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What Doesn't Kill You Will Only Make You More Risk-Loving: Early-Life Disasters and CEO Behavior

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ABSTRACT

The literature on managerial style posits a linear relation between a chief executive officer's (CEOs) past experiences and firm risk. We show that there is a nonmonotonic relation between the intensity of CEOs' early-life exposure to fatal disasters and corporate risk-taking. CEOs who experience fatal disasters without extremely negative consequences lead firms that behave more aggressively, whereas CEOs who witness the extreme downside of disasters behave more conservatively. These patterns manifest across various corporate policies including leverage, cash holdings, and acquisition activity. Ultimately, the link between CEOs' disaster experience and corporate policies has real economic consequences on firm riskiness and cost of capital.

"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

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PRIOR RESEARCH SHOWS THAT CHIEF executive officers' (CEO) managerial styles explain a large part 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)). Prior work further shows that at least part of the heterogeneity in CEOs' managerial styles reflects variation in individual life and career experiences (e.g., Graham and Narasimhan (2005), Malmendier and Tate (2005), Malmendier, Tate, and Yan (2011), Schoar and Zuo (2011), Benmelech and Frydman (2014), Lin et al. (2014), Dittmar and Duchin (2016)).

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

Early-life exposure to natural disasters 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 in turn be more wary of decisions that increase firm risk. However, it is also possible that childhood exposure to natural disasters may increase CEOs' ability to deal with risky situations as well as their confidence when making decisions involving firm risk. Hence, the effect of exposure to natural disasters on subsequent behavior may be nonmonotonic, as Castillo and Carter (2011) find with respect to trust and reciprocity between individuals. CEOs with disaster experience that does not involve significant fatalities may develop a higher risk tolerance, whereas those with exposure to major fatal disasters may behave more conservatively.[1]

To test this conjecture, we examine the relation between CEO early-life exposure to natural disasters and firms' subsequent corporate financial and investment policies. We begin by identifying the name, date, and place of birth of 1,508 U.S.-born CEOs in a sample of S&P1500 firms from 1992 to 2012. Next, we assemble a unique database of U.S. county-level natural disaster events over the period from 1900 to 2010, including earthquakes, volcanic eruptions, tsunamis, hurricanes, tornadoes, severe storms, floods, landslides, and wildfires. We then combine the two databases to infer CEOs' likely exposure to the consequences of natural disasters during their formative years, which we define to be the ages of 5 to 15 (Nelson (1993)).

[1] Apple Inc. CEOs Tim Cook and Steve Jobs are examples of CEOs with widely differing childhood disaster experiences when growing up: Tim Cook, born in Mobile, Alabama in 1960, witnessed 1.15 deaths across 57 natural disaster events between the ages of 5 and 15, while Steve Jobs, born in San Francisco, California in 1955, witnessed 31.6 deaths across 39 natural disasters during the early years of his life.

In our baseline tests, we group CEOs based on the number of disaster-related fatalities in their birth county scaled by the population of their birth county during the formative years of their childhood. We then examine the relation between CEO early-life disaster experience and several firm decisions and outcomes pertaining to capital structure, acquisition activity, and return volatility.

Our results provide a consistent picture across the firm decisions and outcomes on which CEOs typically have a large influence (e.g., Graham, Harvey, and Puri (2012, 2013)). Specifically, we find robust evidence of an inverse U-shaped relation between a CEO's early-life exposure to fatal disasters and corporate risk-taking. For example, all else equal, firms whose CEOs experienced a *moderate* level of fatalities from natural disasters have a 3.4% *higher* leverage ratio than firms whose CEOs experienced no fatal disasters, a magnitude comparable to the Depression babies effect documented in Malmendier and Nagel (2011). In contrast, firms whose CEOs experienced *extreme* levels of fatalities from natural disasters have a 3.7% *lower* leverage ratio than firms whose CEOs have no fatal disaster experience (and hence an overall 7.1% lower leverage ratio than firms whose CEOs have a moderate level of fatal disaster experience). These results are due to active financing choices made by the CEOs. Specifically, CEOs with moderate levels of fatal disaster experience are significantly more likely to meet net financing deficits with debt rather than equity, to pay higher interest expenses and loan spreads on their debt, and to have lower credit ratings than CEOs with no fatal disaster experience. Their firms are also significantly more likely to go through bankruptcy. In contrast, CEOs with extreme levels of fatal disaster experience display the opposite patterns.

Similarly, CEOs with moderate (extreme) levels of fatal disaster experience hold significantly less (more) cash, announce more (fewer) acquisitions, are less (more) likely to pay for acquisitions with stock, and are more (less) likely to announce unrelated acquisitions than CEOs with no fatal disaster experience. Consistent with excessive risk-taking, acquisitions by CEOs with moderate fatal disaster experience earn worse announcement returns. Firms managed by moderate disaster CEOs also display higher volatility, especially idiosyncratic volatility, than CEOs with no disaster experience, while CEOs with extreme disaster experience again display the opposite patterns.

Overall, our results support the view that experiencing fatal disasters without extreme consequences desensitizes CEOs to the negative consequences of risk. In contrast, CEOs who experienced extreme fatal disasters and witnessed the downside potential of risky situations appear to be more cautious in approaching risk when at the helm of a firm.

All of our empirical specifications include time, state of birth, year of birth, and firm fixed effects, which effectively purge cohort effects from our analysis. Moreover, all of our tests control for the historical incidence of disaster-related fatalities in the CEO's county of birth over the period 1900 to 2010 to help us separate the effect of a CEO growing up in a "high-risk" county from actually having lived through a fatal disaster during his 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.[2] For the same reason, we conduct a difference-in-difference analysis on CEOs that experienced major fatal disasters in their formative years relative to CEOs in *unaffected* neighboring counties (within 100 miles from the disaster) who did not experience any major disaster between the ages of 5 to 15. The results from these tests are consistent with our baseline evidence.

A potential concern with our empirical design is that we do not directly observe a CEO's disaster experience, but rather infer it based on the CEO's county and year of birth. It is possible, for example, that the CEO did not live in her county of birth throughout her formative years. 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, for example, years 5 to 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 (SSN)—typically in their teenage years according to Yonker (2012).[3] 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 may not directly observe each CEO's disaster experience, whatever measurement error exists is most likely random noise.

Finally, we conduct a difference-in-difference analysis on a small set of exogenously timed CEO turnover events in our sample where the risk tolerances of the incoming and outgoing CEOs are different. We find that changes in corporate policies around these turnover events reflect differences in the new and old CEOs' risk tolerances as measured by our proxy for childhood disaster experience. This evidence suggests that CEOs' risk preferences may have a causal impact on corporate policies, or at the very least are a determining factor in CEO hiring decisions by boards that aim for swift changes in their firms' risk profiles.

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's license (Cain and McKeon (2016)), political affiliation (Hutton, Jiang, and Kumar (2014)), military experience (Malmendier, Tate, and Yan (2011)), and past career experiences (Schoar and Zuo (2011)). To various degrees, the experiences 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 setting is that early-life exposure to fatal disasters provides a reasonably exogenous source of variation in an individual's life. In this sense, an important contribution of our analysis is that it

[2] This is consistent with accounts 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.

[3] 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.

identifies an exogenous primitive in an individual's life that determines rather than manifests his or her attitude toward risk.

Since we infer CEO early-life experiences based on date and county of birth, our approach is closer to the cohort-based studies that examine the effect of early-life experiences, for example, having lived through the U.S. Great Depression (Malmendier, Tate, and Yan (2011)). However, an important advantage of our setting is that we are able to exploit within-cohort heterogeneity to purge our tests of cohort effects and enhance the identification of early-life experiences on corporate outcomes. In addition, given the nature of our measure, we are able to examine how the *intensity* of early-life experiences affects subsequent risk-taking behavior and provide novel evidence that exogenous *noneconomic* events shape CEOs' attitudes toward *economic* risk.

It is noteworthy that the CEOs in our sample have roughly the same likelihood of experiencing a fatal disaster during their childhood as a typical member of the U.S. population. Thus, the likelihood of becoming a CEO seems to be independent of fatal disaster experience, which suggests that our results may have broader implications beyond CEO risk-taking. In that regard, our results may be important for research on the effects of life experiences on capital market participants' behavior (e.g., Guiso, Sapienza, and Zingales (2013), Kim and Lee (2014), Knüpfer, Rantapuska, and Sarvimäki (2016)). Existing studies focus on the linear relation between risk exposure and investor behavior. Our results suggest that examining nonmonotonic effects of exposure to risks could be fruitful in the context of investor behavior.

The rest of the paper proceeds as follows. Section I develops our motivation. Section II describes the data. Section III discusses our main results and Section IV presents results of various robustness tests. Section V concludes.

I. Motivation

Managers' ability to assess and cope with risk has pervasive effects on corporate decision-making (Ben-David, Graham, and Harvey (2007)), and CEOs are arguably among the most influential corporate decision-makers (Graham, Harvey, and Puri (2012, 2013)). Indeed, CEO fixed effects explain variation in corporate policies that traditional firm-level determinants cannot explain (e.g., Bertrand and Schoar (2003), Bamber, Jiang, and Wang (2010), Graham, Li, and Qiu (2012)). There is a growing consensus that CEOs' past experiences in life account for much of the variation in corporate risk-taking (e.g., Bertrand and Schoar (2003), Graham and Narasimhan (2005), Bamber, Jiang, and Wang (2010), Malmendier, Tate, and Yan (2011), Schoar and Zuo (2011), Dittmar and Duchin (2016)).[4] A unifying thread in this literature is the notion that exposure

[4] 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 (2016) find that CEOs who are licensed small aircraft pilots have a larger appetite for risk in the form of higher financial leverage, stock

to a particular life experience has a unidirectional effect on a CEO's risk-taking propensity and hence on corporate policies.

In the psychology literature, however, Yerkes and Dodson (1908) posit a nonmonotonic relation between arousal and performance: performance should increase with arousal up to a point and then decrease when levels of arousal are too high. The empirical evidence in various contexts is consistent with such a nonlinear relation between stress and performance (e.g., Hammarberg and Silver (1994) , Colville and Cream (2009), Kleim and Ehlers (2009)). Importantly for our purposes, traumatic experiences predict high stress levels long after the events (Holman and Silver (1998)), with exposure to natural disasters in particular shown to have large and lasting effects on individuals (Elder (1999)). Closer to our focus, prior evidence also shows that natural disaster exposure affects the short-run financial decision of both individuals (e.g., Cameron and Shah (2013), Cassar, Healy, and von Kessler (2011)) and firms (e.g., Ramirez and Altay (2011), Dessaint and Matray (2014)), and that natural disaster experiences have long-lasting effects on investor portfolio decisions (Bucciol and Zarri (2013)).

