,598	0.089	1.666	189,889	0.212	2.445	-10.06***
ROA	9,598	0.144	0.131	189,889	0.092	0.717	6.26***
Stock Volatility (%)	9,598	35.05	22.72	189,889	0.475	0.290	-36.53***
			Execucomp Variables				
Total Compensation	9,598	7,220.9	19,160.3	26,199	4,727.8	12,743.7	13.11***
Delta	9,598	2,450.5	17,963.6	26,199	1,161.1	10,829.7	7.66***
Vega	9,598	211.8	403.8	26,199	123.7	265.8	22.11***
Age	9,598	56.8	7.0	26,199	55.5	7.4	12.45***
I(Depression Baby)	9,598	0.038	0.19	26,199	0.029	0.168	3.68***

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A.2 – Comparison of CEO and Population Disaster Experience

This table compares the realized disaster experience of CEOs in our sample with the population probabilities. The annual population of each county is used to calculate the fraction of U.S. residents that experienced each type of disaster in a given year. The weighted average of this percentage is calculated over 1900-2010 by weighting each year by the total U.S. population, and reported in Column 1. The cumulative probability of experiencing a disaster over a ten-year period is reported in Column 2, and the realized incidence of experiencing a disaster for the CEOs in our sample is reported in Column 3. Column 4 reports the results of a two-sided *z*-test for differences in proportions between Column 3 and Column 4. For example, across the U.S. over 1900-2010, in a given year, 21.09% of the population experienced at least one disaster in our database (Column 1). Over a typical ten year period, the probability of not experiencing any disaster is 9.3% ($(1-21.09\%)^{10}$) which implies that the probability of experiencing a disaster over the ten year period is 90.63% (Column 2). 80.20% of CEOs in our sample experienced at least one disaster over years *[t+5,t+15]* after birth (Column 3), which is significantly different from the population proportion in Column 2, as the *z*-score of the difference is -14.80 (Column 4).

	(1)	(2)	(3)	(4)
Disaster Type	Population Annual Probability of Experiencing at least one Disaster	Population 10-Year Probability of Experiencing at least one Disaster	CEO 10-Year Realized Incidence of Experiencing at least one Disaster	*z*-test of Difference (3)-(2)
Any Disaster	21.09%	90.63%	80.20%	-14.80***
Fatal	10.73%	67.86%	66.80%	-0.94
Minor	8.51%	58.90%	51.79%	-5.98***
Major	3.60%	30.69%	32.73%	1.83*

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A.3 – Effect of a Continuous Measure of CEO Disaster Experience on Firm Policies

This table reports regression estimates where the dependent variable is indicated in the column title and fixed effects are employed for state of CEO's birth, industry (Fama French 49) and year. The model intercept is included but not displayed for brevity. Standard errors, clustered at the executive level, reported in parentheses.

	(1)	(2)	(3)	(4)
Dependent Variable:	Book Leverage	Cash/Assets	Volatility	I(Announced Acquisition)
Fatalities from Disasters/County Population	0.335***	-0.182***	8.276**	0.930***
	(0.054)	(0.029)	(3.667)	(0.352)
(Fatalities from Disasters/County Population)^2	-0.377***	0.222***	-12.692***	-1.531***
	(0.065)	(0.034)	(4.132)	(0.394)
Average Fatality Risk of County 1900-2010	0.650	0.735	84.961	29.620
	(2.911)	(1.288)	(112.784)	(22.379)
I(Depression Baby)	-0.029	-0.006	-1.331	0.147
	(0.021)	(0.016)	(1.431)	(0.155)
Ln(Book Assets)	0.022***	-0.015***	-3.257***	0.138***
	(0.003)	(0.002)	(0.253)	(0.022)
Market-to-Book	-0.015***	0.028***	0.242	-0.007
	(0.003)	(0.003)	(0.246)	(0.022)
Book Leverage			11.454***	-0.064
			(2.256)	(0.168)
Fixed Assets/Book Assets	0.140***	-0.152***	0.998	
	(0.026)	(0.019)	(2.030)	
Cash/Assets			19.047***	
			(2.810)	
Dividend Paying	-0.035***	-0.030***	-8.368***	-3.500**
	(0.010)	(0.007)	(0.883)	(1.406)
ROA	-0.200***	-0.008	-30.638***	
	(0.041)	(0.035)	(4.233)	
Sales Growth	-0.006	0.001	0.828	0.087***
	(0.006)	(0.003)	(0.659)	(0.031)
CEO Age	-0.002	-0.008**	0.221	0.132***
	(0.006)	(0.003)	(0.434)	(0.042)
CEO Age^2	0.000	0.000**	-0.002	-0.001***
	(0.000)	(0.000)	(0.004)	(0.000)
CEO is Female	0.013	0.021	1.667	-0.114
	(0.029)	(0.018)	(2.171)	(0.179)
I(Net Income < 0)				-0.205***
				(0.060)
Free Cash Flow				0.341*
				(0.201)
CAPX/Assets				0.000
				(0.000)
Year, Industry (FF49), and State of Birth FE	Yes	Yes	Yes	Yes
Observations	8,659	8,685	8,636	7,675
Adjusted R-squared	0.337	0.467	0.535	0.153