Recent medical research suggests a possible mechanism underlying these patterns. Neuroscience and epigenetics studies indicate that adverse experiences affect subsequent behavior at least in part through permanent physiological and biological changes in the brain (e.g., Lyoo et al. (2011), Labonté et al. (2012), Mehta et al. (2013)). Evolutionary biologists further 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 noneconomic risk may be subsequently co-opted to deal with economic risk.[5] It thus seems reasonable that early-life experiences associated with fatal disasters could have long-term effects on an individual's psyche, neurobiology, and economic decision-making.[6]

II. Data Description

A. *CEOs' 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 retrieve CEO biographical data from *Marquis Who's Who*, Standard and Poor's *Register of Directors and Executives*, and U.S. Executive Compensation database via Lexis-Nexis, NNDB.com, or Google searches in the last instance. We are able to obtain

volatility, and propensity to engage in risky acquisitions. Roussanov and Savor (2013) find that unmarried CEOs also display larger propensities to take on risk.

[5] 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.

[6] Cronqvist et al. (2014) find that even *prenatal* environmental factors such as testosterone exposure explain heterogeneity in risk-taking later in life.

reliable place and date of birth information for 2,102 CEOs of the 6,804 CEOs in the initial database. After excluding foreign-born CEOs, those for whom we cannot determine the county of birth, and those with missing firm-level data, we are left with a sample of 1,508 U.S.-born CEOs of firms in the S&P1500 from 1992 to 2012. Over this period, the sample CEOs span 8,533 firm-year observations for which we are able to obtain the data required to conduct the baseline tests pertaining to firms' capital structure, acquisitiveness, and stock volatility.

B. 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 fires. 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 1900 to 2010 period. 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 1960 to 2010 period.[7] This is a county-level database that includes beginning date, U.S. county location, property losses, crop losses, injuries, and fatalities associated with various natural hazard events. 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 1900 to 1959 period. Details on our data sources are provided in the Appendix.

Panel A of Table I provides summary statistics for the natural disasters in our sample. Most events in our sample are weather-related (e.g., floods, thunderstorms, hail, etc.) and tend to be inconsequential in terms of human injuries and economic damages. In contrast, less frequent events such as earthquakes, fires, and hurricanes tend to have the direst consequences, both in terms of fatalities and economic damages.[8]

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

[8] The collection of disaster data for the pre-1960 period may suffer from an inherent coverage bias toward the most consequential events. To assess the extent of this bias, in Table IA.II of the Internet Appendix available in the online version of the article on the *Journal of Finance* website, we report summary statistics of the county-disaster events for the pre- and post-1960 subsamples. While the number of all events and the number of fatal events are lower in the pre-1960 than in the post-1960 period, the mean number of fatalities is considerably larger in the earlier period, supporting the idea that our pre-1960 data coverage is biased towards larger events. Therefore, in Tables IA.III and IA.IV of the Internet Appendix, we repeat our main empirical tests to assess the robustness of our results to this potential bias in coverage across subperiods. Overall, our main inferences are largely unaffected by the potential coverage bias.

Table I

County-Level Natural Disaster Characteristics

Panel A reports summary statistics for our sample of natural disasters in the United States over the 1900 to 2010 period. Panel B summarizes time-invariant characteristics related to CEO early-life disaster experience. *Extreme Fatality Experience* is an indicator variable equal to one for CEOs who are in the top decile for the number of disaster-related fatalities per capita experienced in their birth county, and zero otherwise. *Medium Fatality Experience* is an indicator variable equal to one for CEOs who experienced some disaster-related fatalities in their birth county but are not in the *Extreme Fatality Experience* group, and zero otherwise. *No Fatality Experience* is an indicator variable equal to one for CEOs who experienced no disaster-related fatalities in their birth-county, and zero otherwise. 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's birth, inclusive. *Average Fatality Risk of County 1900 to 2010* is equal to the average annual fatalities from natural disasters scaled by the county population over the 1900 to 2010 period for the CEO's birth county. Following Malmendier, Tate, and Yan (2011), Panel C reports the top 10 birth states across all the CEOs and their distribution into the three disaster experience categories. For example, 251 CEOs are born in New York; 11.16% of the 251 CEOs born in New York did not experience any fatal disasters during the ages of 5 to 15 and are categorized in the *No Fatality* group. Panel D reports the top 10 birth states for CEOs in the *No Fatality*, *Medium Fatality*, or *Extreme Fatality* groups, and the number of CEOs from that state that belong to that disaster experience group. For example, New York is the modal birth state for CEOs in the *No Fatality* group; 69 CEOs in the *No Fatality* group were born in New York.

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

Disaster Type	*N*	Mean No. of Fatalities	Mean Fatalities per Capita	Mean Economic Damage (2009$, Mil.)
Earthquake	806	4.7455	0.0605	87.677
Hurricane	9,665	2.4280	0.0482	17.376
Severe Weather	237,930	0.0581	0.0004	0.400
Urban Fire	2,466	6.0815	0.0164	10.295
Volcano	9	0.5556	0.1370	17.742
Weather	404,837	0.0490	0.0003	0.505
Wild Fire	2,206	0.0633	0.0002	7.949
All	657,919	0. 115	0.001	0.884

Panel B: Time-Invariant Disaster-Related CEO Characteristics

CEO-Specific Variables	*N*	Mean	Std. Dev.
No Fatality Experience	1,508	0.332	0.471
Medium Fatality Experience	1,508	0.558	0.497
Extreme Fatality Experience	1,508	0.110	0.314
No. of Disasters Experienced	1,508	25.867	41.86
No. of Fatal Disasters Experienced	1,508	3.906	5.408
Total Fatalities Experienced	1,508	15.708	38.515
Fatalities per Capita (%)	1,508	0.027	0.037
Economic Damage Experienced ($M)	1,508	0.216	1.881
Economic Damage per Square Mile ($M)	1,508	0.012	0.591
Average Fatality Risk of County 1900 to 2010	1,508	0.032	0.211
Average Econ. Damage Risk of County 1900 to 2010	1,508	0.301	1.229

(*Continued*)

Table I—*Continued*

Panel C: Top 10 CEO Birth States and Disaster Experience

Top 10 Birth States for All CEOs	No. of CEOs	%No Fatality CEOs	%Medium Fatality CEOs	%Extreme Fatality CEOs
New York	251	27.49%	61.35%	11.16%
Illinois	116	33.62%	55.17%	11.21%
Pennsylvania	110	20.91%	59.09%	20.00%
Ohio	84	26.19%	65.48%	8.33%
California	71	25.35%	64.79%	9.86%
Massachusetts	69	30.43%	57.97%	11.59%
New Jersey	64	37.50%	53.13%	9.38%
Texas	60	38.33%	55.00%	6.67%
Missouri	43	30.23%	48.84%	20.93%
Iowa	41	17.07%	68.29%	14.63%

Panel D: Top 10 CEO Birth States by Disaster Experience Categories

No Fatality CEOs		Medium Fatality CEOs		Extreme Fatality CEOs	
Top 10 Birth States	No. of CEOs	Top 10 Birth States	No. of CEOs	Top 10 Birth States	No. of CEOs
New York	69	New York	154	New York	28
Illinois	39	Pennsylvania	65	Pennsylvania	22
New Jersey	24	Illinois	64	Illinois	13
Pennsylvania	23	Ohio	55	Missouri	9
Texas	23	California	46	Massachusetts	8
Ohio	22	Massachusetts	40	California	7
Massachusetts	21	New Jersey	34	Ohio	7
California	18	Texas	33	Kentucky	7
Missouri	13	Iowa	28	Washington	6
Mississippi	12	Indiana	28	New Jersey	6

C. CEO Early-Life Disaster Experience

We measure early-life disaster experience based on the severity of the disasters in the CEO's county of birth starting 5 years and ending 15 years after the CEO's year of birth. We focus on this period because medical 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, for example, $[t+5, t+10]$.

Using the county-disaster event database, for each county-year we calculate the total number of fatalities from natural disasters and divide this figure by the population of the given county-year. We then calculate the mean of this variable for each CEO-county over the relevant 10-year period after the CEO birth.

Our main measure of a 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.

We employ several other measures of early-life disaster experience to ensure that our results are not sensitive to the choice of measure. First, we alternatively measure disaster experience using inflation-adjusted economic damages (crop and property damage) in the CEO's birth county over the relevant 10-year period. In addition, instead of defining *Extreme Fatality* as the top 10% of the fatality experience distribution, we alternatively define it as the top 15% or the top 5% of the distribution. Lastly, we employ a continuous measure of fatalities from natural disasters per capita instead of indicators for the three categories based on this measure. Our results are consistent across all these alternative measures, as discussed in Section IV.

Panel C of Table I reports the top 10 birth states of CEOs in our sample and the distribution of the disaster experience of CEOs from those states. The modal birth state is New York, which accounts for 251 CEOs in our sample. Of these, 27.49% did not experience any fatal disasters in their birth county between the ages of 5 and 15, 11.16% experienced extreme levels of fatal disasters, while the remaining 61.35% fall in to the *Medium Fatality* group. Although the distribution of CEO birth states is not uniform, there is considerable variation in the disaster experiences of CEOs from the same birth state.

In Table II, we compare the disaster experience of our sample CEOs' to that of the U.S. population. Using the historical annual population and disaster experience of each county, in a given year 21.09% of the population experienced at least one disaster in our database, 10.7% experienced at least one fatal disaster, 1.2% experienced a disaster with major fatalities, and 1.1% experienced a disaster with major economic damages.[9] Compared to a typical 10-year period, our sample CEOs are just as likely to experience at least one fatal disaster, a disaster with major fatalities, and a disaster with major economic damages during the relevant 10 years of their childhood as is the U.S. population—66.80% versus 67.86%, 11.73% versus 10.22%, and 10.56% versus 10.87%, respectively.

That CEOs in our sample are roughly as likely to experience disasters with a fatality or with major fatalities or economic damages as a typical member of the U.S. population is potentially important. In particular, if disaster experience does not materially affect the likelihood of becoming a CEO, our inferences about the effects of early-life fatal disaster experience on risk-taking may apply beyond the narrow context of individuals who later become CEOs of publicly traded firms. A natural question that would then arise is why would the effect of disaster experiences manifest when choosing policies like corporate leverage but not careers? However, while exposure to natural disaster risk may indeed

[9] We define a disaster with "major fatalities" as one with at least five fatalities and the number of fatalities scaled by the county population greater than 0.05%, and a disaster with "major economic damage" as one with at least $1 million of property and crop damage (inflation-adjusted). Alternative choices of cutoffs do not significantly alter our results.

Table II

Comparison of CEO and U.S. Population Disaster Experience

This table compares the 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. Column (1) reports the fraction of U.S. residents that experienced each type of disaster in a typical year, where each year is weighted by the total U.S. population. Column (2) reports the cumulative probability of disaster experience for the typical member of the U.S. population over a 10-year period. Column (3) reports the incidence of disasters during the relevant 10 years of our sample CEOs' early life. Column (4) reports the results of a two-sided z-test for differences in proportions reported in Columns 2 and 3. For example, across the U.S. over the 1900 to 2010 period, in a given year 21.09% of the population experienced at least one disaster in our database (Column (1)). Over a typical 10-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 10-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)). A disaster with "major fatalities" is one with at least five fatalities and the number of fatalities scaled by the county population greater than 0.05%. A disaster with "major economic damage" is one with at least $1 million of property and crop damage (inflation-adjusted). ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

Disaster Type	Population Annual Probability of Experiencing at Least One Disaster (1)	Population 10-Year Probability of Experiencing at Least One Disaster (2)	CEO 10-Year Realized Incidence of Experiencing at Least One Disaster (3)	z-Test of Difference (3)−(2) (4)
Any Disaster	21.09%	90.63%	80.20%	–14.80***
With Fatalities	10.73%	67.86%	66.80%	–0.94
With Major Fatalities	1.24%	11.73%	10.22%	–0.61
With Major Econ Damages	1.11%	10.56%	10.87%	0.14

affect career choices, becoming a CEO is not quite a choice variable and thus investigating this link is beyond the scope of our paper given that our analysis is in-sample (i.e., focuses on a sample of executives that do become CEOs).

D. Firm Characteristics

Table III reports summary statistics for the main firm characteristics used in our analysis. The first two columns report the mean and standard deviation of those characteristics for the full sample, while the remaining columns report similar statistics for the subsamples segmented by CEO disaster experience. We do not discuss these statistics here because, as noted below, the lack of controls for cohort effects means that we are unable to draw meaningful comparisons from these statistics.

Since we are not able to locate the birthplace of all CEOs in Execucomp, we also assess the differences between CEOs and firms in our sample and CEOs and firms in the Execucomp and Compustat universes (see Table IA.I in the

Table III

Time-Varying Firm Characteristics

This table reports summary statistics for various firm-year characteristics. The first two columns include all firm-years in the sample, while in the remaining columns the sample is restricted to firm-years with CEOs in the groups with *No Fatality*, *Medium Fatality*, or *Extreme Fatality* disaster experience, respectively. *Market-to-Book Ratio* is the market value of equity divided by the book value of equity at the fiscal year-end. *Book Leverage* is the sum of long-term debt and current liabilities divided by book assets. *Cash-to-Assets* is the ratio of cash and marketable securities divided by book assets. *I(Dividend Paying)* is an indicator variable equal to one if the firm pays dividends during the year, and zero otherwise. *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, and *Idiosyncratic Volatility* and *Systematic Volatility* are calculated using a CAPM market model. *CEO Age* is the age of the firm's CEO as of the fiscal year-end. *Announced Acquisition* is an indicator variable equal to one if the firm announced a merger or acquisition in the current fiscal year. *Bankrupt Next Year* is an indicator equal to one if the firm files for Chapter 7 or Chapter 11 bankruptcy in the next year (obtained from the UCLA-LoPucki Bankruptcy Research Database), and zero otherwise.

	All Observations ($N = 8{,}533$)		No Fatality ($N = 2{,}836$)		Medium Fatality ($N = 4{,}864$)		Extreme Fatality ($N = 833$)	
Sample	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Book Assets ($M)	30,863	119,903	18,148	57,533	36,787	141,925	39,562	132,615
Market-to-Book ratio	1.84	1.41	1.81	1.24	1.86	1.52	1.88	1.30
Book Leverage	0.25	0.18	0.26	0.18	0.26	0.19	0.24	0.18
Cash-to-Assets	0.11	0.14	0.11	0.14	0.11	0.14	0.13	0.17
I(Dividend Paying)	0.73	0.45	0.73	0.44	0.72	0.45	0.76	0.43
ROA	0.05	0.13	0.05	0.11	0.05	0.13	0.06	0.19
Stock Volatility (%)	38.60	22.09	38.44	20.83	39.01	23.15	36.81	19.67
Idiosyncratic Volatility (%)	34.47	20.72	34.67	19.96	34.76	21.52	32.11	18.26
CEO Age	56.85	7.01	56.96	6.91	56.83	7.15	56.59	6.49
I(Announced Acquisition)	0.42	0.49	0.42	0.49	0.43	0.50	0.33	0.47
I(Bankrupt Next Year)	0.01	0.07	0.01	0.06	0.01	0.08	<0.01	0.03
Interest Expense/Debt	0.08	0.07	0.08	0.06	0.08	0.07	0.07	0.06

Internet Appendix).[10] Compared to the typical Compustat firm, the average firm in our sample is significantly larger (about seven 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 public sources documenting their biography and birth place. There is thus an inherent bias in our data collection leading to some CEOs being omitted. We do not take a formal stance on the extent to which our results may generalize to CEOs not in our sample. However, we see no obvious reason why these differences should imply that our inferences regarding the effects of CEOs' early-life exposure to natural disasters would be biased *within the sample* that we do obtain.

III. Main Results

In this section, we examine the relation between CEOs' attitude toward risk, as captured by early-life natural disaster experiences, and various firm decisions and outcomes pertaining to firm capital structure, acquisitiveness, and stock volatility. Various papers in this area focus on cohort effects, most prominently for the cohort affected early in life by the Great Depression (e.g., Malmendier and Nagel (2011), Malmendier, Tate, and Yan (2011)). In contrast, our approach is not specific to a single cohort. In particular, in all of our empirical models, we include firm, year, CEO birth year, and CEO state of birth fixed effects. Including these four types of fixed effects enables us to effectively wash out all cohort effects. To illustrate why it is important to purge cohort effects, consider two examples. First, at a particular point in time, a CEO growing up in Florida may experience a major hurricane while another CEO of the same age growing up in California does not. But people born in Florida may be culturally more or less risk averse on average than people born in California, and we would not want these differences to contaminate our estimates. Similarly, a CEO who experienced Hurricane Andrew in Florida might not be comparable to a CEO born in Florida 10 years earlier. Here the idea is that, within a state, as populations ebb and flow and economic conditions change, time-varying differences in state-level characteristics have the potential to affect our inferences. By controlling for the four types of fixed effects listed above, our tests only exploit within-cohort heterogeneity across CEOs. It is worth noting, however, that our results are robust to excluding one or more of these fixed effects.

To absorb the effect of certain counties being more disaster prone, all tests also control for the nonlinear effect of the expected disaster fatality rate in the CEOs' birth counties over the 1900 to 2010 period. As a result, a CEO's residual

[10] The Internet Appendix is available in the online version of this article on the *Journal of Finance* website.

disaster experience during a particular 10-year period should effectively be random.[11]

Since we model the effect of CEO disaster experience using a nonlinear specification, we also allow for the relation between each dependent variable and the birth county average fatality rate to be nonlinear by including its square in all baseline specifications. In a similar spirit, in alternative specifications we augment the baseline model specifications to ensure that our treatment effects are not capturing unmodeled nonlinearities between the dependent variables and any other control variable.

The standard set of controls across all tests includes the natural log of book assets, the market-to-book ratio, asset tangibility (fixed assets/book assets), a dividend paying indicator, ROA, sales growth, CEO age and age squared, and a female CEO indicator.

A. CEO Early-Life Disaster Experience and Corporate Financial Policies

Table IV reports estimates from OLS regressions where the dependent variables are year-end book financial leverage (Columns (1) to (3)) and the cash-to-asset ratio (Columns (4) to (6)) of the firms in the sample. Across policies and model specifications, the evidence consistently indicates that there is a nonmonotonic relation between CEO experiences with fatal disasters during childhood and corporate risk-taking. Simply put, compared to CEOs with no disaster experience, moderate disaster fatality experience is associated with riskier corporate policies, while extreme disaster fatality experience is associated with less risky policies.

Specifically, the evidence in Column (1) shows that there is an inverse U-shaped relation between fatal disaster experience and firm financial leverage. All else equal, firms whose CEOs experienced a moderate level of fatalities from natural disasters have 3.3% *higher* leverage than firms whose CEOs have no fatal disaster experience. In contrast, firms whose CEOs experienced an extreme level of fatalities from disasters have 3.5% *lower* leverage than firms whose CEOs have no fatal disaster experience (and thus 6.8% lower leverage than firms whose CEOs have a medium level of fatal disaster experience). The economic magnitude of the effects documented in Column (1) is large relative to the sample mean (25.4%) and standard deviation (18.2%) of financial leverage. For example, the difference in leverage between *Medium* and *Extreme Fatality* CEOs is comparable to the effect of a four-standard-deviation change in the market-to-book ratio ($-1.1\% \times 1.41 \times 4 = -6.21\%$), traditionally one of the strongest documented determinants of capital structure.

The estimates reported in Column (4) mirror those reported in Column (1), indicating that there is a U-shaped relation between firms' propensity to hold cash and CEO disaster experience. All else equal, firms whose CEOs

[11] This assumption rests on the stationarity of disaster risk within the year of the CEO's birth. The stationarity assumption is supported by findings in the meteorology literature (see, for example, Elsner and Bossak (2001), Pielke, Wigley, and Green (2008)).

Table IV

CEO Early-Life Disaster Experience and Corporate Financial Policies

This table reports OLS regression estimates for the relation between CEO disaster experience and corporate financial policies (dependent variables given in column titles). The dependent variable in Columns (1) to (3) is book leverage. The dependent variable in Columns (4) to (6) is the ratio of cash to assets. All models include fixed effects for the firm, year, CEO birth year, and CEO birth state. Columns (2) and (5) include third-order polynomials for all continuous control variables in the model (not shown). Columns (3) and (6) include decile step functions for all continuous control variables in the model (not shown). All variables are as defined in Table III. The standard set of controls include: natural log of book assets, market-to-book ratio, asset tangibility (fixed assets/book assets), dividend paying indicator, ROA, sales growth, CEO age and age squared, and CEO female indicator. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	Book Leverage			Cash-to-Asset		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Medium Fatality Experience	0.033***	0.030***	0.030***	–0.012**	–0.010**	–0.010**
	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.005)
Extreme Fatality Experience	–0.035***	–0.032***	–0.035***	0.022***	0.022***	0.020***
	(0.011)	(0.011)	(0.011)	(0.007)	(0.007)	(0.007)
Average Fatality Risk of County	0.003			–0.005		
	(0.007)			(0.004)		
(Average Fatality Risk of County)^2	–0.000			0.001		
	(0.001)			(0.001)		
Ln(Book Assets)	–0.010			–0.030***		
	(0.009)			(0.006)		
Market-to-Book	–0.011***			0.005*		
	(0.002)			(0.002)		
Fixed Assets/Book Assets	0.040			–0.294***		
	(0.061)			(0.034)		
Dividend Paying	–0.023**			–0.001		
	(0.012)			(0.006)		
ROA	–0.116***			0.032		
	(0.026)			(0.022)		
Sales Growth	0.001			–0.005**		
	(0.003)			(0.002)		
CEO Age	–0.000			–0.006		
	(0.007)			(0.005)		
CEO Age^2	0.000			0.000*		
	(0.000)			(0.000)		
CEO is Female	0.021			0.008		
	(0.019)			(0.012)		
Observations	8,533	8,533	8,533	8,533	8,533	8,533
Adjusted R^2	0.828	0.799	0.810	0.842	0.822	0.837
3rd-Order Polynomial Controls	No	Yes	No	No	Yes	No
Decile Step Function Controls	No	No	Yes	No	No	Yes
Firm, Year, Birth Year, and State of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes

experienced a moderate level of fatalities from natural disasters hold 1.2% *less* cash per dollar of assets than firms whose CEOs experienced no fatal disasters. In contrast, firms whose CEOs experienced an extreme level of fatalities from disasters hold 2.2% *more* cash per dollar of assets than firms whose CEOs have no fatal disaster experience. As in the case of financial leverage, the economic magnitude of the effects is large: the difference in cash holding intensity between *Medium* and *Extreme Fatality* CEOs (3.7%) is equivalent to one-third of the sample mean intensity and one-quarter of its sample standard deviation.