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A.4 - Effect of CEO Early-Life Disaster Experience over Years [Birth+5, Birth+10]

Each row of this table reports regression estimates of models whose dependent variable is indicated in each panel title. OLS estimates are displayed in Rows 1-9 while Probit estimates are displayed in Rows 10-12. The main independent variable is indicated in the column titles. CEO disaster experience is measured over a 5-year window for years *[t+5,t+10]* after birth. All standard controls (from earlier tables) are included, but not shown for brevity. All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses.

	CEO-Disaster Experience over Years [Birth+5, Birth+10]							
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# minor disasters)	Obs.	R-sq.	All Contr.	Year, Industry (FF-49) and Birth State FE
	Dep. Var. = Book Leverage							
(1)	0.042***	-0.043***			8,659	0.338	Yes	Yes
	(0.010)	(0.013)						
(2)			0.093***		4,668	0.383	Yes	Yes
			(0.013)					
(3)				0.002***	7,378	0.308	Yes	Yes
				(0.000)				
	Dep. Var. = Cash-to-Asset							
(4)	-0.013**	0.046***			8,685	0.470	Yes	Yes
	(0.006)	(0.011)						
(5)			-0.057***		4,685	0.523	Yes	Yes
			(0.009)					
(6)				-0.002***	7,397	0.476	Yes	Yes
				(0.000)				
	Dep. Var. = Annualized Stock Volatility							
(7)	1.771***	-2.043**			8,636	0.536	Yes	Yes
	(0.673)	(1.040)						
(8)			2.577**		4,659	0.541	Yes	Yes
			(1.062)					
(9)				-0.010	7,357	0.542	Yes	Yes
				(0.026)				
	Dep. Var. = Acquisition Activity							
(10)	0.012	-0.058*			7,675	0.135	Yes	Yes
	(0.023)	(0.030)						
(11)			0.111***		4,003	0.165	Yes	Yes
			(0.031)					
(12)				0.000	6,539	0.125	Yes	Yes
				(0.001)				

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A.5 - Effect of CEO Early-Life Disaster Experience Controlling for CEO Overconfidence

Each row of this table reports regression estimates of models whose dependent variable is indicated in each panel title. OLS estimates are displayed in Rows 1-9 while Probit estimates are displayed in Rows 10-12. The main independent variable is indicated in the column titles. All standard controls (from earlier tables) are included, but not shown for brevity. An additional control for CEO overconfidence is included and displayed (Holder67), as defined in Malmendier, et. al. (2011). All models include fixed effects for state of CEO's birth, industry (Fama French 49) and year. Standard errors, clustered at the executive level, reported in parentheses.

	CEO-Disaster Experience				CEO Overconfidence				
	I(Medium Fatality)	I(Extreme Fatality)	I(Blasé)	Ln(# minor disasters)	Holder67	Obs.	R-sq.	All Contr.	Year, Industry (FF-49) and Birth State FE
	Dep. Var. = Book Leverage								
(1)	0.022**	-0.033**			0.013*	8,166	0.329	Yes	Yes
	(0.010)	(0.015)			(0.008)				
(2)			0.083***		-0.012	4,406	0.386	Yes	Yes
			(0.014)		(0.011)				
(3)				0.001***	0.018**	7,205	0.325	Yes	Yes
				(0.000)	(0.008)				
	Dep. Var. = Cash-to-Asset								
(4)	-0.004	0.030**			-0.006	8,189	0.466	Yes	Yes
	(0.007)	(0.012)			(0.005)				
(5)			-0.052***		-0.008	4,422	0.518	Yes	Yes
			(0.009)		(0.006)				
(6)				-0.002***	-0.007	7,224	0.480	Yes	Yes
				(0.000)	(0.005)				
	Dep. Var. = Annualized Stock Volatility								
(7)	1.510**	-2.892***			0.594	8,145	0.541	Yes	Yes
	(0.689)	(1.076)			(0.598)				
(8)			2.593**		0.498	4,397	0.540	Yes	Yes
			(1.071)		(0.873)				
(9)				-0.003	0.489	7,185	0.541	Yes	Yes
				(0.027)	(0.633)				
	Dep. Var. = Acquisition Activity								
(10)	0.024**	-0.083**			0.037**	7,211	0.132	Yes	Yes
	(0.012)	(0.032)			(0.018)				
(11)			0.122***		0.025	3,751	0.155	Yes	Yes
			(0.033)		(0.026)				
(12)				0.001	0.043**	6,369	0.142	Yes	Yes
				(0.001)	(0.019)				

*** p<0.01, ** p<0.05, * p<0.1