A potential concern with the results in Columns (1) and (3) of Table IV is that the documented relation between CEO disaster experience and corporate financial policies may be due to spurious correlations resulting from unmodeled nonlinearities between corporate risk-taking and the other control variables. To account for this possibility, we follow two distinct approaches to relaxing the assumption of linear relations between corporate policies and all other control variables. First, in Columns (2) and (5) of Table IV (for leverage and cash holdings, respectively), we replace each continuous control variable with sample decile indicators. This approach saturates the models with step functions for each continuous control variable and ensures that the step function for CEO experience captures nonlinearities associated with disaster fatalities as opposed to a confounding source of variation. Alternatively, in Columns (3) and (6) of Table IV, we augment the baseline specifications by including higher-order polynomials (up to the third degree) for each continuous control variable.

Across all columns, the results are very similar. Although their magnitude decreases slightly, the coefficient estimates of interest retain the same signs and remain highly statistically and economically significant. Therefore, it seems unlikely that the nonmonotonic relation between CEO fatal disaster experience and corporate financial policies stems from spurious correlations due to nonlinearities between corporate risk-taking and other control variables.

Overall, the results in Table IV indicate that there is a nonmonotonic relation between CEOs' fatal disaster experience early in life and corporate financial policies that affect firm risk. In particular, CEOs with some fatal disaster experience are associated with riskier policies (i.e., higher leverage, lower cash holdings), whereas CEOs who witnessed extreme levels of disaster-related fatalities are associated with more conservative corporate policies. This evidence supports the view that CEOs who have experienced risky events with ex post minor (major) consequences may be desensitized (sensitized) to the downside of risky behavior and take on more (less) risk when at the helm of a firm.

A.1. Do Different Financial Policies Reflect Active Financing Decisions?

The literature shows that corporate financial policies are sticky. Hence, it is possible that the results in Table IV are due to CEOs adjusting their firms' capital structure only partially over time. Following Shyam-Sunder and Myers (1999), we examine the effect of CEOs' disaster experience on their propensity to actively fill firm financing gaps via debt, external equity, or internal equity. Specifically, for each firm-year, we calculate the firm's net financing deficit

(*FD*) as cash dividends plus net investment plus change in working capital minus cash flows after interest and taxes, all scaled by lagged assets, as in Malmendier, Tate, and Yan (2011). Also, we compute net new debt issues as long-term debt issues minus long-term debt repayment, net new equity issues as the sale of common and preferred stock minus repurchases, and changes in accumulated internal equity as the change in retained earnings, all scaled by lagged assets. We then estimate OLS regression models where the dependent variable is the net new capital (debt, external equity, or internal equity) and the main independent variable is *FD* interacted with indicators for the CEO's disaster experience. Following Malmendier, Tate, and Yan (2011), we include firm fixed effects and their interactions with *FD*. Hence, in these models, there is a separate intercept and slope for each firm, with the latter absorbing the average effect of changes in *FD*. In addition, we include all the control variables in Frank and Goyal (2003) and their interactions with *FD*: book leverage, change in profitability, asset tangibility, logarithm of sales, and Q. Finally, as in our earlier tests, we include the average fatality risk of the CEO's birth county, its square, and fixed effects for year, CEO birth state, and CEO birth year.

Table V reports the results. To provide a benchmark, the specifications in Columns (1), (3), and (5) include *FD* as the only independent variable in the net debt, net external equity, and net internal equity models, respectively. The corresponding coefficient estimates imply that, on average, firms finance a dollar of financing deficit by issuing 69 (33) cents of new debt (external equity) or drawing down 14 cents of accumulated internal equity. The magnitude of the net debt model, in particular, is very similar to those reported in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003).[12]

In Columns (2), (4), and (6) of Table V, we augment the baseline models by including indicators for *Medium Fatality* and *Extreme Fatality* CEOs, their interactions with *FD*, and all other control variables. The results show that CEOs with different disaster experience systematically resort to different sources of capital to meet their firms' financing gaps. In particular, in the net debt model (Column (2)), the coefficient on the interaction between *Extreme Fatality* and *FD* is negative and significant, while the interaction with *Medium Fatality* is positive and significant. The coefficients imply that *Extreme Fatality* CEOs use 15 cents less debt financing than *No Fatality* CEOs to cover financing deficits, while *Medium Fatality* CEOs use almost 5 cents more debt. This 20-cent difference in active debt financing per dollar deficit between *Medium* and *Extreme Fatality* CEOs is economically sizable compared to the average marginal propensity documented in Column (1) of 69 cents. Although the coefficient estimates in the external equity model have signs similar to those in the debt model (Column (4)), the differences across CEO types are not significant. In

[12] The coefficient for the same test in Shyam-Sunder and Myers (1999) is 0.75 (Table 2, Column (2)). When Frank and Goyal (2003) restrict the sample to the top quartile of firms (which have a similar size to the firms in our sample), they obtain a coefficient of 0.753 for the 1971 to 1989 period and 0.675 for the 1990 to 1998 period (Table 6, Columns (7) and (11)).

Table V

Sensitivity of Debt Issues, Equity Issues, and Retained Earnings to Financing Deficits by CEO Early-Life Disaster Experience

This table reports OLS regression estimates for the sensitivity of net debt issues, net external equity issues, and changes in accumulated internal equity with respect to firm net financing deficits, conditional on CEO disaster experience. The dependent variable in Columns (1) and (2) is net debt issues divided by lagged assets. The dependent variable in Columns (3) and (4) is net equity issues divided by lagged assets. The dependent variable in Columns (5) and (6) is the change in retained earnings from the prior year divided by lagged assets. *Net Debt Issues* is defined as long-term debt issues minus long-term debt reduction and *Net Equity Issues* is defined as sale of common and preferred stock net of repurchases. *Net Financing Deficit* is defined as cash dividends plus net investment plus change in working capital minus cash flow after interest and taxes, normalized by beginning-of-year assets. The control variables are identical to those in Frank and Goyal (2003): changes in profitability (operating income before depreciation normalized by beginning-of-year assets), in tangibility (property, plants, and equipment, normalized by beginning-of-year assets), in the logarithm of sales, and in Q (market value of assets over book value of assets, where market value of assets is the book value of total assets plus market equity minus book equity). Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	Net Debt Issues Lagged Assets		Net Equity Issues Lagged Assets		$-1\times\Delta$Retained Earnings Lagged Assets	
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Net Financing Deficit (FD)	0.691***		0.332***		0.140***	
	(0.066)		(0.005)		(0.008)	
Medium Fatality Experience		–0.0018		–0.0019		–0.0064
		(0.0022)		(0.0023)		(0.0057)
Extreme Fatality Experience		0.0032		0.0042		–0.0169**
		(0.0029)		(0.0028)		(0.0075)
Medium Fatality Experience × FD		0.0495*		0.0055		–0.0307
		(0.0266)		(0.0592)		(0.1081)
Extreme Fatality Experience × FD		–0.1558**		–0.0735		0.0448**
		(0.0729)		(0.0691)		(0.0228)
Observations	8,533	8,533	8,533	8,533	8,533	8,533
Adjusted R^2	0.500	0.8814	0.442	0.779	0.311	0.790
Firm Fixed Effects	No	Yes	No	Yes	No	Yes
Firm Fixed Effects × FD	No	Yes	No	Yes	No	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes
County Risk Controls, Birth Year and Birth State Fixed Effects	No	Yes	No	Yes	No	Yes
Frank and Goyal (2003) Control Variables	No	Yes	No	Yes	No	Yes
Frank and Goyal (2003) Control Variables × FD	No	Yes	No	Yes	No	Yes

contrast, the results show that the propensity to accumulate and draw down internal equity (Column (6)) differs significantly across CEO types in a way that compensates for the differences in their reliance on external sources of capital. Specifically, when the firm has no financing deficit or a financing surplus (deficit), *Extreme Fatality* CEOs accumulate (tap into accumulated) internal equity more heavily. Consistent with our main conjecture, these patterns suggest that CEOs' disaster experience affects firms' propensity to build (equity)

reserves, which may be tapped into in times of need and reduce firm reliance on external (debt) capital.

Overall, the evidence in Table V suggests that differences in capital structure across CEO types stem from active financing decisions, rather than sticky leverage ratios due to passive adjustments. In particular, the dynamics of firms' reliance on external debt versus internal equity capital are consistent with greater (lower) appetite for risk by *Medium* (*Extreme*) *Fatality* CEOs.

A.2. CEO Experience, Credit Risk, and Cost of Debt Capital

The differences in firm-level financing decisions across CEO types should affect firm credit risk and ultimately the cost of debt capital, if they are in fact due to differential risk-taking propensity rather than opportunism. In Table VI, we begin by investigating how firm credit ratings and the likelihood of bankruptcy vary with CEO disaster experience.

To conduct the ratings analysis, we categorize credit ratings in Capital IQ's Entity Ratings database on an integer scale from 0 to 26, with 0 corresponding to the lowest rating (i.e., D) and 26 to the highest rating (i.e., AAA) in our sample. The modal rating in our sample is BBB, in 15.34% of firm-years, while the median rating is BBB+. Column (1) of Table VI reports estimates from an ordered probit model and Column (2) reports OLS coefficients. Both estimation approaches suffer some shortcomings. On the one hand, OLS estimation is less sensitive to the large number of fixed effects in the model, but requires the potentially problematic assumption that the "distance" between two adjacent rating categories is constant across the full range of ratings. On the other hand, ordered probit estimation accommodates varying distances between adjacent rating categories, but is potentially more sensitive to the large number of fixed effects. We therefore report the results from both approaches. Both models include all the standard controls and fixed effects from the baseline specification in Table IV. The sample size in this analysis drops by roughly half due to missing credit ratings.

In line with our interpretation of earlier results, we find that firms with *Medium Fatality* CEOs have lower credit ratings, while firms with *Extreme Fatality* CEOs have higher credit ratings than the baseline group of firms with *No Fatality* CEOs. The difference between a firm with *Medium Fatality* CEOs and one with *Extreme Fatality* CEOs is approximately one (two-thirds of) credit rating category based on the ordered probit (OLS) estimates. Thus, for the modal or median firm, this difference amounts to being rated as investment versus below-investment grade and can have a large impact on the firm's cost of debt capital.

In Columns (3) and (4), we focus on extreme credit risk and examine how the likelihood of a "junk" rating (i.e., BBB and below) varies with CEO disaster experience. Controlling for firm fixed effects and average birth county risk (Column (3)), we find that firms with *Medium Fatality* CEOs are 7.1% more likely than firms with *No Fatality* CEOs to have below-investment grade ratings, while firms with *Extreme Fatality* CEOs are 8.8% less likely. Although some

Table VI

CEO Early-Life Disaster Experience and Credit Risk

This table reports regression estimates for the relation between CEO disaster experience and interest expenses, credit ratings, or bankruptcy incidence (dependent variables given in column titles). The sample is restricted to those firms with credit ratings in Columns (1) to (4). There are 27 unique credit ratings in the sample, with the lowest being D, and the highest being AAA. Credit ratings are given a numerical score increasing by 1 for each increase in credit rating, with a 0 corresponding to a rating of D and 26 corresponding to a rating of AAA. The dependent variable in Columns (1) and (2) is the numerical credit rating score, where Column (1) reports ordered probit estimates and Column (2) reports OLS estimates. *Junk Rating* is an indicator equal to one if the firm has a credit rating lower than BBB−, and zero otherwise. *Not Rated* is an indicator equal to one if the firm does not have a credit rating, and zero otherwise. Standard errors, clustered at the firm level, are reported in parentheses. *Bankrupt Next Year* is an indicator equal to one if the firm files for Chapter 7 or Chapter 11 bankruptcy in the next year (obtained from the UCLA-LoPucki Bankruptcy Research Database), and zero otherwise. An analogous definition is employed for *Bankrupt Next 2 Years*. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

Dependent Variable	Credit Rating: Ordered Probit (1)	Credit Rating: OLS (2)	"Junk" Rating (3)	"Junk" Rating (4)	Not Rated (5)	Bankrupt Next Year (6)	Bankrupt Next 2 Years (7)
Medium Fatality Experience	–0.365*	–0.460**	0.071**	0.053*	–0.021	0.009**	0.017**
	(0.214)	(0.204)	(0.033)	(0.031)	(0.033)	(0.004)	(0.008)
Extreme Fatality Experience	0.774***	0.586**	–0.088*	–0.051	–0.026	–0.015**	–0.027**
	(0.267)	(0.254)	(0.048)	(0.042)	(0.041)	(0.006)	(0.011)
Observations	4,114	4,114	4,114	4,114	8,553	8,553	8,553
Adjusted R^2	0.560	0.898	0.765	0.805	0.746	0.393	0.513
Nonlinear County Risk Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Controls from Table IV	Yes	Yes	No	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year, Birth Year, and Birth State Fixed Effects	Yes	Yes	No	Yes	Yes	Yes	Yes

of these differences are absorbed by firm-level characteristics and other fixed effects (Column (4)), the inverse U-shaped relation between the likelihood of junk rating and CEO disaster experience persists even in the more restrictive specification.

A potential concern is that the firm's choice to obtain a rating might depend on its CEO type and the resulting self-selection may impact our inferences, given the large fraction of firm-years with missing credit ratings. To assess this possibility, we test whether CEOs' disaster experience explains credit rating availability. Column (5) presents estimates of a linear probability model where the dependent variable is an indicator variable equal to one if the firm is *not* rated, and zero otherwise. We find no association between CEO disaster experience and the availability of a credit rating. This suggests that selection effects are unlikely to be driven by CEO type and should have a limited impact on the interpretation of the results in Columns (1) to (4).

The evidence in Columns (1) to (4) shows that market participants' assessment of firm credit risk varies nonmonotonically with CEOs' disaster experience in childhood. To complement this analysis, we examine whether market participants' expectations line up with ex post realizations of bankruptcy. We obtain Chapter 7 and Chapter 11 filings from the UCLA-LoPucki Bankruptcy Research Database and define the firm-year indicator variable *Bankrupt Next Year* (*Bankrupt Next 2 Years*) to be equal to one if the firm files for bankruptcy in the following year (next two years), and zero otherwise. In line with the credit rating results, the evidence in Columns (6) and (7) shows that firms with *Medium* (*Extreme*) *Fatality* CEOs are significantly more (less) likely to file for bankruptcy than firms with *No Fatality* CEOs and that the estimated effects are economically large. The difference between the incremental likelihood of bankruptcy for firms with *Medium* and *Extreme Fatality* CEOs is approximately twice as large as the unconditional probability for the mean firm-year in our sample of 1%.

Next, in Table VII, we investigate whether a firm's cost of debt capital reflects the effect of the CEO's attitude toward risk as proxied by early-life disaster experience. All models reported in the table explicitly control for firm leverage, and thus the estimated effect of CEO disaster experience on the cost of debt capital is incremental relative to the effect of firm leverage. This is important given that our earlier results show that there is a strong relation between financial leverage and CEO type.

We begin by measuring the cost of debt as reported interest expenses scaled by the amount of long-term debt. While this measure is desirable due to its wide availability for most firm-years in our sample (as opposed to the cost of newly issued debt), it has some shortcomings. First, a missing or zero value for interest expenses does not imply that the cost of raising debt capital is actually zero. Accordingly, we drop these observations from our sample. Second, given their backward-looking nature, it is not obvious that reported annual interest expenses reflect the effect of the current CEO's attitude toward risk. For this reason, in subsequent tests below we examine the cost of newly issued debt.

Table VII

CEO Early-Life Disaster Experience and Cost of Debt

This table reports OLS regression estimates for the relation between CEO disaster experience and the cost of debt (dependent variables given in column titles). The dependent variable in Column (1) is the reported annual interest expense divided by total debt. The dependent variable in Columns (2) to (4) is the all-in-spread inclusive of all fees, in basis points, for bank loans, where each observation corresponds to a different loan deal. Loan controls, taken from Ivashina (2009), are the borrowing firm's credit rating, whether the borrowing firm has a prior lending relationship with the lead bank, log sales, log assets, book leverage, ROA, log of the loan amount, loan maturity, collateral requirement, the presence of financial covenants and/or performance pricing, and the prime base rate. The dependent variable in Columns (5) to (7) is the spread over Treasury yields for the firm's newly issued bonds (bond yield-to-maturity less the yield on the U.S. Treasury of equivalent maturity), where each observation corresponds to a unique bond issue. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	Int. Exp. Debt	Bank Loan All-in Spread			Bond Issue Spread over Treasury		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Medium Fatality Experience	0.016***	18.974***	21.108***	16.852***	–6.292	–1.637	10.962
	(0.006)	(6.729)	(6.832)	(5.830)	(8.134)	(7.811)	(6.735)
Extreme Fatality Experience	–0.015*	–20.602**	–25.753***	–13.752	–29.851**	–28.435**	–13.981*
	(0.009)	(7.404)	(9.777)	(8.730)	(11.595)	(12.334)	(8.222)
Observations	7,206	2,435	2,435	2,264	2,107	2,107	2,107
Adjusted R^2	0.517	0.290	0.481	0.596	0.291	0.482	0.792
Nonlinear County Risk Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Controls from Table IV	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Ivashina (2009) Controls	N/A	No	No	Yes	No	No	Yes
Firm Fixed Effects	Yes	No	No	Yes	No	No	Yes
Year, Birth Year, and Birth State Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes
Lead Lender Fixed Effects	N/A	Yes	Yes	Yes	N/A	N/A	N/A

The results in Column (1) of Table VII indicate that firms with *Medium Fatality* CEOs, on average, report 1.6% higher annual interest expenses per dollar of outstanding long-term debt than firms with *No Fatality* CEOs. Conversely, firms with *Extreme Fatality* CEOs have 1.5% lower interest rate expenses, for a difference of 3.1% between *Medium* and *Extreme Fatality* CEOs. Thus, the inverse U-shaped relation that manifests in firm capital structure and credit risk also holds when we examine the ex post cost of debt and is economically significant.

Given the shortcomings of reported interest expenses that we use in Column (1), we conduct supplemental tests that examine the relation between CEO disaster experience and the cost of debt at the issue level at the time of issuance. The main advantage of this approach is the direct link between the cost of debt and the CEO leading the firm at the time of the issue. Columns (2) to (4) and (5) to (7) in Table VII report the results of this analysis for bank loans and bond issues, respectively. We obtain bank loan-level data from *Deal Scan* for the 1992 to 2012 period and use the "all in spread" as the cost of debt at the time of loan initiation. We obtain bond issue-level data from the Mergent Fixed Income Securities Database (FISD) for the 1992 to 2012 period and use the spread between newly issued bonds' yield-to-maturity and the yield on the U.S. Treasury of equivalent maturity. Following Ivashina (2009), we control for a wide array of factors that may affect the cost of new debt, in addition to controls for the birth county's average fatality rate and its square, and fixed effects for year, CEO birth year, CEO birth state, firm, and (in the bank loan models) lead lender.

Column (2) of Table VII reports estimates of the model including only year and lead lender fixed effects as controls. Conditional on receiving a bank loan, firms with *Medium Fatality* CEOs pay a 18.9 basis points higher spread and firms with *Extreme Fatality* CEOs pay a 20.6 basis points lower spread than firms with *No Fatality* CEOs. Including fixed effects for CEO birth year and birth state in Column (3) yields similar results and economic magnitudes. The specification in Column (4) includes all other deal-level characteristics that likely depend on the lender's assessment of borrowers' credit risk (e.g., collateral, covenants) and firm fixed effects. Although controlling for these characteristics absorbs some of the CEO type effects, there continues to be an inverse U-shaped relation between the cost of new bank loans and CEO disaster experience. Specifically, loans contracted by *Medium Fatality* CEOs are charged significantly higher spreads than those by *No Fatality* and *Extreme Fatality* CEOs.

The remaining columns of Table VII report results of similar models for the spread over Treasury of newly issued bonds. Although in the full model (Column 7) the sign of the estimated coefficient on *Medium Fatality* CEOs is consistent with a higher cost of debt, the effect is not statically significant in any of the specifications. In contrast, the effect of CEO exposure to extreme disaster fatalities in childhood is negative and economically large across all specifications, in line with the bank loan results. The lack of robust results for *Medium Fatality* CEOs may be due to the arm's-length nature of bond issues,

which can make their pricing less sensitive to CEOs' personal characteristics. Alternatively, the lack of significant effects on the pricing of public debt for *Medium Fatality* CEOs may be due to endogenous selection in credit markets. In other words, given the higher credit risk of firms led by *Medium Fatality* CEOs, it is possible that riskier firms would be precluded from accessing the public debt market and be forced to resort to bank financing, in line with our earlier results. Overall, however, the evidence in Table VII is largely consistent with the view that the effect of CEO disaster experience on the aggressiveness of financial policies ultimately affects a firm's cost of debt capital.

B. CEO Disaster Experience and Corporate Acquisition Activity

Existing studies suggest that CEOs exert significant decision-making power in the context of mergers and acquisitions and, whether due to empire building or managerial hubris, may engage in acquisitions at the expense of firm shareholders (Jensen (1986), Roll (1986)). Corporate acquisitions are inherently riskier compared to organic internal growth due to the typically large commitment of time and resources required. Therefore, in our next set of tests we examine whether CEO fatal disaster experience explains corporate acquisition activity. To conduct these tests, we obtain merger announcements that involve public targets between 1992 and 2012 available in Securities Data Corporation's (SDC) U.S. Mergers and Acquisitions database. After excluding buybacks, share repurchases, self-tenders, and spinoffs, there are 2,883 merger announcements in our sample. We next estimate a series of linear probability models to assess whether CEO attitude toward risk, as measured by childhood experiences of fatal disasters, has a material impact on firm acquisitiveness. The structure of these tests is similar to those reported in Table IV for the corporate financial policy models. The results are reported in Table VIII.

The results in Table VIII are in line with those of our earlier tests. Across all specifications, the effect of a CEO's childhood experience with fatal disasters on firm acquisitiveness is statistically significant at conventional levels and depends on the severity of the disaster consequences witnessed by the CEO. Specifically, the evidence supports the existence of an inverse U-shaped relation between CEO fatal disaster experience and corporate acquisitiveness. The estimates imply that firms led by *Extreme Fatality* CEOs are 8.1% less likely to attempt an acquisition in a given year than firms with *No Fatality* CEOs. In stark contrast, firms led by *Medium Fatality* CEOs are 6.1% more likely to engage in at least one acquisition of another public company than firms with *No Fatality* CEOs. This in turn implies a 14.2% difference in the probability of an acquisition by *Extreme Fatality* versus *Medium Fatality* CEOs. The effect is economically sizeable given that the average probability of announcing an acquisition is 30% with a standard deviation of 45.7%. Although the baseline estimates are based on linear probability models for tractability and the presence of a large number of fixed effects, the results are robust to estimating logit models without fixed effects.

Table VIII

CEO Early-Life Disaster Experience and Firm Acquisitiveness

This table reports linear probability model regression estimates for the relation between CEO disaster experience and the propensity to make acquisitions. The dependent variable is an indicator equal to one if the firm announced an acquisition in the current year. All models include fixed effects for the firm, year, CEO birth year, and CEO birth state. Columns (2) and (5) include third-order polynomials for all continuous control variables in the model (not shown). Columns (3) and (6) include decile step functions for all continuous control variables in the model (not shown). All variables are as defined in Table III. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	Announced Acquisition		
Dependent Variable	(1)	(2)	(3)
Medium Fatality Experience	0.061**	0.065**	0.068**
	(0.028)	(0.028)	(0.029)
Extreme Fatality Experience	–0.081**	–0.079**	–0.077**
	(0.038)	(0.038)	(0.038)
Average Fatality Risk of County	0.023		
	(0.027)		
(Average Fatality Risk of County)^2	–0.003		
	(0.003)		
Ln(Book Assets)	0.050***		
	(0.016)		
Market-to-Book	–0.003		
	(0.005)		
Book Leverage	–0.098		
	(0.071)		
Fixed Assets/Book Assets	–0.345***		
	(0.118)		
I(Net Income $<$ 0)	–0.057***		
	(0.021)		
Dividend Paying	0.006		
	(0.029)		
ROA	0.025		
	(0.045)		
Sales Growth	0.006		
	(0.012)		
CEO Age	0.009		
	(0.018)		
CEO Age^2	–0.000		
	(0.000)		
CEO Is Female	–0.084		
	(0.075)		
Observations	8,533	8,533	8,533
Adjusted R^2	0.394	0.397	0.404
3rd-Order Polynomial Controls	No	Yes	No
Decile Step Function Controls	No	No	Yes
Firm, Year, Birth Year, and State of Birth FE	Yes	Yes	Yes

Next, we examine in greater depth whether CEO disaster experience affects economic decisions and outcomes associated with corporate acquisition activity. In particular, for each announcement in our sample, we calculate four deal-specific variables that are germane to our main conjecture: the proposed method of payment, acquirer announcement returns, whether the target is in the same industry as the acquirer, and the premerger correlation between acquirer and target stock returns.

We define *All-Stock Acquisition* to be an indicator equal to one if the merger offer includes acquirer stock only, and zero otherwise. Paying for the acquisition with acquirer stock reduces the risk resulting from unforeseen issues with the target's valuation. Thus, all else equal, an all-stock acquisition is less risky than paying for the acquisition with cash. Next, we define *Announcement CAR* to be the acquirer's cumulative abnormal return during trading days [–2, +2] around the merger announcement based on the market model. We define *Unrelated Acquisition* to be an indicator equal to one if the target is not in the same Fama–French 17 industry as the acquirer, and zero otherwise. Lastly, we calculate the stock return correlation between acquirer and target daily returns over trading days [–250,–22]. All models include acquirer industry-by-year, CEO birth year, and CEO birth state fixed effects. Similar to prior tests, standard errors are clustered at the acquiring firm level. In addition, we include a host of control variables identified by prior literature as relevant factors affecting our merger outcomes (e.g., Eckbo (2014)). Table IX reports the results of OLS regressions where the dependent variable is one of the deal-specific variables described.

Column (1) reports estimates of a linear probability model where the dependent variable is the *All-Stock Acquisition* indicator. Firms with *Medium Fatality* CEOs are 7.4% less likely to make an all-stock acquisition than *No Fatality* CEOs. In our sample, roughly 25% of announcements are all-stock, making this a sizeable effect. *Extreme Fatality* CEOs, on the other hand, are equally likely to make an all-stock acquisition as *No Fatality* CEOs. Thus, *Medium Fatality* CEOs are less likely to make all-stock acquisitions than both *No Fatality* and *Extreme Fatality* CEOs, consistent with a nonmonotonic relation between disaster experience and risk attitudes.

The evidence in Column (2) indicates that merger announcements by acquiring firms with *Medium Fatality* CEOs earn 0.57% lower abnormal returns during the five trading days around the announcement. In contrast, acquiring firms with *Extreme Fatality* CEOs earn 1.25% higher abnormal returns than those in the *No Fatality* group. It therefore appears that capital markets penalize merger offers by *Medium Fatality* CEOs and reward those by *Extreme Fatality* CEOs. This result supports the idea that investors view merger offers by *Medium Fatality* CEOs as excessively risky relative to those by other CEO types.

The lower returns associated with *Medium Fatality* CEOs may be due to a higher propensity to venture into unrelated acquisitions, where the acquiring firm lacks target-specific expertise and finds it harder to realize synergistic gains due to complementarities or cost savings. Indeed, the evidence in Column (3) shows that *Medium Fatality* CEOs are 7.9% more likely to announce

Table IX

CEO Early-Life Disaster Experience and Acquisition Characteristics

This table reports OLS regression estimates for the relation between CEO disaster experience and acquisition characteristics (dependent variables given in column titles). *Announcement CAR* is calculated for the acquirer using a CAPM market model. *All Stock Acquisition* is an indicator equal to one for stock acquisitions, and zero otherwise. *Unrelated Acquisition* is defined using the Fama-French 17 industry definitions. Columns (4) and (5) restrict the sample to diversifying and nondiversifying mergers, respectively. All models include fixed effects for (acquirer's industry × year), CEO birth year, and CEO birth state. Controls for target public status, acquirer toehold ownership, friendly merger, and diversifying merger are also included but not shown for brevity. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	All Merger Announcements			Diversifying Mergers	Focused Mergers
Sample:	All Stock Acquisition	Announcement CAR [–2,+2]	Unrelated Acquisition	Bidder-Target Correlation	
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Medium Fatality Experience	–0.074**	–0.574*	0.079**	0.008	0.015
	(0.033)	(0.332)	(0.040)	(0.032)	(0.025)
Extreme Fatality Experience	0.039	1.250**	–0.039	0.057	0.050
	(0.067)	(0.612)	(0.073)	(0.093)	(0.041)
Average Fatality Risk of County	–0.002	0.001	–0.000	0.001	0.003
	(0.001)	(0.013)	(0.002)	(0.004)	(0.002)
(Average Fatality Risk of County)^2	0.000**	0.000**	0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
All Stock Acquisition		–0.758**		0.028	0.067***
		(0.311)		(0.035)	(0.017)
Relative Size of Target	0.366***	–0.960	–0.084	0.169**	0.200***
	(0.056)	(0.690)	(0.053)	(0.069)	(0.030)
Acq. Ln(Book Assets)	0.024**	–0.083	0.026*	0.044***	0.058***
	(0.011)	(0.118)	(0.014)	(0.012)	(0.008)
Acq. M/B	0.036***	0.292**	–0.008	0.002	0.021***
	(0.009)	(0.116)	(0.010)	(0.012)	(0.006)
Acq. Book Leverage	–0.376***	2.507**	–0.204*	–0.107	0.022
	(0.089)	(0.985)	(0.105)	(0.116)	(0.064)
Acq. Cash/Assets	–0.288**	1.158	–0.135	0.047	0.015
	(0.113)	(1.307)	(0.126)	(0.191)	(0.074)
Acq. Stock Price Run-up [–250,–30]	0.001***	–0.007	0.000	0.000	0.000
	(0.000)	(0.005)	(0.000)	(0.001)	(0.000)
Acq. Stock Volatility [–250,–30]	0.004***	0.013	–0.000	0.004**	0.002*
	(0.001)	(0.019)	(0.001)	(0.002)	(0.001)
CEO Is Female	0.163	–2.883**	0.115	0.212	0.107*
	(0.107)	(1.251)	(0.125)	(0.130)	(0.062)
CEO Age	–0.045	–0.460	–0.012	–0.017	–0.012
	(0.035)	(0.364)	(0.034)	(0.068)	(0.018)
CEO Age^2	0.001	0.004	–0.001	0.001	0.001
	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
Observations	2,883	2,882	2,882	651	1,123
Adjusted R^2	0.400	0.221	0.200	0.842	0.762
(Acquirer Industry × Year), Birth Year, and State of Birth Fixed Effects	Yes	Yes	Yes	Yes	Yes

unrelated acquisitions, while *Extreme Fatality* CEOs are not significantly different from *No Fatality* CEOs along this dimension. Therefore, again in line with our earlier inference, there is a markedly nonmonotonic relation between risk-taking in mergers and CEOs' fatal disaster experience in childhood.

Although unrelated acquisitions are likely associated with greater difficulty of realizing synergies and may require CEOs to extend beyond their area of expertise, these deals may also reduce risk via a diversification effect. We examine this possibility by analyzing the stock return correlation between bidder and target stock returns, conditional on the type of merger, that is, diversifying versus focused deals. If *Medium Fatality* CEOs aim to reduce the firm's overall risk through diversifying acquisitions, then these acquisitions should involve targets whose premerger returns are less correlated with the bidder's returns. However, we find that this is not the case, as seen in Columns (4) and (5). Within the sample of diversifying mergers (Column (4)), *Medium Fatality* CEOs are not associated with acquisitions involving either a higher or a lower correlation with the target, and the same is true within the sample of focused mergers (Column (5)).

C. CEO Disaster Experience and Stock Return Volatility

The results in Tables IV and VIII relate to corporate policies that theory suggests affect the risk borne by investors that hold the firm's equity. Hence, in a sense, those tests provide an ex ante perspective on firm riskiness. A natural implication of the earlier evidence is that the ex post realized volatility of equity returns should also depend on CEOs' attitude toward risk, as captured by early-life natural disaster experiences. We examine this conjecture next.

Table X reports estimates from pooled OLS regressions where the dependent variables are various measures of annualized volatility of daily stock returns over the fiscal year. In particular, Columns (1) to (3) report estimates for various specifications of the model where total volatility is the dependent variable, whereas Columns (2) to (6) report similar estimates for the idiosyncratic component of total volatility, calculated using a CAPM market model.[13] Across the various columns of Table X, the model specifications are similar to those reported in Tables IV and VIII.

In line with the results for corporate policies, the evidence in Table X shows that there is a marked and robust inverse U-shaped relation between CEO early-life experience with fatal disasters and the realized volatility of stock returns. The estimates in Column (1) indicate that firms whose CEOs are in the *Medium Fatality* group are associated with 3.73% *higher* annualized stock volatility than firms whose CEOs are in the *No Fatality* group. In contrast, firms whose CEOs are in the *Extreme Fatality* group are associated with 3.61% *lower* annualized stock volatility than firms whose CEOs are in the *No Fatality* group. Hence, all else equal, the average difference in annualized stock return

[13] We obtain qualitatively similar results when we use monthly returns to calculate volatility, or when we examine systematic volatility instead.

Table X

CEO Early-Life Disaster Experience and Firm Equity Risk

This table reports OLS regression estimates for the relation between CEO disaster experience and firm risk (dependent variables given in column titles). All models include fixed effects for the firm, year, CEO birth year, and CEO birth state. Columns (2) and (5) include third-order polynomials for all continuous control variables in the model (not shown). Columns (3) and (6) include decile step functions for all continuous control variables in the model (not shown). All variables are as defined in Table III. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	Stock Volatility			Idiosyncratic Volatility		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Medium Fatality Experience	3.734***	3.258***	3.472***	3.354***	2.861***	3.039***
	(0.927)	(0.912)	(0.892)	(0.847)	(0.824)	(0.809)
Extreme Fatality Experience	–3.613**	–4.121***	–3.552***	–3.295**	–3.836***	–3.306***
	(1.437)	(1.406)	(1.361)	(1.340)	(1.296)	(1.259)
Average Fatality Risk of County	–1.046			–1.047		
	(0.799)			(0.751)		
(Average Fatality Risk of County)^2	0.036			0.037		
	(0.090)			(0.085)		
Ln(Book Assets)	–2.600***			–3.342***		
	(0.719)			(0.676)		
Market-to-Book	0.558**			0.051		
	(0.240)			(0.230)		
Book Leverage	8.787**			10.507**		
	(4.112)			(4.097)		
Fixed Assets/Book Assets	12.416***			10.393**		
	(4.387)			(4.347)		
Cash/Assets	12.653***			9.872***		
	(4.018)			(3.623)		
Dividend Paying	–3.568**			–3.527***		
	(1.400)			(1.343)		
ROA	–16.775***			–16.153***		
	(3.306)			(3.089)		
Sales Growth	0.396			0.476		
	(0.563)			(0.627)		
CEO Age	–0.050			0.019		
	(0.776)			(0.700)		
CEO Age^2	0.000			–0.001		
	(0.007)			(0.006)		
CEO Is Female	1.612			1.436		
	(3.728)			(3.490)		
Observations	8,533	8,533	8,533	8,533	8,533	8,533
Adjusted R^2	0.737	0.771	0.752	0.718	0.766	0.735
3rd-Order Polynomial Controls	No	Yes	No	No	Yes	No
Decile Step Function Controls	No	No	Yes	No	No	Yes
Firm, Year, Birth Year, and State of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes

volatility between firms with *Medium* and *Extreme Fatality* CEOs is more than 7%. Once again, the economic magnitude of this spread is large, at one-fifth of the mean (35.05%) and almost one-third of the standard deviation (22.72%) of the sample annualized stock return volatility.

In Column (4) of Table X, we repeat the analysis in Column (1) after decomposing total stock return volatility into its systematic and idiosyncratic components and focusing on the latter. The patterns documented in Column (4) are consistent with the results obtained for total stock return volatility. Specifically, CEOs in the *Medium Fatality* group are associated with significantly *higher* and CEOs in the *Extreme Fatality* group are associated significantly *lower* idiosyncratic stock volatility than CEOs in the *No Fatality* group. Moreover, compared to untabulated results for the systematic component of return volatility, the idiosyncratic volatility spreads across CEO disaster groups are notably larger (approximately three times) than the spreads observed for systematic volatility. In the augmented models that account for the nonlinear effects of the control variables, in Columns (2) to (3) and (5) to (6), the estimated coefficients on CEOs' disaster experiences are very similar to those in the more parsimonious models in Columns (1) and (4).

Overall, the evidence in Table X supports the view that the relation between the riskiness of corporate policies and CEOs' early-life experiences with natural disasters has a first-order impact on the risk borne by firm equity investors.

IV. Robustness Tests

In this section, we discuss the results of a series of tests that aim to assess the robustness of our baseline evidence and main inferences.

A. Alternative Measures of CEO Early-Life Disaster Experience

A potential concern with our identification of the effects of CEOs' disaster experience stems from the ad hoc nature of our measure and the threshold that we use to separate *Medium* and *Extreme Fatality* CEOs. In Table IA.V of the Internet Appendix, we examine the robustness of our baseline results when 1) we use different thresholds to categorize CEOs' experiences (Panels A and B), 2) we model the effect of CEO experience using a more general quadratic specification (Panel C), 3) we categorize CEO experience based on disaster-related economic damages rather than fatalities (Panel D), and 4) we categorize CEOs based on their "abnormal" experiences with disaster-related fatalities relative to the birth county's long run mean (Panel E).

In Panels A and B of Table IA.V, we classify as *Extreme Fatality* CEOs those whose fatal disaster experience falls above the sample 15^{th} and 5^{th} percentiles, respectively. The evidence in these panels is largely consistent with our baseline results across the various corporate policies and measures of return volatility that we examine. Our inferences therefore seem robust to the threshold chosen to classify CEOs into more and less risk-averse individuals.

In Panel C, we use an alternative specification based on the underlying continuous measure of CEO fatal disaster experience. Across the various models, the results are consistent with our baseline evidence. While the linear term is statistically significant and in the direction of more risk-taking behavior (positive for leverage, volatility, and acquisitiveness, and negative for cash holdings), the squared term is also significant but takes the opposite sign. Most important, the implied in-sample maxima (minimum in the case of cash holdings) are very close to the cutoff levels we use to identify extreme fatality experience. Across the various models, the implied maximum (minimum in the case of cash holdings) hovers around a fatalities rate of about 0.05%, which is similar to the 10^{th} percentile value of disaster experience used in our baseline classification.

In Panel D, we categorize CEO experience based on economic damages from disasters rather than fatalities. The results based on this classification are again in line with our fatality-based tests. This is perhaps not surprising given that the sample correlation between the fatality- and damages-based measures of CEO experience is very high (i.e., Pearson correlation = 0.831). While it would be interesting to disentangle the effect of witnessing disaster-related economic damages versus fatalities on a CEO's subsequent risk-taking propensity, the high correlation between the two measures makes it practically unfeasible. We ultimately favor the fatalities-based measure in our tests because it is likely measured with lower error, especially in the earlier portion of the county-disaster database.

In Panel E, we modify our classification approach and use the "abnormal" fatality rate in the CEO's birth county during the relevant 10-year window. Specifically, we first define the abnormal fatality rate as the difference between the actual fatality rate and the corresponding mean in the CEO's birth county over the 1900 to 2010 period. We then classify CEOs into three groups using the following scheme: CEOs in the bottom three deciles of the abnormal fatality distribution are classified as *Low Fatality*, those in the 4^{th} to 9^{th} deciles inclusive are classified as *Medium Fatality*, while those in the highest decile are classified as *Extreme Fatality*. We choose these decile cutoffs to closely mimic the distribution of the baseline measure of CEO disaster experience (approximately 30% *No Fatality*, 60% *Medium Fatality*, and 10% *Extreme Fatality*). The results from this alternative approach are in line with our earlier evidence.

Overall, the supplemental evidence presented in Table AI.V shows that our inferences about the relation between corporate risk-taking and CEO risk attitudes continue to hold when we rely on alternative empirical approaches to characterize a CEO's childhood disaster experience.

Another potential concern is that we do not know whether CEOs lived in their county of birth between the ages of 5 and 15. While it may be the case that we measure the CEO's location of residence during the relevant time period with error, this should add noise but not bias to our analysis. Nevertheless, we attempt to address this concern in three ways. First, we repeat our earlier tests using a shorter window, $[t+5, t+10]$, which should reduce the measurement error related to CEOs' location of residence. By and large, as shown in Table IA.VI of the Internet Appendix, our results (and to a certain extent even the

magnitudes of our coefficients) continue to hold. Second, in Table IA.VII of the Internet Appendix, we restrict our sample to CEOs for whom we can verify that they resided in their birth state when they obtained their SSN, typically around the age of 15 (Yonker (2012)).[14] The CEO's birth state and SSN state coincide in about 75% of the cases. In this subsample, our empirical approach should result in 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.

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 in Tables IV, VIII, and X, and repeat the exercise 500 times. Table XI reports the average coefficient for the main independent variables over the 500 repetitions and the percentage of coefficients that are significant at the 5% level. Consistent with our expectations, approximately 5% of the coefficients are significant at the 5% level, and those cases are roughly equally split between positive and negative. Moreover, attesting to the significance of our main results, the estimated coefficients are statically significant and in the "right direction" in 0.4% to 1.6% of the replications. This evidence strongly suggests that our measure of early-life disaster experiences likely reflects an economically meaningful characterization of CEOs' risk attitudes, as opposed to random noise.

B. Omitted Variables

Another 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 spurious effects of CEOs' disaster experience, if the latter is systematically correlated with nondisaster-related characteristics of the place of birth such as economic conditions, crime rate, or quality of education. A related concern is that the decision by the parents to live in a disaster-prone area reflects their risk preferences and the latter rather than the disaster experience would affect the CEO's risk preferences.

In our tests, we address the above concerns in three ways. First, our earlier tests control for the average disaster fatality risk of the CEO's county of birth and its square over the 1900 to 2010 period. The addition of these controls ensures that the results are not merely due to CEOs with fatal disaster experience coming from high-risk counties. Even if CEOs cluster by region on any number of characteristics, after controlling for the average time-series disaster

[14] We are indebted to Scott Yonker for sharing the SSN-based data, which allowed us to perform these robustness tests (see Yonker (2012) and Pool, Stoffman, and Yonker (2012) for details regarding this database).

Table XI

Placebo Test: Random Assignment of Disaster Experience across CEOs

This table reports summary statistics of the regression estimates for the baseline models in Tables IV, VIII, and X (dependent variables given in column titles), when we randomly assign a birth county to each CEO based on the observed distribution of CEO birth counties (with replacement). For each replication, we record the estimated coefficient and associated p-value. We repeat the procedure 500 times. We report the mean coefficient estimate for the main independent variables across the 500 replications. In brackets, we report the percentage of coefficient estimates that are positive and significant at the 5% level (%$\beta > 0$ & $\alpha < 5\%$) or negative and significant at the 5% level (%$\beta > 0$ & $\alpha < 5\%$). In parentheses, we report the percentage of coefficient estimates that have larger absolute value than and the same sign as our baseline estimates from Tables IV, VIII, and X and are significant at the 5% level (% $|\beta| > |\beta^*|$ & $\beta \times \beta^* > 0$ & $\alpha < 5\%$). The dependent variable is indicated in the column titles. All standard controls from Tables IV, VIII, and X and fixed effects for firm, year, CEO birth year, and CEO birth state are included but not shown for brevity.

Dependent Variable	Book Leverage (1)	Cash Holdings (2)	Announced Acquisition (3)	Stock Volatility (4)	Idiosyncratic Volatility (5)
Mean β for Medium Fatality CEOs	–0.006	0.004	–0.022	–0.774	–0.615
[% $\beta>0$ & $\alpha\leq5\%$; % $\beta<0$ & $\alpha\leq5\%$]	[2.0%; 2.2%]	[3.0%; 2.2%]	[2.6%; 3.0%]	[1.4%; 3.4%]	[1.4%; 2.6%]
(% $\lvert\beta\rvert > \lvert\beta^*\rvert$ & $\beta\times\beta^*>0$ & $\alpha\leq5\%$)	(1.0%)	(0.6%)	(1.4%)	(0.8%)	(0.6%)
Mean β for Extreme Fatality CEOs	–0.005	0.003	0.011	–0.334	–0.222
[% $\beta>0$ & $\alpha\leq5\%$; % $\beta<0$ & $\alpha\leq5\%$]	[2.0%; 2.4%]	[3.0%; 2.4%]	[2.2%; 1.8%]	[2.2%; 3.8%]	[2.0%; 3.8%]
(% $\lvert\beta\rvert > \lvert\beta^*\rvert$ & $\beta\times\beta^*>0$ & $\alpha\leq5\%$)	(1.2%)	(1.4%)	(0.4%)	(1.6%)	(1.0%)

Table XII

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

This table reports OLS regression estimates where the dependent variable is indicated in the column title. The main dependent variable is an indicator equal to one for 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), and equal to zero for CEOs who were also between 5 to 15 years old in unaffected counties within 100 miles from the major disaster county (control group). All standard controls from Tables IV, VIII, and IX and fixed effects for firm, year, CEO birth year, and CEO birth state are included but not shown for brevity. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

Dependent Variable	Book Leverage (1)	Cash Holdings (2)	Announced Acquisition (3)	Stock Volatility (4)	Idiosyncratic Volatility (5)
Major Disaster Experience	–0.054***	0.027***	–0.107***	–6.204***	–5.842***
	(0.009)	(0.006)	(0.030)	(1.251)	(1.216)
Observations	6,350	6,350	6,350	6,350	6,350
Adjusted R^2	0.830	0.854	0.417	0.736	0.716
All Controls from Table IV	Yes	Yes	Yes	Yes	Yes
Firm, Year, Birth Year, and State of Birth FE	Yes	Yes	Yes	Yes	Yes

risk of the county of birth, the existence of fatal disasters during a particular 10-year period that a CEO resides there should effectively be random.[15] 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 that isolate the effect of major disasters by focusing only on the difference between affected versus neighboring counties. Specifically, we define a "treatment" group as the set of CEOs who experienced a major fatal disaster (as defined in footnote 9 of Section II.C) in their county of birth over the period [t+5, t+15] years and a "control" group as the set of CEOs who did not experience a major disaster in their birth county but were between 5 to 15 years old in *unaffected* counties located within 100 miles from the major disaster. The results reported in Table XII show that our main findings are unchanged, and in some instances become stronger, when analyzing differences in our outcome variables between CEOs in the treatment and control groups. CEOs who experienced a major disaster in their birth counties are associated with lower leverage, stock volatility, and acquisitiveness, and higher cash holdings, relative to CEOs who resided in unaffected counties located within 100 miles of the disaster zone.

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

C. CEO and Firm Matching

Although our models control for firm fixed effects, the latter only absorb time-invariant firm-level factors. Further, the timing of CEO turnover is not typically exogenous. Dynamic matching of CEOs to firms is thus a potential concern, to the extent that firm style changes significantly over time and the resulting CEO turnover depends on executives' risk preferences as captured by our measures.

To better identify the causal effect of CEOs' attitude toward risk, we examine exogenous CEO turnover events as classified by Eisfeldt and Kuhnen (2013).[16] Of 678 CEO turnover events in our sample, 85 are classified as having exogenous timing and have nonmissing observations over a four-year window around the event. Among these, there are 41 cases in which the CEO's risk attitude type changes. We calculate the change in firms' industry-adjusted book leverage, cash-to-asset ratio, acquisitiveness, and stock volatility from two years prior to two years after the CEO turnover events. We then test whether the change in these outcome variables around a CEO turnover is consistent with higher (lower) risk-taking when the incoming CEO is more (less) risk-tolerant than the outgoing CEO.

Despite the small sample size, the evidence in Table XIII is consistent with a causal effect of CEOs' risk tolerance as shaped by early-life disaster experience on firm risk-taking. For instance, the mean difference in the change in industry-adjusted book leverage around *More Risk-Tolerant* versus *Less Risk-Tolerant* CEO turnover events is positive (1.98%, with a t-statistic of 1.81). Similarly, the mean difference in the change in industry-adjusted stock volatility, total and idiosyncratic, and firm acquisition propensity is positive and statistically significant. The results for the changes in cash holdings are qualitatively similar when we compare *Less Risk-Tolerant* to *More Risk-Tolerant* new CEOs, but they are not statistically significant. It is worth noting that, because the variables of interest are adjusted by industry-year means, the results cannot be explained by industry or time trends that may be correlated with CEO turnover.

Although Table XIII provides plausible evidence that CEOs' risk preferences have a causal effect on the risk-taking of the firms that they lead, this interpretation warrants a caveat. Specifically, while the timing of an outgoing CEO's exit is plausibly exogenous, the board's choice of successor is not. Hence, matching dynamics could still be at work, whereby the board appoints the CEO candidate whose risk preferences are expected to foster the prompt implementation of a desired change in direction with respect to the firm's risk-taking. While it is unfeasible to design a natural experiment that definitively rules out this explanation, at the very least the evidence in Table XIII indicates that CEO risk preferences play a major role at the hiring stage, if the board of directors aims to achieve significant changes in corporate policies and risk-taking.

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

Table XIII
Changes in Corporate Policies around Exogenous CEO Turnover Events

This table reports mean changes in industry-adjusted book leverage, cash-to-assets, probability of announcing an acquisition, 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 change around exogenous CEO turnover events where the incoming CEO is *more* risk-tolerant than the outgoing 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 change around exogenous CEO turnover events where the incoming CEO is *less* risk-tolerant than the outgoing CEO. Column (3) reports the difference in the mean change in 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. ***, **, and * indicate significance at the 1%, 5%, and 10% probability level, respectively.

	More Risk-Tolerant ($N = 20$) (1)	Less Risk-Tolerant ($N = 21$) (2)	(1) – (2) (3)	t-stat. (4)
ΔIndustry-Adjusted Book Leverage	0.010	–0.011	0.021*	1.81
ΔIndustry-Adjusted Cash/Assets	–0.015	0.001	–0.016	–1.04
ΔIndustry-Adjusted Acquisition Probability	0.129*	–0.091	0.220*	1.81
ΔIndustry-Adjusted Volatility (%)	1.432	–3.081***	4.512**	2.15
ΔIndustry-Adjusted Idiosyncratic Volatility (%)	1.738	–3.118***	4.855**	2.70

V. Conclusion

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

In contrast, we conjecture that the intensity of life experiences can result in nonlinear effects on subsequent risk-taking. We find that there is a nonmonotonic relation between CEOs' early-life exposure to fatal disasters and several corporate policies including leverage, cash holdings, stock volatility, and acquisitiveness. Our results support the hypothesis that experiencing fatal disasters without extremely negative consequences desensitizes CEOs to the negative consequences of risk, while CEOs who witnessed the extreme downside potential of disasters appear to be more cautious in approaching risk when at the helm of a firm. Ultimately, the link between CEOs' disaster experience and corporate policies has real economic consequences on firm risk and its cost of capital.

Our results are robust to including firm fixed effects and controls for nondisaster-related factors at the county or state of birth level. For instance, we

find significant differences between CEOs who experienced major disasters and those who grew up in geographically contiguous areas during the same time but did not experience major disasters. Moreover, results from difference-in-difference tests that we conduct on a set of exogenously timed turnover events show that changes in CEO risk tolerance are shortly followed by changes in firm risk-taking in the same direction. Therefore, although it is possible that CEOs' risk preferences as shaped by early-life natural disasters determine the matching between firm and CEO styles to some extent, the evidence is consistent with a direct link between CEOs' risk attitude 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 investment behavior. Examining nonlinearities between investors' life experiences and risk-taking may be an equally promising endeavor for future research.

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Appendix: Data Sources for Natural Disasters

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 Geophysical Data Center (NGDC).[17] 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, 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*,[18] 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."

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.[19] If we cannot retrieve all relevant information for a recorded tsunami event, we perform a web search with the following param-

[17] 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), Engdahl and Villaseñor (2002), and C.A. Perry, "Significant Floods in the United States during the 20th Century: USGS Measures a Century of Floods," USGS.

[18] See also Harpel, Chris, and John Ewert, "Bibliography of literature from 1900 to 1997 pertaining to Holocene and fumarolic Pleistocene volcanoes of Alaska, Canada, and conterminous United States," USGS.

[19] See http://www.ngdc.noaa.gov/hazard/tsu_db.shtml.

eters to retrieve related news articles or historical records: "tsunami + state location + event year."

Hurricanes, *tornadoes*, and *severe storm events*: Our main data sources are the data archive of the National Climatic Data Center (NCDC) and the National Weather Service (NWS) of the National Oceanic and Atmospheric Administration.[20] 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 parameters to retrieve related news articles or historical records: "hurricane or tornado or severe storm + state location + event year."

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).[21] 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 articles 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.

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[20] See 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 by Eric S. Blake, Christopher W. Landsea, and Ethan J. Gibney. See also http://bangladeshtornadoes.org/UScases.html.

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

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1: Internet Appendix.